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WORK PLAN – REVISION 1

Gustavus Airport PFAS Site Characterization

GUSTAVUS, ALASKA

SHANNON & WILSON

July 2019

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Alaska Department of Transportation & Public Facilities
2301 Peger Road
Fairbanks, Alaska 99709

Attn: Ms. Samantha Loud

RE: WORK PLAN – REVISION 1, GUSTAVUS AIRPORT PFAS SITE CHARACTERIZATION, GUSTAVUS, ALASKA

The services we propose in this Work Plan will be conducted on behalf of the Alaska Department of Transportation & Public Facilities (DOT&PF). Our scope of services was specified in our proposal dated February 1, 2019 and authorized on February 27, 2019 by DOT&PF under our Professional Services Agreement Number 25-19-1-013 *Per- and Polyfluoroalkyl Substance (PFAS) Related Environmental & Engineering Services*. Additional funding to implement this Work Plan will be requested following Alaska Department of Environmental Conservation (DEC) approval.

This Work Plan was prepared and reviewed by:

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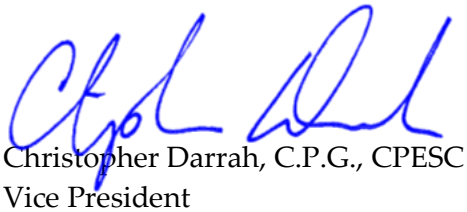
Senior Chemist
Role: Project Manager



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CONTENTS

1 Introduction 1
1.1 Data Quality Objectives 1
1.1.1 Project Objectives 1
1.1.2 Information Inputs 1
1.1.3 Study Boundaries 2
1.1.4 Proposed Analytical Approach 2
1.1.5 Acceptance Criteria 3
1.1.6 Data Collection Methods and Procedures 3
1.2 Project Schedule and Submittals 3
1.3 Project Team 3
2 Site and Project Description 4
2.1 Background 4
2.2 Summary of Private-Well and Surface Water Sampling 5
2.3 Site Characterization Field Activities 6
3 Contaminants of Potential Concern and Regulatory Levels 7
4 Preliminary Conceptual Site Model 7
4.1 Description of Potential Receptors 7
4.2 Potential Exposure Pathways 8
4.2.1 Soil…… 8
4.2.2 Groundwater 8
4.2.3 Surface Water and Biota 8
5 Sampling And Analysis Plan 8
5.1 Soil Borings and Monitoring Well Installation 9
5.2 Soil Sample Collection Procedures 10
5.3 Monitoring Well Installation and Development 10
5.4 Temporary Well Point Installation 11
5.5 Groundwater Sampling 11
5.5.1 Groundwater-level Monitoring 11
5.5.2 Groundwater Parameters Stabilization Criteria 12

CONTENTS

5.5.3 Water Sample Collection Procedure 12
5.6 Surface Water Sampling 12
5.6.1 Sediment Sample Collection Procedure 13
5.7 Special Considerations for PFAS Sampling 13
5.8 Level-loop Survey 14
5.9 Investigation-Derived Waste 14
6 Analytical Laboratories and Methods 14
6.1 Sample Custody, Storage, and Shipping 15
6.2 Equipment Decontamination 15
6.3 Field Notebook 16
6.4 Deviations and Modifications to Work Plan 16
7 Quality Assurance Project Plan 16
7.1 QC Samples 17
7.2 Data Quality Objectives 17
7.3 Laboratory Data Deliverables 19
8 References 19

Exhibits

Exhibit 1-1: Project Team 4
Exhibit 3-1: Applicable Regulatory and Action Levels 7
Exhibit 5-1: Analytical Testing Summary 8
Exhibit 6-1: Sample Containers, Preservation, and Holding Time Requirements 15
Exhibit 7-1: Quality Assurance Objectives for Analytical Samples 18

Figures

Figure 1: Site Vicinity
Figure 2: Proposed Water Sample Locations
Figure 3: Proposed Soil Sample Locations

CONTENTS

Appendices

Appendix A: Site Safety and Health Plan
Appendix B: Preliminary Conceptual Site Model
Appendix C: Field Forms
Appendix D: DEC Laboratory Data Review Checklist
Important Information

ACRONYMS

AAC	Alaska Administrative Code
AFFF	aqueous film-forming foam
bgs	below ground surface
°C	degrees Celsius
COC	chain of custody
COPC	contaminant of potential concern
DEC	Alaska Department of Environmental Conservation
DO	dissolved oxygen
DOT&PF	Alaska Department of Transportation & Public Facilities
DQO	data quality objective
DRM	Alaska Department of Administration Division of Risk Management
EPA	U.S. Environmental Protection Agency
GAC	granular activated carbon
GST	Gustavus Airport Terminal
HDPE	high-density polyethylene
LHA	Lifetime Health Advisory
mg/L	milligrams per liter
mV	millivolts
MS/MSD	matrix spike/matrix spike duplicate
NPS	National Park Service
PFAS	per- and polyfluoroalkyl substance
PFHpA	perfluoroheptanoic acid
PFHxS	perflurohexanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFNA	perfluorononanoic acid
ppt	parts per trillion
QA	quality assurance
QC	quality control
RPD	relative percent difference
SSHP	site safety and health plan
TestAmerica	TestAmerica Laboratories, Inc.
µS	microSiemens

1 INTRODUCTION

This Work Plan describes our proposed approach for site characterization activities at the Gustavus Airport Terminal (GST) in Gustavus, Alaska (Figure 1). The GST is an active, Alaska Department of Environmental Conservation (DEC)-listed contaminated site due to the presence of per- and polyfluoroalkyl substances (PFAS) in groundwater and surface water (File Number 1507.38.017, Hazard ID 26904).

We have prepared this Work Plan in general accordance with DEC's March 2017 *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites*. We will conduct these activities in general accordance with DEC's August 2017 *Field Sampling Guidance* document, and our Site Safety and Health Plan (SSHP) presented in Appendix A.

1.1 Data Quality Objectives

This section outlines our data quality objectives (DQOs) for this project based on the six-part DQO process presented in DEC's March 2017 *Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data, and Sample Handling* technical memorandum. The results of our soil and water sampling will support an informed evaluation of the extent of PFAS contamination from the GST property. Findings from our site characterization activities will guide our recommendations for continuing monitoring or corrective action, as necessary.

1.1.1 Project Objectives

Our project objectives are to sample surface soil, subsurface soil, sediment, surface water, and groundwater in and around the GST to better understand the extent of PFAS contamination resulting from the historic use of fire-fighting foam by the Alaska Department of Transportation and Public Facilities (DOT&PF). Our project goals are to identify PFAS source areas and evaluate the horizontal and vertical extent of contamination on the GST property. Off the GST property, we will evaluate the plume of PFAS contamination in groundwater at various aquifer depths to a maximum of 50 feet below ground surface (bgs) and determine the impact to surface-water from GST runoff drainage channels.

1.1.2 Information Inputs

On the GST property, we propose collecting surface soil samples in a grid style (Section 5.2) from two of the known or suspected source areas for PFAS contamination, based on historic

aqueous film-forming foam (AFFF) use (labeled "New" and "Old" AFFF training area on Figures 1 through 3). We will interview and work closely with local DOT&PF staff to determine the location of AFFF use. A maximum of eight and ten surface soils samples will be collected from the "Old" and "New" AFFF training areas, respectively. We will collect an additional 14 surface soil samples and eight temporary-well-point groundwater samples along the runway boundaries to screen for other potential PFAS source areas. We will collect ten surface-water samples from drainage ditches along the edge of the runways to determine whether surface water is transporting PFAS contamination from the GST and potentially affecting off-site private-use wells (Figure 2). Private-well sampling conducted in 2018 indicates drainage ditches may play a larger role in impacting drinking-water wells than groundwater movement.

A total of 12 monitoring well nests will be installed: two on-site near the two known AFFF areas (Figures 2 and 3), and ten outside of the GST property, including near the apparent boundary of the contamination identified during 2018 private-well sampling. The monitoring wells will be installed in nested pairs at each location to determine where in the water table the PFAS is migrating. Because we are not certain of the extent of PFAS contamination from GST, we will also install and sample two temporary-well points and sample one surface-water and sediment location offsite to screen for PFAS in surface water (Figures 2 and 3).

We will log subsurface soil conditions and other field observations for all the soil borings. We will collect analytical soil samples only from the two proposed onsite borings within the old AFFF-training area and new AFFF-training area to investigate the vertical extent of soil contamination in the known source areas.

1.1.3 Study Boundaries

Based on our current understanding of site conditions, we consider the boundary for the proposed services to include the GST property and the area where we conducted private-well sampling (Figure 2). Based on the results of our soil and groundwater sampling, we may revise these boundaries later.

1.1.4 Proposed Analytical Approach

Contaminants of potential concern (COPCs) and proposed cleanup levels are outlined in Section 3.0. Analytical methods are presented in Section 6.0.

1.1.5 Acceptance Criteria

For measurement data, the DQO is to verify environmental data are of known and acceptable quality. For analytical data, the DQO is to meet acceptable quality assurance (QA) standards of precision, accuracy, representativeness, comparability, and completeness.

Laboratory and field quality control measures are outlined in Section 6.0. QA objectives for analytical data and data review procedures are presented in Section 7.0.

1.1.6 Data Collection Methods and Procedures

Sample collection and handling procedures are outlined in Section 5.0.

1.2 Project Schedule and Submittals

Once we receive DEC approval for our proposed scope of services, we will coordinate with DOT&PF to collect surface water samples, soil samples, install temporary and permanent monitoring wells, and collect groundwater samples. We anticipate field activities will occur during one visit in summer 2019. Laboratory analysis will be requested on a standard 14-day turn-around time.

We will prepare a summary report documenting the results of our environmental sampling. The report will include summarized field observations, analytical results, photo documentation, laboratory test results, and our conclusion and recommendations.

We will tabulate sample results and include a drawing showing sample locations; a description of deviations from our Work Plan, if any; and a discussion of analytical results and data quality in the context of regulatory levels presented in this Work Plan. The report will also include an updated conceptual site model. We anticipate the following schedule:

- Work Plan Implementation (field activities component) – June/July 2019
- Draft Report Submittal – within 60 days of receipt of analytical results
- Final Report Submittal – within 30 days of receiving DEC comments on the Draft Report

1.3 Project Team

Chris Darrah will be Shannon & Wilson's Principal-in-Charge, and Kristen Freiburger will serve as the Project Manager. 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 project objectives. The project team and their associated responsibilities are summarized in Exhibit 1-1 below.

Exhibit 1-1: Project Team

Member	Responsibility	Representative	Contact Number
DOT&PF	Client	Sam Loud, Statewide PFAS Coordinator	907-888-5671
DEC	Regulator	Danielle Duncan, Project Manager	907-465-5207
Shannon & Wilson, Inc.	Principal-in-Charge	Chris Darrah	907-458-3143
	Project Manager	Kristen Freiburger	907-458-3146
Drilling subcontractor	Soil-boring, monitoring-well, and temporary-well-point installation	To be determined	
TestAmerica Laboratories, Inc.	Analytical laboratory services	David Alltucker, Project Manager	916-374-4383
Chilkat Surveying & Mapping LLC	Surveyor subcontractor	Josh Ivaniszek	907-957-1908

2 SITE AND PROJECT DESCRIPTION

2.1 Background

The GST terminal is located at 1 Airport Way in Gustavus, Alaska. The property is owned by the DOT&PF, who also own multiple adjacent parcels. The geographic coordinates of the GST terminal are latitude 58.4252, longitude -135.7074.

The DOT&PF Crash and Fire Rescue program used AFFF for training, systems testing, and emergency response at the GST for many years. Areas of potential use include the DOT&PF Crash and Fire Rescue building, near the intersection of runways one and two, and near the end of runway one on the northeast and southeast sides (Figure 2). The precise timeline and locations of AFFF use at the GST are unknown.

AFFF contains PFAS, a category of persistent organic compounds considered emerging contaminants. Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are two PFAS commonly found at sites where AFFFs were used. Due to their persistence, toxicity, and bioaccumulative potential, these compounds are of increasing concern to environmental and health agencies. The U.S. Environmental Protection Agency (EPA) published a Lifetime Health Advisory (LHA) level for PFOS and PFOA in drinking water in May 2016. The DEC Contaminated Sites Program published groundwater-cleanup levels 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 August 20, 2018, the DEC published a Technical

Memorandum outlining a new action level for the sum of 5 PFAS (PFOS, PFOS, perfluorohexane sulfonate [PFHxS], perfluoroheptanoate [PFHpA], and perfluorononanoate [PFNA]) in water. The action levels proposed in the Technical Memorandum were then submitted as proposed regulation, although they were not formally adopted by the State of Alaska. However, statewide PFAS projects for the State of Alaska from August 2018 to March 2019 adopted the proposed regulatory action level, including the initial response in Gustavus.

On May 4, 2018 DEC informed DOT&PF that the airport terminal well and National Park Service (NPS) Water System well were at risk for PFAS contamination. On June 27, 2018, DOT&PF sampled both drinking-water supply wells for the presence of PFAS. The analytical results were received on July 30, 2018. The airport terminal well contained levels of PFAS exceeding both the EPA's LHA levels and the DEC proposed action level. The NPS well had detections of several PFAS but were less than the EPA's LHA levels and the DEC proposed action levels.

DOT&PF and the Alaska Department of Administration Division of Risk Management (DRM) contacted Shannon & Wilson regarding the Gustavus results. We began the private-well search and sampling efforts in August 2018.

The initial response and private-well sampling in Gustavus referenced the sum of 5 PFAS action limit for the purposes of assessing drinking-water well contamination. Private drinking-water wells used for drinking and/or cooking with concentrations for the sum of 5 PFAS exceeding 65 parts per trillion (ppt) were provided with an alternative drinking-water source.

On April 9, 2019 DEC issued an update to the August 20, 2018 Technical Memorandum rescinding the previous action level and realigning with EPA's LHA. The memo notes "In order to align state actions to the recently announced EPA plans, DEC will use the EPA LHA (PFOS+PFOA above 0.07 μg/L) as the action level. Any new testing for PFAS will be for PFOS and PFOA only." These action levels for PFAS are summarized in Exhibit 3-1, Contaminants of Concern and Regulatory Levels.

2.2 Summary of Private-Well and Surface Water Sampling

We sampled a total of 101 private-wells for PFAS-analytes over several visits to Gustavus between August 27 and December 9, 2018. We also collected five surface-water samples during the August and September sampling events. In addition, we held several public-outreach meetings in conjunction with State of Alaska employees to inform residents about the project.

Private-well sampling concentrations for the sum of 5 PFAS ranged from not-detected to 6,729 ppt for affected wells associated with the GST. Private-well sampling areas were expanded until the concentration for the sum of 5 PFAS were below the DEC action level along the edges of the affected area. Private-water well depths are reportedly generally between 15-25 feet bgs based on information provided by the residents. No boring logs were available to confirm these depths. Our sampling was able to define the impacted area of contamination in this depth range of the aquifer. However, we were not able to obtain samples from deeper levels of the aquifer due to the absence of available wells. Our Site Characterization activities proposed in this Work Plan seek to obtain groundwater samples from deeper levels for the off-site groundwater.

Surface water samples exceeded the sum of 5 PFAS-action level of 65 ppt in three locations along the edge of the runway (Figure 2).

2.3 Site Characterization Field Activities

Our site characterization activities will be performed in accordance with the conditions of our DOT&PF Professional Services Agreement Number 25-19-1-013 *Per- and Polyfluoroalkyl Substance (PFAS) Related Environmental & Engineering Services*, 18 Alaska Administrative Code (AAC) 75, and the DEC *Field Sampling Guidance*. We have used information collected from our initial site visits and private-well sample results to select sample locations of soil, surface water, and groundwater to better delineate the extent of PFAS contamination from the GST.

This Work Plan will guide the following:

- collection of 14 surface soil samples, with additional surface soil samples collected from a grid near two potential AFFF release locations;
- collection of 10 samples from surface water near the GST;
- installation of 8 temporary well points;
- installation of 12 nested monitoring wells;
- groundwater elevation survey to estimate groundwater flow direction and gradient;
- collection of soil, surface water, and groundwater samples for laboratory analysis; and
- evaluation and reporting of the analytical data.

The details of these tasks are described in Section 5.0. We will require the services of a drilling contractor to complete these tasks. Our analytical testing program includes select PFAS-analytes. Analytical laboratories and methods are described in Section 6.0.

3 CONTAMINANTS OF POTENTIAL CONCERN AND REGULATORY LEVELS

The primary COPCs are PFOS and PFOA. Per direction from the DEC, no additional PFAS compounds will be reported. We will request the laboratory retain the analytical data for 10 years. If additional analytes are desired in the future, it may be possible to obtain that information from the stored data set. However, the information will not be reported, and we will not have knowledge of the results, unless requested to obtain the additional data. Due to the complex chemistry of PFAS in AFFF it may be necessary to have this information in the future to assist with site characterization, remediation, and treatment technologies. The action level is 70 ppt for the sum of PFOS and PFOA. The current drinking-water action levels based on the April 2019 technical memorandum and the current groundwater and soil cleanup levels for PFOS and PFOA are summarized below in Exhibit 3-1.

Exhibit 3-1: Applicable Regulatory and Action Levels

Agency	Media	Compound	Level
DEC	Drinking water	PFOS + PFOA	70 ppt[1]
DEC	Groundwater	PFOS	400 ppt[2]
DEC	Groundwater	PFOA	400 ppt[2]
DEC	Soil	PFOS	3.0 ug/kg[3]
DEC	Soil	PFOA	1.7 ug/kg[3]

Notes: Parts per trillion (ppt) is equivalent to nanograms per liter (ng/L).

milligrams per kilogram (mg/kg)

milligrams per liter (mg/L)

1 Action level is reported in DEC April 2019 Technical Memorandum.

2 DEC groundwater-cleanup levels are reported in 18 AAC 75.345, Table C.

3 DEC migration-to-groundwater soil-cleanup levels are reported in 18 AAC 75.341, Table B1.

4 PRELIMINARY CONCEPTUAL SITE MODEL

4.1 Description of Potential Receptors

We consider commercial/industrial workers, site visitors, construction workers, subsistence hunters and consumers, farmers/gardeners, and residents to be current or future potential receptors.

4.2 Potential Exposure Pathways

Potential human exposure pathways include inhalation of fugitive dust; direct contact with contaminated sediment; and incidental soil, surface water, and groundwater ingestion. Additionally, ingestion of wild and farmed foods may be a human exposure pathway as PFOS and PFOA are bioaccumlative.

4.2.1 Soil

Incidental ingestion may be a potential direct-contact exposure pathway for soil. Direct contact with the contaminated surface and subsurface soil at the site is unlikely at present. However, future excavation at the site may result in ingestion of soil by commercial workers, site visitors, residents, or construction workers. Also, if contaminated surface soil is present then fugitive dust could be a current exposure pathway for site workers, visitors, and nearby residents.

4.2.2 Groundwater

Ingestion of groundwater is an exposure pathway as several private-wells near the GST have been found to have PFAS contamination that exceeds state regulatory levels. Groundwater in Gustavus is shallow. Private-wells near the GST are shallow, at about 15 – 25 feet bgs.

4.2.3 Surface Water and Biota

Incidental ingestion of contaminated surface water is a potential human exposure pathway. Direct contact with surface water is unlikely to be an exposure pathway because PFAS is not readily absorbed through the skin. Contaminated surface water may be contributing to groundwater contamination by moving contaminants off-site. Animals are known to use the area where a previous surface-water sample showed contamination. Due to the bioaccumulative risk of PFAS, biota are considered a potential pathway for exposure. Our site assessment activities are not designed to assess the biota exposure pathway. However, we understand the State of Alaska is currently conducting sampling at various PFAS sites to investigate this pathway.

5 SAMPLING AND ANALYSIS PLAN

This section describes our analytical sampling approach to investigate the presence of PFAS contamination on the GST property. Please note, this plan does not include sampling locations beneath airport runway asphalt. Additionally, this plan seeks to better define the

off-site impacts identified in previous sampling events. A DEC-qualified sampler will collect and handle the samples for this project and collect required QC samples in accordance with 18 AAC 75 and the DEC's *Field Sampling Guidance*. Field personnel will document field activities with field notes and photographs, in accordance with Section 6.3 of this Work Plan. An analytical sampling summary is presented in Exhibit 5-1 below.

Exhibit 5-1: Analytical Testing Summary

	Matrix	PFAS (EPA 537M)
Number of Samples	Surface Water	10 + 1 QC
	Groundwater	32 + 4 QC
	Subsurface Soil[1]	22 + 3 QC
	Sediment	9 + 1 QC
	Surface Soil	32 + 4 QC

Note:

QC – quality control

1 – subsurface samples will be collected at intervals of between 5 and 10 feet, from the surface to a maximum extent of the boring (approximately 40-50 feet bgs). This table describes the maximum number of subsurface samples, but the actual number will be depended on field conditions and soil lithology.

5.1 Soil Borings and Monitoring Well Installation

Shannon & Wilson will retain the services of a drilling company to perform direct-push soil sampling using a drill rig. At this time, we have not selected a drilling subcontractor. We will coordinate with DOT&PF and other local personnel to select final boring locations and assess potential conflicts with buried utilities. We will not drill through runway asphalt; borings will be offset to non-paved, nearby areas. The drilling contractor will advance two soil borings for each of the 12 well nests (Figure 2). Monitoring wells will be set to span the water table in the shallow well and set at 40-50 feet bgs for the deeper wells, unless we encounter an impermeable soil layer (i.e. seabed clay) at a shallower depth.

The drilling contractor will use a drill rig equipped with Macro-Core® tooling, or equivalent, which is a solid barrel (2-inch outside diameter) direct-push device for collecting continuous core samples (1.5-inch diameter) of unconsolidated materials at depth. An experienced field professional will observe and log the soil borings, describe samples in the field based on visual observations, collect analytical samples for testing, and prepare a descriptive log of soil conditions encountered during drilling. For the two onsite borings in the known AFFF use areas, we will collect soil samples for laboratory analysis within six inches of the soil-groundwater interface and every 5-10 feet (depending on changes in soil lithology)thereafter to the maximum extent of the well (approximately 40-50 feet bgs).

Upon completion of the logging and sample collection, the drilling contractor will install a monitoring well as described in section 5.3. Excess soil from borings will be stored in 5-gallon buckets and held pending analytical results.

5.2 Soil Sample Collection Procedures

We will use a new, clean, stainless-steel spoon for the collection of each sample. The samples will be placed in an appropriate laboratory-supplied container. Field personnel will change nitrile gloves before collecting each PFAS sample to prevent cross-contamination and exposure. We will ship the samples to be analyzed for PFOS and PFOA to TestAmerica, Inc. (TestAmerica) in West Sacramento, California.

Two potential AFFF release locations, indicated in Figure 3, will be sampled in a grid style. The intent of using a grid-style sampling approach is to target and characterize the most concentrated areas local to the potential AFFF release locations. The precise location and dimensions of the grid will be based on information provided by local DOT&PF staff on the use of AFFF in those areas. A maximum of eight and ten samples will be collected from the "New" and "Old" AFFF training areas, respectively. The samples will be collected just below vegetation.

5.3 Monitoring Well Installation and Development

The drilling contractor will install the monitoring wells on the GST property or along a city right-of-way (Figure 2), where possible. If the desired location is a private property, Shannon & Wilson personnel will obtain permission from the owner. The wells will be constructed with two-inch inside-diameter schedule 40 PVC material and have a 5-foot (deeper wells) or 10-foot section (groundwater table wells) of 0.010-inch slotted screen and threaded end caps. The filter pack around the screened intervals will be 10/20 rounded silica sand and will extend 2 feet above the top of the screen. The grout seal above the sand pack will be bentonite chips, hydrated in place. The wells will be completed with stick-up monuments, constructed with 8-inch-diameter steel and encased in concrete to shed water away from the well at ground surface.

The wells will be installed as described in the DEC *Monitoring Well Guidance* (2013). We will install the wells in nests of two, with one well screened to span the water table and the second well screened at about 40 feet bgs, unless we encounter an impermeable soil layer (i.e. seabed clay) at a shallower depth. Shannon & Wilson field staff will develop the wells and collect groundwater samples using the procedures described below. Well construction and installation information will be recorded on the Monitoring Well Construction Details form (Appendix C).

Monitoring wells will be developed prior to sampling to remove sediment and to verify proper hydraulic connection to the aquifer. To allow time for annular-seal materials to set, we will begin development no sooner than 24 hours after installation is complete. We will develop the monitoring wells using a Waterra inertial pump and a combination of surging and purging. Development water will be treated and disposed of in accordance with section 5.9.

5.4 Temporary Well Point Installation

The drilling contractor will install the temporary well points using 1-inch steel sand-point wells driven to approximately 5 feet below the groundwater table. Temporary wells will be purged and sampled directly after installation. Purge water will be treated and disposed of in accordance with section 5.9.

5.5 Groundwater Sampling

Our proposed groundwater activities include sampling eight temporary well points and twelve nests of monitoring wells (Figure 2). At each well sampled, we will record the following on a standard Shannon & Wilson Monitoring Well Sampling Log (Appendix C):

- water levels prior to sampling;
- groundwater parameters;
- measurements of the well casing and monument relative to the ground surface;
- total volume of water purged; and
- odor, color, or other apparent groundwater characteristics.

We will purge and sample each well using a decontaminated (Section 6.2) Waterra inertial pump or a peristaltic pump and new, disposable PFAS-free tubing. We will place the pump tubing within the screened interval in each well for purging and sampling activities. We will measure groundwater parameters during purging using a YSI Pro Plus or equivalent multiprobe water quality meter, inserted into a flow-through cell attached to the pump discharge line. Shannon & Wilson field personnel are trained to calibrate and use water quality meters.

5.5.1 Groundwater-level Monitoring

We will measure the static groundwater level in each well prior to sampling using an electronic water-level indicator. The probe of the water-level indicator will be decontaminated prior to each use and between each well to prevent the addition of external or cross-contamination into a well. Decontamination will consist of cleaning the probe with

a non-phosphate detergent wash followed by a tap-water rinse, a distilled-water rinse, and a PFAS-free water rinse. Following decontamination, the probe will be slowly lowered down the well until it produces the distinct tone indicating contact with the water-surface. We will measure the depth to water from the top of the well casing to the nearest 0.01 foot. Details and results of water-level measurement will be recorded on the Monitoring Well Sampling Log (Appendix C).

5.5.2 Groundwater Parameters Stabilization Criteria

We will measure temperature in degrees Celsius (◦C), pH, conductivity in microSiemens (µS), dissolved oxygen (DO) in milligrams per liter (mg/L), and redox potential in millivolts (mV) using a water quality meter to determine the point at which sample collection can begin. We will purge each well until three consecutive readings (taken at least three minutes apart) of temperature, pH, conductivity, DO, and redox potential have stabilized, or after three well-casing volumes are purged.

We will begin sampling when the well reaches stabilization. The following values are used to indicate stability: ±3 percent ◦C, ±0.1 pH; ±10 percent DO, ±3 percent conductivity; and ±10mV redox. Water clarity (visual) will also be recorded during purging.

5.5.3 Water Sample Collection Procedure

Once water quality parameters are stable, we will collect groundwater samples into laboratory-supplied, high-density polyethylene (HDPE) containers to prevent PFAS from adhering to the container. We will wear a new pair of disposable, powderless nitrile gloves during the collection and handling of each groundwater sample to prevent cross-contamination. We will fill sample containers directly from the discharge line. Samples will be labeled with a unique identifier, collection date and time, and all requested analyses.

5.6 Surface Water Sampling

Our proposed water-sampling activities include collecting 10 surface water samples from various locations on and around the GST property. We will attempt to collect surface water samples at least 72 hours after a rain event, if possible, to prevent potential dilution effects from the rain event. We will collect surface-water samples using a peristaltic pump and new, PFAS-free disposable tubing. We will place the pump tubing approximately 6 inches to 1 foot below the water's surface at each location and fill sample containers directly from the discharge line. Samples will be collected as close to the center of water body cross section as possible. Our samplers may enter shallow water bodies to collect the samples. Prior to entering a water body, our samplers will verify they are not wearing PFAS-containing

clothing or gear. Care will be taken to prevent disturbance of the sediment below; samples will be collected once disturbed solids have settled to the bottom or have moved down stream. Sample containers will be labeled with a unique identifier, date, and time, and placed immediately in a cooler with ice-substitute.

5.6.1 Sediment Sample Collection Procedure

A sediment sample will be collected at each location where a surface-water sample is collected, where possible, except for the surface water sample north of the runway (Figure 2). We will collect the sediment samples from the shore using a decontaminated Eckman dredge. We will lower the dredge to the bottom of the water body and collect a sediment sample by scraping material from the sediment/water interface. We will drain away excess water from the sample and place the remaining solid material in a laboratory-provided sampling container. Sample containers will be labeled with a unique identifier, date, and time, and placed immediately in a cooler with ice-substitute.

5.7 Special Considerations for PFAS Sampling

Because PFOS and PFOA are found in numerous everyday items, the following special precautions will be taken during sampling activities:

- No use of Teflon®-containing materials (e.g., Teflon® tubing, bailers, tape, sample container lid liners, or plumbing paste).
- No Tyvek® clothing will be worn on-site.
- Clothes treated with stain-, flame-, or rain-resistant coatings will be avoided or go through several washings prior to use on-site.
- No Post-It® notes will be brought on-site.
- No fast food wrappers, disposable cups, or microwave popcorn will be brought on-site.
- After handling the above items, field personnel will wash their hands thoroughly with soap and water prior to sampling activities.
- No use of foil.
- No use of chemical (blue) ice packs.
- Change nitrile gloves between each sample location.
- No preservative, other than chilling is required for PFAS analysis.
- Label jars using permanent, waterproof ink.

5.8 Level-loop Survey

Groundwater flow direction in Gustavus is assumed to be approximately south to southwest; however, we do not have recent data on groundwater flow direction. To calculate the groundwater flow direction, a horizontal and vertical survey of the monitoring wells will be performed by Chilkat Surveying and Mapping LLC. Survey activities will be conducted for each monitoring and temporary well. The survey will happen within 72 hours of sample collection.

From our observations during previous site visits, the ground slope is relatively flat and a network of drainage ditches is used to divert surface water flow. Our site characterization services will also investigate the possible influence of surface water flow direction on contaminant migration.

5.9 Investigation-Derived Waste

Drilling activities and soil sampling may generate excess soil, which will be contained in 5-gallon buckets until the receipt of analytical results. Excess soil with results below the action level will be disposed of to the ground and excess soil with results above the action level will be disposed of via shipment to a waste disposal facility, yet to be determined, or an equivalent alternative. Decontamination fluids will be treated through granular activated carbon (GAC) and disposed of to the ground surface on-site. Development and purge water from temporary well points and monitoring wells will be treated with GAC and disposed of to the ground surface. An effluent sample will be collected following GAC disposal. Other investigation-derived waste will include non-reusable equipment such as nitrile gloves and sample tubing and will be disposed of in the Gustavus landfill.

6 ANALYTICAL LABORATORIES AND METHODS

We will ship samples for PFAS analysis via air courier to TestAmerica in West Sacramento, California. Upon receipt of the samples, authorized laboratory personnel will store and prepare the samples for analysis, taking into consideration sample holding times for the analysis. TestAmerica's turnaround time for PFAS analysis is 14 business days. A summary of laboratory methods, preservation methods, and holding time is presented in Exhibit 6-1. Analytical deliverables will be provided as described in Section 7.3.

Exhibit 6-1: Sample Containers, Preservation, and Holding Time Requirements

Analyte	Method	Container and Sample Volume	Preservation	Holding Time
PFOS & PFOS	EPA 537M	Water: 2 x 250-mL HDPE bottles Soil: 4-ounce amber glass jar filled to near capacity	0 °C to 6 °C	14 days to extraction, analyzed within 40 days of extraction

Notes:
mL – milliliter
°C – degrees Celsius

6.1 Sample Custody, Storage, and Shipping

Prior to the delivery to the laboratory, the soil and water samples will be in the custody of Shannon & Wilson personnel. During field activities, we will store the samples in a cooler with adequate quantities of ice substitute to maintain samples at 0° C to 6° C.

Our field representative will complete chain-of-custody (COC) records to document sample possession from the point of collection to the time of receipt by the laboratory's sample-control center. Shannon & Wilson personnel will keep a copy of the COC record to allow sample accountability between field and laboratory.

We will ship the samples to the analytical laboratory with sufficient time to allow for the laboratory to extract the sample within the holding time requirements of the test method. Our field representative will pack the samples in a hard-plastic cooler with bubble wrap and enough ice substitute to maintain samples between 0° C to 6° C during travel. They will pack a "temperature blank" with the samples in each cooler, carefully tape the cooler shut, and affix dated and signed custody seals across the front of the hinged cooler lid.

6.2 Equipment Decontamination

All reusable equipment introduced into sample collection must be decontaminated prior to use and reuse. Decontamination procedures will be as follows:

- non-phosphate detergent wash;
- tap water rinse;
- distilled-water rinse; and
- PFAS-free water rinse.

The drilling contractor will decontaminate their drilling tools using high-pressure steam or hot water and contain their decontamination fluids.

6.3 Field Notebook

Shannon & Wilson will maintain a bound field notebook throughout the project to document our field activities, procedures, and observations. The field notebook will have consecutively numbered pages. Our field representative will sign and date each page on day he or she makes entries. They will write entries in the notebook in waterproof ink, including at least:

- Name of sampling personnel;
- Names and affiliations of pertinent field contacts;
- Date and time(s) of sampling;
- Date, time, and location of sampling;
- A summary of field measurements;
- Unusual/unexpected problems, including observations of leaks, releases, signs of soil contamination, or other unusual items;
- Photographic data (contact number, date/time, location, photographer, photograph number, description, and direction of view);
- YSI identification and calibration data, if applicable; and
- Weather conditions.

6.4 Deviations and Modifications to Work Plan

Deviations from the procedures discussed in this document may be required due to circumstances that may arise during the course of a given sampling event. Deviations from the specified program and the purpose for the deviation will be clearly documented in field logs and reported to the project manager.

The project report will include a separate section discussing deviations from the procedures outlined in this Work Plan. Modifications to this Work Plan may be made in the form of an addenda.

7 QUALITY ASSURANCE PROJECT PLAN

QA and quality control (QC) are important components of an environmental site investigation. QA is the integrated program for measuring the reliability of data. QC is the routine use of specific procedures set forth to meet defined standards for sampling and analysis. This QA/QC plan describes specific procedures to be followed so the sampling, documentation, and laboratory data are effective and do not detract from the quality and

reliability of the results. We will perform our services on this project in general accordance with the DEC *Field Sampling Guidance* and the *DEC Monitoring Well Guidance*. This section of the sampling and analysis plan describes project-specific details.

7.1 QC Samples

In addition to the primary project samples, the field representative will collect and submit field-duplicate samples and matrix spike/matrix spike duplicate (MS/MSD) samples for laboratory analysis. We will collect duplicate samples at a minimum of 10 percent for soil and water samples and MS/MSD samples at a minimum of 5 percent of soil samples submitted for laboratory analysis. If possible, we will collect duplicate samples from locations suspected to be contaminated, as calculation of duplicate precision is not possible for samples with contaminants below detection limits. We will assign a separate sample number to duplicates and submit them "blind" to the laboratory. We will use duplicate sample results to test comparability of analytical data.

We will collect an equipment blank daily from reusable soil-sampling and sediment-sampling equipment. Following decontamination of the split-spoon or dredge used for the soil samples, we will collect an equipment blank by pouring certified PFAS-free water down the length of the spoon and collecting the rinsate in a sample jar. We do not anticipate introducing reusable sampling equipment into the monitoring wells or temporary well points, so an equipment blank for groundwater will not be necessary. We have checked with the manufacturer that the purge and sample tubing we will use is PFAS-free.

Field blanks are used to assess whether airborne, particulate PFAS may be contaminating groundwater samples during collection. We will collect a field blank daily. We will collect the field blank after collecting a groundwater sample, without changing gloves, by pouring PFAS-free water into a sample jar.

Temperature blanks enable the receiving laboratory to determine the temperature at which the samples arrive at the lab. Temperature blanks consist of a container filled with water and packed with the other samples in each cooler. The water temperature in the blank will be measured at the laboratory and sample temperature should be within a range of 0°C to 6°C. The laboratory will document cooler conditions, including internal cooler temperature and temperature blank, and occurrence of broken sample containers.

7.2 Data Quality Objectives

The QA objective for measurement data is to verify environmental monitoring data are of known and acceptable quality. Due to the heterogeneous nature of soils, exact duplication of

soil samples is often not possible. In addition, matrix interference in soil samples can adversely affect comparability of duplicate laboratory results. For analytical data, the objective is to meet acceptable QA standards of precision, accuracy, representativeness, comparability, and completeness. These terms are defined below:

- Precision: is a measure of agreement among replicate or duplicate results of the same analyte. The laboratory objective for precision is to equal or exceed the precision demonstrated for similar samples and shall be within the established control limits for the methods as published by the EPA. Precision will be measured as the relative percent difference (RPD) between project and duplicate samples.
- Accuracy: is a measure of bias in a measurement system. Accuracy will be expressed as the percent recovery of an analyte from a surrogate or MS sample, or a standard reference material. The laboratory objective for accuracy is to equal or exceed accuracy demonstrated for these analytical methods on similar samples and shall be within the established control limits for the methods as published by the EPA.
- Representativeness: is a quality characteristic attributable to the type and number of samples to be taken to be representative of the medium/environment (e.g., soil or water). Sample locations will be selected in the field to be representative of the soils or water at that location, within the constraints of sample-location guidelines in the regulations.
- Comparability: is a qualitative parameter expressing the confidence with which one data set can be compared to another. The sampling method employed, methods used for the transfer of samples to the analytical laboratory, and analytical techniques implemented at the laboratory shall be performed in a uniform manner.
- Completeness: is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. The objective of completeness is to generate an adequate database to successfully achieve the goals of the investigation.

DQOs will meet DEC limits and are presented in Exhibit 7-1 below; reporting limit goals for this project will be below DEC cleanup levels. We will request that the laboratory flag analytes detected below the reporting limit but above the method detection limit as estimated values.

Exhibit 7-1: Quality Assurance Objectives for Analytical Samples

Analyte	Method	Matrix	Precision	Accuracy	Completeness
PFOS & PFOA	EPA 537M	Water	±30%	(analyte dependent)	85%
		Soil	±50%	(analyte dependent)	85%

7.3 Laboratory Data Deliverables

Shannon & Wilson will request standard DEC-Level II Data Deliverables from the analytical laboratory for transmittal with the summary report. We will also include our own internal QA assessment and submit a copy of the completed DEC laboratory data review checklist.

8 REFERENCES

Alaska Department of Environmental Conservation (DEC), 2017, 18 AAC 75: Oil and other hazardous substances pollution control: Juneau, Alaska, July, available: http://dec.alaska.gov/commish/regulations/.

Alaska Department of Environmental Conservation (DEC), 2017, 18 AAC 75.341 Table C, Groundwater-Cleanup Levels.

Alaska Department of Environmental Conservation (DEC), 2017, Guidance on Developing Conceptual Site Models.

Alaska Department of Environmental Conservation (DEC), 2017, Field Sampling Guidance: Juneau, Alaska, DEC Division of Spill Prevention and Response, Contaminated Sites Program, August, available: http://dec.alaska.gov/spar/csp/guidance_forms/csguidance.htm.

Alaska Department of Environmental Conservation (DEC), 2013, Monitoring Well Guidance: Juneau, Alaska, DEC Division of Spill Prevention and Response, Contaminated Sites Program, August, available: http://dec.alaska.gov/spar/csp/guidance-forms.

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: http://dec.alaska.gov/spar/csp/guidance_forms/csguidance.htm.

0 200 400

Miles

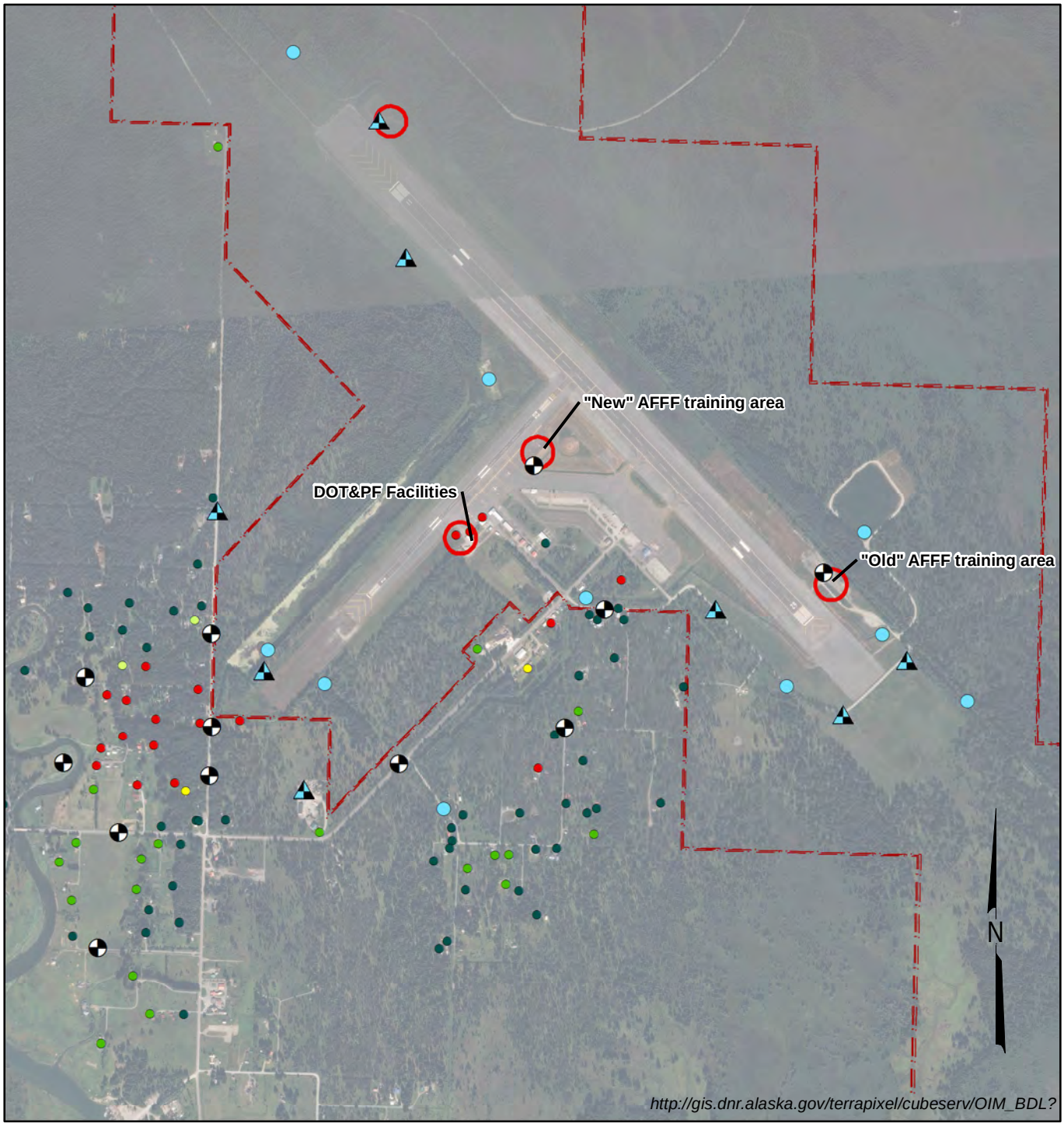
Gustavus Airport PFAS
Site Characterization Work Plan
Gustavus, Alaska

SITE VICINITY

July 2019 102599-001

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 1



LEGEND

Sum of 5 PFAS

- ≤2.0 ppt
- 2.1 to 17.4 ppt
- 17.5 to 34 ppt
- 35 to 64 ppt
- ≥65 ppt

- Airport Property Boundary
- Monitoring Well Nest
- Surface Water
- Temporary Well Point
- Potential AFFF Use

0 0.5 1

Miles

Notes: Sum of 5 PFAS = Sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA.

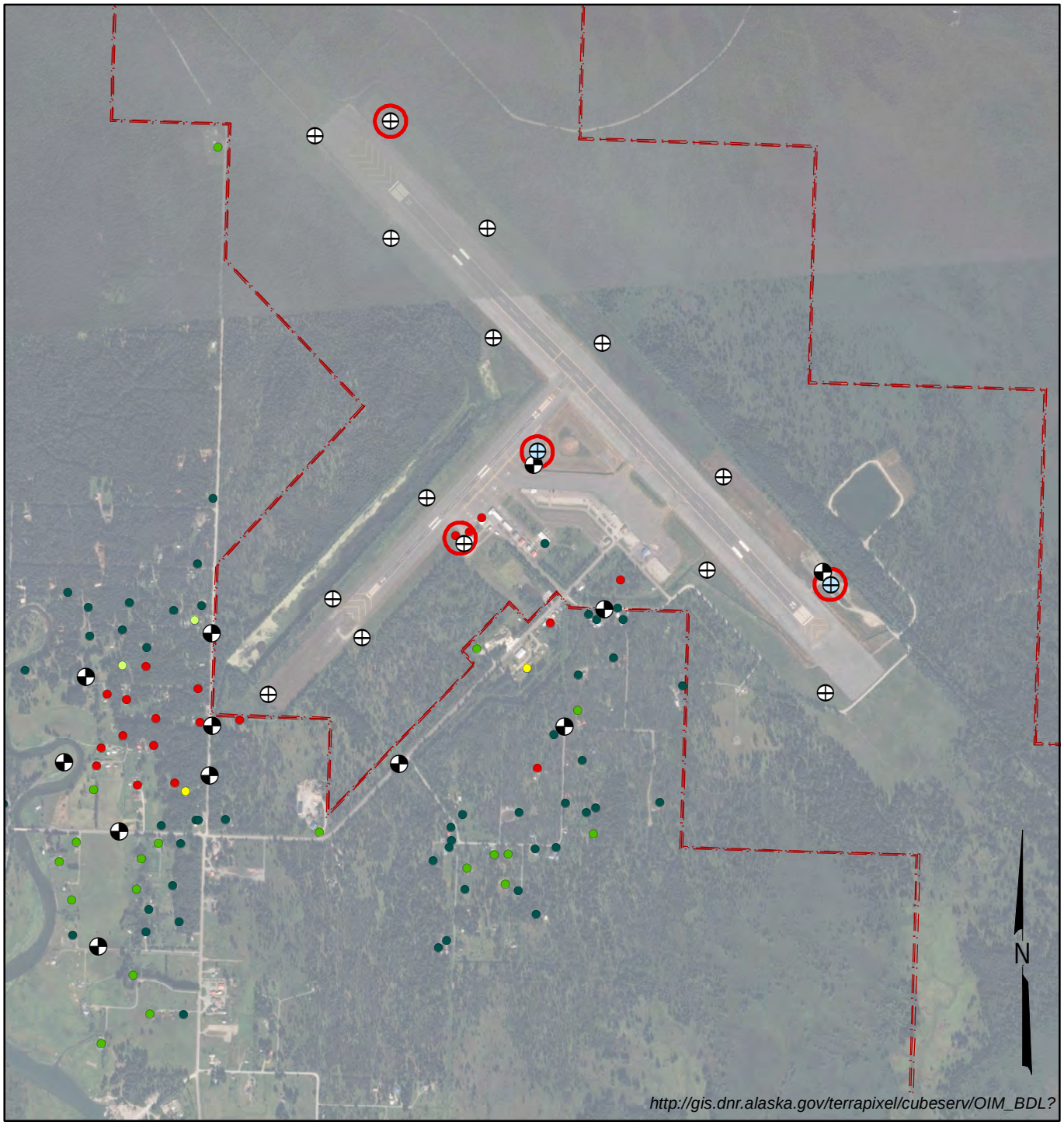
Gustavus Airport PFAS
Site Characterization Work Plan
Gustavus, Alaska

PROPOSED WATER SAMPLE LOCATIONS

July 2019 102599-001

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 2



LEGEND

Sum of 5 PFAS

- ≤2.0 ppt
- 2.1 to 17.4 ppt
- 17.5 to 34 ppt
- 35 to 64 ppt
- ≥65 ppt

- Airport Property Boundary
- Surface Soil - Grid
- Surface Soil
- Soil Boring (Onsite MWs)
- Potential AFFF Use

0 0.5 1

Miles

Notes: Sum of 5 PFAS = Sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA.

Gustavus Airport PFAS
Site Characterization Work Plan
Gustavus, Alaska

PROPOSED SOIL SAMPLE LOCATIONS

July 2019 102599-001

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 3

APPENDIX A: SITE SAFETY AND HEALTH PLAN

Appendix A

Site Safety and Health Plan

1.0 SITE SAFETY AND HEALTH PLAN

1.1 Applicability and Purpose

Shannon & Wilson prepared this Site Safety and Health Plan (SSHP) for site characterization activities at the Gustavus Airport Terminal (GST). 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 our 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.

1.2 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.

1.2.1 Chemical-Exposure Hazards

Contaminated soil and water may be encountered during site exploration activities. Perfluoroalkyl-substances (PFAS) are believed to be the primary contaminants of potential concern and may be encountered in soils and 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, and Level D personal protective equipment. Field personnel will not require respiratory protection based on our current understanding of site conditions and scope of services.

1.2.2 Physical Hazards

Primary physical hazards associated with site characterization activities include: drilling equipment; 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.

1.2.2.1 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.

1.2.2.2 Insects and Animals

During the summer months in Interior 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 coastal Alaska. If a large animal approaches the site, workers should keep their distance or seek shelter in their vehicles.

1.2.2.3 Temperature Stress

Wearing PPE may put a worker at risk of developing heat stress; however, since the field screening activities will be conducted in Level D PPE 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.

1.2.2.4 Lifting Hazards

Moving coolers of soil 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.

1.2.2.5 Congested Area

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. We will use appropriate cones, barricades, or signs to secure the work area when required.

1.2.3 Other Hazards

Underground utilities are present at the site. We will request utility locates prior to conducting any ground penetrating work.

Biological or ionizing radiation hazards are not expected to be present.

1.3 Personnel Responsibilities, Training, and Medical Surveillance

1.3.1 Assignment of Responsibilities

We are 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.

1.3.2 Personnel 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.

1.3.3 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).

1.4 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. Field personnel will use Level D protective equipment during normal work activities. Personnel are trained in the use of PPE that is, or may be, required. All personnel shall wear Level D PPE as a minimum:

- standard work clothes or cotton overalls;
- 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.

1.5 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.

When decontamination is necessary, it will consist of the following:

- A decontamination station, just outside the work site, will be placed where personnel routinely enter/exit the work site. When exiting the work site, personnel will remove over boots, chemical resistant boots, coveralls, and outer gloves at the specified decontamination area.
- Personnel shall be instructed in proper decontamination technique. This entails removal of protective equipment in an "inside-out" manner. Removal of contaminants from protective clothing or equipment by blowing, shaking, or other means that may disperse material into the air is prohibited.
- Personnel protective clothing that has been removed shall remain at the decontamination station pending personnel re-donning the clothing. At the conclusion of site work each day, PPE will be placed in trash bags for off-site disposal.
- Personnel will not exit the work site until contaminated clothing and equipment have been removed and employees have washed their hands and face with soap and water. A washtub with soap and water will be available to personnel as they exit the work site.
- Employees will wash their hands and face with soap and water before eating, drinking, smoking, or applying cosmetics. These activities will be restricted to designated rest area(s).
- Decontaminated items will be visually inspected for residual contamination to determine if decontamination procedures are effective.

1.6 Accidents and Emergencies

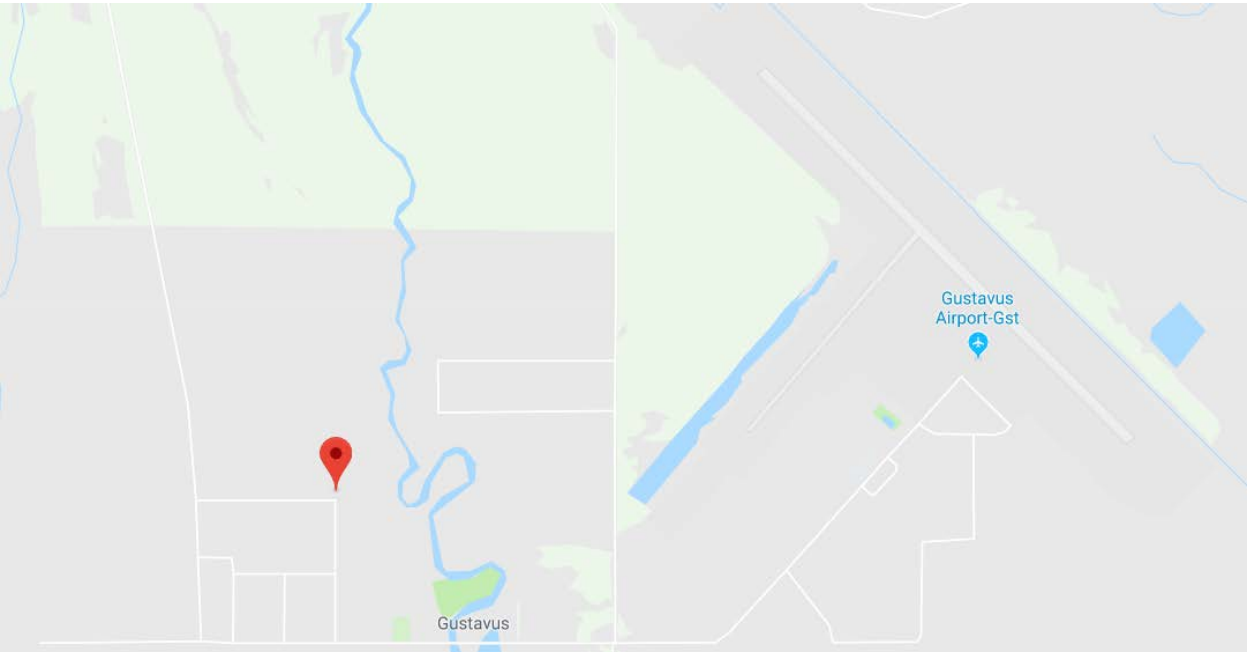
Shannon & Wilson field personnel are current in first aid and cardiopulmonary resuscitation (CPR) training. At a minimum, the following site safety equipment and first aid supplies shall be available in the field:

- 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 our corporate Medcor service (1-800-775-5866).

More serious injuries will require assistance from the medical staff at Gustavus Clinic, 42 Dolley Varden Road, Gustavus AK 99826. The telephone number for the clinic is 907-697-3008. We will keep field phones easily accessible in the case of an emergency.

Exhibit 1-1: Directions to Gustavus Clinic



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.

1.7 General Site Safety Requirements

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

- Field personnel will refrain from smoking, eating, drinking, or chewing tobacco while in work zones or a potentially contaminated area.
- 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 ACKNOWLEDGMENT FORM

GUSTAVUS AIRPORT PFAS SITE CHARACTERIZATION
GUSTAVUS, AK

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

APPENDIX B: PRELIMINARY CONCEPTUAL SITE MODEL

Appendix B

Preliminary Conceptual Site Model

CONTENTS

- Scoping Form
- Graphic Form

Print Form

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

Site Name: Gustavus Airport Terminal

File Number: 1507.38.017

Completed by: Dana Fjare; 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: Fire-training activities

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:

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: Incomplete

Comments:

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:

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: Complete

Comments:

This pathway is considered potentially complete due to suspected surface-water influence on drinking-water wells in the affected area.

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:

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:

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:

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:

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:

Due to the lack of current soil sample analytical results, the box was not checked. However, it may change following the collection of surface samples during site characterization activities.

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:

Due to the lack of current sediment sample analytical results, the box was not checked. However, it may change following the collection of surface samples during site characterization activities.

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

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Gustavus Airport Terminal

Completed By: Dana Fjare; Shannon & Wilson, Inc.

Date Completed: 4/11/19 updated July 19, 2019

***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.

Current & Future Receptors

Media	Transport Mechanisms	Exposure Media	Exposure Pathway/Route	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		F	
	☑ Migration to subsurface — check soil		☐ Dermal Absorption of Contaminants from Soil							
	☑ Migration to groundwater — check groundwater		☑ Inhalation of Fugitive Dust	C/F	C/F	C/F	C/F			
	☐ Volatilization — check air	☑ groundwater	☑ Ingestion of Groundwater	C/F	C/F	C/F	C/F	C/F		
	☑ Runoff or erosion — check surface water		☐ Dermal Absorption of Contaminants in Groundwater							
	☑ Uptake by plants or animals — check biota		☐ Inhalation of Volatile Compounds in Tap Water							
	☐ Other (list):	☐ air	☐ Inhalation of Outdoor Air							
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil — check soil		☐ Inhalation of Indoor Air							
	☑ Migration to groundwater — check groundwater		☐ Inhalation of Fugitive Dust							
	☐ Volatilization — check air	☑ surface water	☐ Ingestion of Surface Water							
	☑ Uptake by plants or animals — check biota		☐ Dermal Absorption of Contaminants in Surface Water							
	☐ Other (list):		☐ Inhalation of Volatile Compounds in Tap Water							
☑ Ground-water	☑ Direct release to groundwater — check groundwater	☐ sediment	☐ Direct Contact with Sediment							
	☐ Volatilization — check air	☑ biota	☑ Ingestion of Wild or Farmed Foods	C/F	C/F	C/F	C/F		F	
	☑ Flow to surface water body — check surface water									
	☑ Flow to sediment — check sediment									
	☑ Uptake by plants or animals — check biota									
	☐ Other (list):									
☑ Surface Water	☑ Direct release to surface water — check surface water									
	☐ Volatilization — check air									
	☑ Sedimentation — check sediment									
	☑ Uptake by plants or animals — check biota									
	☐ Other (list):									
☐ Sediment	☐ Direct release to sediment — check sediment									
	☐ Resuspension, runoff, or erosion — check surface water									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									

Revised, 10/01/2010

APPENDIX C: FIELD FORMS

Appendix C

Field Forms

CONTENTS

- Field Activities Daily Log
- Daily Safety Meeting Log
- Sample Collection Log
- Chain-of-Custody Record
- Monitoring Well Sampling Log
- Monitoring Well Construction Details
- Well Development Log
- Log of Boring

FIELD ACTIVITIES DAILY LOG

Date _____
Sheet ____ of ____
Project No. _____

Project Name: _____
Field activity subject: _____
Description of daily activities and events: _____

Visitors on site: _____

Changes from plans/specifications and other special orders and important decisions:

Weather conditions: _____

Important telephone calls: _____

Personnel on site: _____
Signature: Date:

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

DAILY SAFETY MEETING LOG

JOB NAME: _____ JOB NO: _____ BORING NO: _____

LOCATION: _____ DATE: / / TIME: :

SUBCONTRACTOR: _____ S&W REP: _____ S&W PM: _____

WORK DESCRIPTION: _____

CHECK APPLICABLE HAZARDS: Heavy Equipment ☐, Vehicles ☐, Overhead ☐, Tools ☐, Temperature ☐, Lifting ☐ (Use Mechanical Means Instead), Site Housekeeping ☐ (Clear Walkways to Prevent Slips, Trips, Falls), Awkward Work Area ☐, Public ☐, Security ☐, Plants ☐, Animals ☐, Noise ☐, Vibration ☐, Dust ☐, Radiation ☐, UV exposure ☐, Repetitive Motion ☐, Suspected Contamination ☐, Chemical Exposure ☐, Flammable/Explosive ☐

OTHER HAZARDS: _____

EQUIPMENT ON SITE: _____

DOCUMENTATION:	Present	PPE:	Present
SSHSP On Site?	☐	Boots - Safety Toe / Other	☐
Hospital Map On Site?	☐	Safety Glasses	☐
Fall Protection Plan On Site?	☐	Vest - Class II / Class III	☐
Respiratory Protection Plan On Site?	☐	Hard Hat	☐
Confined Space Entry Plan On Site?	☐	Ear - Plugs / Muffs / Both	☐
Traffic Control Plan?	☐	Gloves - Type: _____	☐
Other Plan? _____	☐	Face Shield	☐
Current Fit Test?	☐	Respirator	☐

Cards/Certs Required? *List Below*

_____

_____

Other PPE? *List Below*

_____

_____

Hazards & Controls Discussed? ☐ Need to Update SSHSP? ☐

My signature below confirms that the above hazards, controls and plans have been discussed and that I understand them.

PRINT NAME	SIGNATURE	COMPANY	HAS ALL CARDS	PPE On?
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐

SAMPLE COLLECTION LOG

Project Number: Location: Page of

Date:

Sampler:

Sample Number	Location	Sample Time	Depth Interval (ft) top	Depth Interval (ft) bottom	Matrix Type	Sampling Method	Sample Type	PID Reading	Analyses

Matrix Type

AR	Air
GW	Groundwater
PR	Product
SB	Subsurf. soil
SE	Sediment
SG	Sludge
SS	Surface soil
SW	Surface water
WR	Water

Sampling Method

B	Bailer/Coliwasa
D	Drill cuttings
G	Grab sampling
H	Hand auger
L	Tube liner
P	Pump (liquid)
SS	Split spoon
T	Shelby tube
V	Vacuum (gas)
W	Wipe sampling

Sample Type

ES	Environmental sample
ER	Equipment rinsate
FB	Field blank
FD	Field duplicate
FM	Field measurement
FR	Field replicate
MD	Matrix spike duplicate
MS	Matrix spike duplicate
TB	Trip blank

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN-OF-CUSTODY RECORD

Page_____ of_____

Laboratory_____

Attn:_____

400 N. 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

2043 Westport Center Drive
St. Louis, MO 63146-3564
(314) 699-9660

303 Wellsian Way
Richland, WA 99352
(509) 946-6309

2355 Hill Road
Fairbanks, AK 99709
(907) 479-0600

5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

2255 S.W. Canyon Road
Portland, OR 97201-2498
(503) 223-6147

1200 17th Street, Suite 1024
Denver, Co 80202
(303) 825-3800

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab							Total Number of Containers	Remarks/Matrix

Project Information	Sample Receipt	
Project Number:	Total Number of Containers	
Project Name:	COC Seals/Intact? Y/N/NA	
Contact:	Received Good Cond./Cold	
Ongoing Project? Yes ☐ No ☐	Delivery Method:	
Sampler:	(attach shipping bill, if any)	

Instructions
Requested Turnaround Time:
Special Instructions:

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Time:	Signature: Time:	Signature: Time:
Printed Name: Date:	Printed Name: Date:	Printed Name: Date:
Company:	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: Time:	Signature: Time:	Signature: Time:
Printed Name: Date:	Printed Name: Date:	Printed Name: Date:
Company:	Company:	Company:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

F-19-91/UR

No. 30000

MONITORING WELL SAMPLING LOG

Owner/Client _____ Project No. _____
Location _____ Date _____
Sampling Personnel _____ Well _____
Weather Conditions _____ Air Temp. (°F) _____ Time started _____
Time completed _____

Sample No. _____ Time _____
Duplicate _____ Time _____
Equipment Blank _____ Time _____

Pump _____
Purging Method *portable / dedicated pump* Diameter and Type of Casing _____
Pumping Start _____ Approximate Total Depth of Well Below MP (ft.) _____
Purge Rate (gal./min.) _____ Measured Total Depth of Well Below MP (ft.) _____
Pumping End _____ Depth to Water Below MP (ft.) _____
Depth to Ice (if frozen) Below MP (ft.) _____
Pump Set Depth Below MP (ft.) _____ Feet of Water in Well _____
KuriTec Tubing (ft.) _____ Gallons per foot _____
TruPoly Tubing (ft.) _____ Gallons in Well _____
Purge Water Volume (gal.) _____
Purge Water Disposal _____

Monument Condition _____

Casing Condition _____

Wiring Condition _____
(dedicated pumps) _____

Measuring Point (MP) *Top of Casing (TOC)* Monument type: *Stickup / Flushmount*
Measurement method: *Rod & level / Tape measure*

Top-of-casing to monument (ft.) _____ Datalogger type n/a
Monument to ground surface (ft.) _____ Datalogger serial # n/a
Measured cable length (ft.) n/a

- ☐ Lock present and operational
- ☐ Well name legible on outside of well
- ☐ Evidence of frost-jacking _____

Notes _____

WELL CASING VOLUMES

Diameter of Well [ID-inches]	CMT	1¼	2	3	4	6	8
Gallons per lineal foot	0.000253	0.08	0.17	0.38	0.66	1.5	2.6

Well No.

MONITORING WELL SAMPLING LOG

Field Parameter Instrument _____ Circle one: *Parameters stabilized or >3 well volumes purged*

Sample Observations _____

Notes _____

FIELD PARAMETERS [stabilization criteria]

Time	Temp. (°C) [± 3%]	Dissolved Oxygen (mg/L) [±10%]	Conductivity (µS/cm) [± 3%]	pH [± 0.1]	ORP (mV) [± 10 mV]	Water Clarity (visual)

Laboratory *SGS*

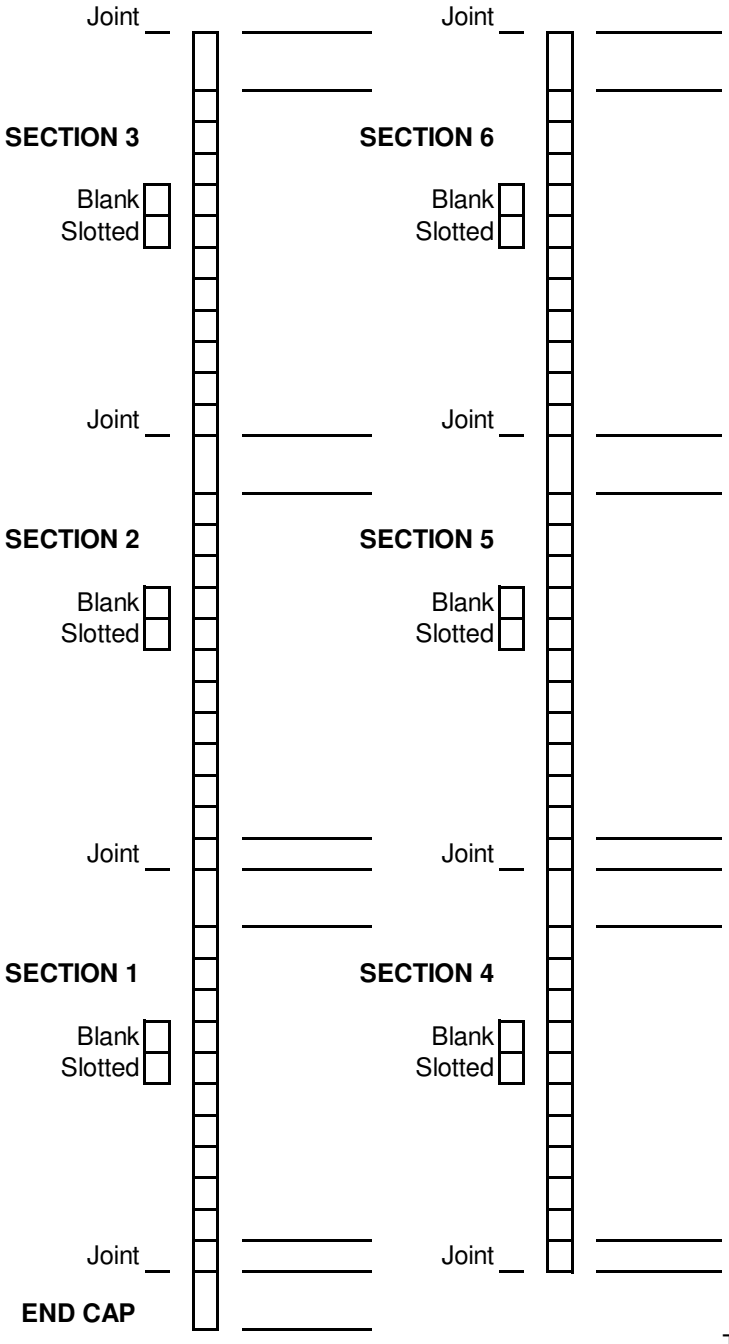
	Analysis	Sample Containers	Preservatives	Dup
□				□
□				□
□				□
□				□
□				□
□				□

Well No.

MONITORING WELL CONSTRUCTION DETAILS

Monitoring Well No. _____

Project Name _____
Project Number _____
Date Installed _____
Geologist/Engineer _____



WELL DATA

Pipe Type: PVC ☐ Stainless Steel ☐ Other _____

Diameter: 2" ☐ 4" ☐ Other _____

Slot Size: 0.010 ☐ 0.020 ☐ Other _____

SEALS

	Depth below ground surface From	To
Bentonite		
Pea Gravel		
Concrete		

MONUMENTS

Flush Mount _____
Post _____
Depth below surface _____
Casing Stickup _____

JOINTS

Type _____
Pin end: Down ☐ Up ☐

SAND PACK

Type or gradation _____
Depth: _____ to _____

LOCKS Type _____
Key # _____

Length cutoffs, last section _____

Magnet _____
Well stickup _____

Total Length of Well _____
Screen Depths below top of casing
Top _____
Bottom _____

WELL DEVELOPMENT LOG

Owner-Client _____ Well No. _____

Location _____ Project No _____

Weather _____ Date _____

Development Personnel _____

Diameter and Type of Casing: _____

Total Depth of Well **Before** Development (feet below top of casing): _____

Depth to Water **Before** Development (feet below top of casing): _____

Depth to Screen Top and Bottom (from Construction Log): Top: Bottom:

Development Details

Feet of water in well _____ Time pumping started _____

Gallons per foot _____ Flow rate (gal/min) _____

Gallons in well _____ Flow-rate measurement method:

Surge method _____ _____

Pump used _____ Time pumping ended _____

Tubing used (ft) _____ Gallons Pumped _____

Disposal: _____

Depth to Water **After** Development (feet below top of casing): _____

Total Depth of Well **After** Development (feet below top of casing): _____

Observations

Time	Water Clarity (Visual)	Time	Water Clarity (Visual)

NOTES: _____

WELL CASING VOLUMES

Diameter of Well [ID-inches]	1¼	2	3	4	6	8
Gallons per lineal foot	0.08	0.17	0.38	0.66	1.5	2.6

Boring ID_____ Depth Interval_____ Page ___ of ____ Time Beginning Boring_____ Time Ending Boring _____

Date _____ Total Depth _____ Drilling Co. _____ Drill Rig _____ Driller _____ Geo/Eng _____ Casing size _____

Saturated Zone _____ Water Level _____ Sheen _____ Frozen _____ Weather _____

Moisture, color, odor, % gravel, % sands, % fines, angularity, grain shape; fine soils, structure, permafrost, other

Time to drive **BEGIN**: _____

Recovery	PID		Time	Sample ID	# of jars
		Drill Action:			
		Drill Action:			
		Drill Action:			
		Drill Action:			
		Drill Action:			

Pg___of____Boring ID _____

Recovery: _____

Photo #: _____

Time to drive **END**:

APPENDIX D: DEC LABORATORY DATA REVIEW CHECKLIST

Appendix D

DEC Laboratory Data Review Checklist

Laboratory Data Review Checklist

Completed By:

Title:

Date:

CS Report Name:

Report Date:

Consultant Firm:

Laboratory Name:

Laboratory Report Number:

ADEC File Number:

Hazard Identification Number:

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

   ○ Yes ○ No Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

   ○ Yes ○ No Comments:

2. Chain of Custody (CoC)

   a. CoC information completed, signed, and dated (including released/received by)?

   ○ Yes ○ No Comments:

   b. Correct Analyses requested?

   ◉ Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

   a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

   ○ Yes ○ No Comments:

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

   ○ Yes ○ No Comments:

   c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

   ○ Yes ○ No Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

○ Yes ○ No Comments:

e. Data quality or usability affected?

Comments:

4. Case Narrative

a. Present and understandable?

○ Yes ○ No Comments:

b. Discrepancies, errors, or QC failures identified by the lab?

○ Yes ○ No Comments:

c. Were all corrective actions documented?

○ Yes ○ No Comments:

d. What is the effect on data quality/usability according to the case narrative?

Comments:

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

○ Yes ○ No Comments:

b. All applicable holding times met?

○ Yes ○ No Comments:

c. All soils reported on a dry weight basis?

○ Yes ○ No Comments:

d. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project?

○ Yes ○ No Comments:

e. Data quality or usability affected?

○ Yes ○ No Comments:

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

○ Yes ○ No Comments:

ii. All method blank results less than limit of quantitation (LOQ)?

○ Yes ○ No Comments:

iii. If above LOQ, what samples are affected?

Comments:

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

v. Data quality or usability affected?

Comments:

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

○ Yes ○ No Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

○ Yes ○ No Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

○ Yes ○ No Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

○ Yes ○ No Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

○ Yes ○ No Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

○ Yes ○ No Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

iv. Data quality or usability affected?

Comments:

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples?
(If not, enter explanation below.)

○ Yes ○ No Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

○ Yes ○ No Comments:

iii. All results less than LOQ?

○ Yes ○ No Comments:

iv. If above LOQ, what samples are affected?

Comments:

v. Data quality or usability affected?

Comments:

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

○ Yes ○ No Comments:

ii. Submitted blind to lab?

○ Yes ○ No Comments:

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

○ Yes ○ No Comments:

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below).

○ Yes ○ No ○ Not Applicable

i. All results less than LOQ?

○ Yes ○ No Comments:

ii. If above LOQ, what samples are affected?

Comments:

iii. Data quality or usability affected?

Comments:

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

○ Yes ○ No Comments:

IMPORTANT INFORMATION

Important Information

About Your 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 which 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.

IMPORTANT INFORMATION

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 JUDGEMENTS.

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.

IMPORTANT INFORMATION

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.

IMPORTANT INFORMATION

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