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FINAL

REPORT

Yakutat Airport - Long-Term Alternate Water Feasibility Study

YAKUTAT, ALASKA

SHANNON & WILSON

March 2023

Shannon & Wilson No: 102896-005

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Submitted To: Alaska Department of Transportation & Public Facilities – Southcoast Region
PO Box 112506
Juneau, Alaska 99811-2506
Attn: Sammy Cummings and Marcus Zimmerman

Subject: FINAL REPORT, YAKUTAT AIRPORT - LONG-TERM ALTERNATE WATER FEASIBILITY STUDY, YAKUTAT, ALASKA

The effort summarized herein was conducted on behalf of the Alaska Department of Transportation & Public Facilities (DOT&PF), in accordance with Shannon & Wilson, Inc.'s (S&W's) approved scope of services dated April 15, 2020.

S&W submitted a draft Long-Term Alternate Water Feasibility Study Report (Report) to DOT&PF in March 2021. During DOT&PF' s review, the Yakutat City Manager, Jon Erikson, requested to have Kevin Ulrich from the Alaska Native Tribal Health Consortium (ANTHC) review and provide comments on the municipal water system expansion alternate water option described in the Report. In fall 2021, ANTHC informed DOT&PF they agreed with the estimate for the water system extension outlined in the Report. Since that time, DOT&PF and the City and Borough of Yakutat (CBY) have been in discussions regarding expansion of the municipal water system as an alternate water option for affected properties at the Yakutat airport. In December 2022, through Senator Murkowski's office, CBY was awarded $5.1 million to extend the Municipal Water System. DOT&PF and CBY have been collaborating on next steps.

DOT&PF requested S&W finalize this Report, which S&W has done with no further revisions. No alternate water option described in the Report was chosen or implemented by DOT&PF.

S&W appreciates the opportunity to be of service to you on this project. If you have questions concerning this Report, or we may be of further service, please contact us.

Sincerely,

SHANNON & WILSON, INC.

Ashley Jaramillo
Project Manager, Senior Chemist

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ACRONYMS

AAC	Alaska Administrative Code
ANTHC	Alaska Native Tribal Health Consortium
ARFF	Aircraft Rescue and Firefighting
Barr	Barr Engineering Co.
CBY	City and Borough of Yakutat
DEC	Alaska Department of Environmental Conservation
DOT&PF	Alaska Department of Transportation and Public Facilities
EPA	U.S. Environmental Protection Agency
GAC	granular activated carbon
HDR	HDR Engineering, Inc.
LDRC	Laboratory Data Review Checklist
LHA	lifetime health advisory
MCL	Maximum Contaminant Level
µg/L	micrograms per liter
ng/L	nanograms per liter
NPDWR	National Primary Drinking Water Regulation
NSDWR	National Secondary Drinking Water Regulation
O&M	operations and maintenance
PER	2017 Preliminary Engineering Report
PFAS	per- and polyfluoroalkyl substances
PFHpA	perfluoroheptanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
POET	Point-of-Entry Water Treatment
ppt	parts per trillion – equivalent to ng/L
PWS	public water system
QA	quality assurance
SGS	SGS North America, Inc.
S&W	Shannon & Wilson, Inc.
SMCL	Secondary Maximum Contaminant Level
UV	Ultraviolet
YAK	Yakutat Airport

1 INTRODUCTION

Shannon & Wilson, Inc. (S&W) is pleased to submit this Long-Term Alternate Water Feasibility Study Report (Report) summarizing potential alternative drinking water sources for water supply wells impacted by per- and polyfluoroalkyl substances (PFAS) at the Yakutat Airport (YAK) in Yakutat, Alaska. These locations are shown in red on Figure 1, Highest Reported Water Supply Well Analytical Results Through December 2020. The YAK is an active, Alaska Department of Environmental Conservation (DEC) listed contaminated site (File Number 1530.38.022, Hazard ID 27090).

1.1 Drinking Water Action Levels

The current DEC action level for drinking water samples aligns with the U.S. Environmental Protection Agency (EPA) lifetime health advisory (LHA) level of 70 nanograms per liter (ng/L) for the sum of two PFAS compounds, perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). The former DEC action level was 70 ng/L for the sum of five PFAS compounds: PFOS, PFOA, perfluoroheptanoic acid (PFHpA), perfluorohexanesulfonic acid (PFHxS), and perfluorononanoic acid (PFNA). PFAS concentrations are compared to the applicable action level at the time each sample was collected (Figure 1).

1.2 Background

On behalf of the Alaska Department of Transportation and Public Facilities (DOT&PF), S&W conducted a water supply well search on and downgradient of the YAK property beginning in June 2019. To date, S&W has sampled 21 water supply wells, the majority of which are drinking water wells. The water supply well search and initial sampling effort occurred in June 2019. Resampling of select wells occurred in December 2019, August 2020, December 2020, and is ongoing.

Two wells are considered impacted due to PFAS results above the applicable action level. Both wells are located on the YAK property (Figure 1). These two wells, located on separate YAK lease lots, serve two structures, a restaurant, and a lodge. The owner of these wells is receiving interim bottled water deliveries until an alternate long-term solution is chosen and implemented. Exhibit 1-1, below, describes these properties.

Exhibit 1-1: Impacted Properties

Well ID	Property Type	Airport Block and Lot	Description	Highest Reported PFAS Analytical Result (ppt)
33063	Commercial	Block 3, Lot 1A	Yakutat Lodge Employee and Guest Lodging	90[a]
33066	Commercial	Block 2, Lot 4A	Yakutat Restaurant	77[b]

NOTES:

a. Compared to the former DEC PFAS action level for drinking water.

b. Compared to the current DEC PFAS action level for drinking water.

DEC – Alaska Department of Environmental Conservation; ng/L – nanograms per liter; PFAS - per- and polyfluoroalkyl substances ppt – parts per trillion – equivalent to ng/L.

1.3 Purpose

The purpose of this Report is to present a range of potential long-term alternate water options, including estimated capital and operations and maintenance (O&M) costs, and advantages and disadvantages of each option. This information is meant to assist the DOT&PF in selecting a long-term water source for PFAS-impacted water supply wells at the YAK in Yakutat, Alaska. The preferred alternative may include a combination of these options.

S&W understands DOT&PF is responsible for the two impacted properties. This feasibility study assumes O&M costs will be addressed by a one-time settlement to the property operator, system operator, or other entity. Potential settlement costs are not included as a part of the long-term costs included in this Report.

1.4 Use of Report

This Report was prepared for the exclusive use of the DOT&PF, and their representatives for the purpose of long-term alternate water planning for impacted wells on the YAK property. This work presents S&W's professional judgment and is based on information obtained from individuals in Yakutat, S&W's contractors, and analytical sampling results.

This Report should not be used for other purposes without S&W's approval or if any of the following occurs:

- Project details change, or new information becomes available such that Report findings may be affected.
- Conditions change due to natural forces or human activity at, under, or adjacent to the project site.
- Assumptions stated in this Report have changed.
- If ownership or land use of the site and/or impacted properties has changed.

- More than one year has passed since the date of this Report.
- Regulations, laws, or cleanup levels change.
- If the site's regulatory status has changed.

If any of these occur, S&W should be retained to review the applicability of this Report. This Report should not be used for other purposes without S&W's review. If a service is not specifically indicated in this Report, do not assume it was performed.

2 FEASIBILITY OF LONG-TERM WATER OPTIONS

S&W prepared the following summary of four different options for providing long-term alternate water to PFAS-impacted properties at the YAK in Yakutat, Alaska. These options included:

1. Water Storage Tanks and Deliveries (Section 2.1)
2. City and Borough of Yakutat (CBY) Water System Expansion (Section 2.2)
3. Small-Scale Distribution Systems (Section 2.3)
4. Individual Point-of-Entry Water Treatment (POET) Systems (Section 2.4)

HDR Engineering, Inc. (HDR) investigated the feasibility of water storage tanks and deliveries, CBY water system expansion, and small-scale distribution systems. HDR based the estimate of water demand for each impacted property using EPA and American Water Works Association guidelines. HDR's report is included in Appendix A.

Barr Engineering Co. (Barr) prepared preliminary POET system designs. Barr based the peak water demand on property type (commercial) and fixture counts for each property. Barr's report is included in Appendix B.

In August 2020, S&W field staff conducted site visits at the impacted properties for planning purposes. This information was recorded on *PFAS Impacted Well Site Assessment Forms*, copies of which are include within Barr's report (Appendix B, Attachment 1). These forms were provided to HDR and Barr.

2.1 Water Storage Tanks and Deliveries

This option would provide an on-site high-density polyethylene water storage tank to each impacted property, which would be filled by scheduled deliveries of water from the CBY public water system. The capacity of the tanks was recommended based on estimated water usage for each property. HDR's report assumes the water storage tanks would be installed

underground. Exhibit 2-1 below summarizes the main advantages and disadvantages, and estimated costs (capital and O&M) for this option. For details regarding this option see HDR's report included in Appendix A. For the purposes of the summaries presented in Section 2, we have rounded the estimated capital and O&M costs to the nearest one hundred dollars.

Exhibit 2-1: Water Storage Tanks and Deliveries Advantages, Disadvantages, and Associated Costs

Advantages
The water source is CBY's water system, an established long-term water source managed by a known entity with a proven track record.
CBY would be responsible for ongoing water quality testing and utility management.
Water source is far removed from the PFAS contamination at the YAK.
Underground installation of tanks prevents taking up limited above-ground space on the impacted properties versus above-ground installations.
Disadvantages
There is no water truck in Yakutat certified for water delivery. The water truck currently owned by the Borough of Yakutat is unlikely to be approved by DEC for delivery of potable water due to previous uses of the truck.
A new water truck needs to be purchased, including installing a new sanitary connection with backflow prevention that meets requirements of the DEC.
Construction operations would require significant space for excavation and installation of tanks which may temporarily affect the lodge and restaurant business during construction.
There is the possibility of water delivery delays resulting in additional management tasks for the property operators, compared to the ease of using a well or direct connection to the CBY municipal water system.
Underground tank installations would require a small, separate heated space to house the well pump which will take up limited space on the properties.
Estimated Project Capital Cost: $410,400
Capital cost includes two tanks, excavation, installation and plumbing, new water delivery vehicle with the appropriate connections, well decommissioning[1], contingency, engineering and construction management, and administration and legal.
Estimated Ongoing O&M Cost Per Month: $3,200
O&M costs include labor, maintenance of the vehicle, and regular water testing.

NOTES:

1 Existing wells would be decommissioned per the guidelines in 18 AAC 80.015(e).

AAC – Alaska Administrative Code; CBY – City and Borough of Yakutat; DEC – Alaska Department of Environmental Conservation; PFAS - per- and polyfluoroalkyl substances; O&M - operations and maintenance; YAK – Yakutat Airport.

2.2 Municipal Water System Expansion

This option involves extending the existing CBY water system to serve the impacted properties at the YAK. The CBY water system currently provides water approximately three miles northwest of the two PFAS-impacted wells. HDR developed preliminary water main routing for the water pipeline following the paved Yakutat Road from the present edge of the water distribution system to the YAK. The pipe would be constructed within a cleared

right-of-way on the side of the existing road. Demolition and reconstruction of the road may be required at two segments of the pipe near road crossings.

Probable costs for this option are based on estimates included in the 2017 Preliminary Engineering Report (PER) prepared by DOWL, which is unrelated to the current PFAS response effort but outlines the existing CBY water system and proposed possible improvements to the water system, including estimated costs. After finalization, the PER was presented to the Alaska Native Tribal Health Consortium (ANTHC) for possible funding for water system expansion. ANTHC's funding cycle at the time the PER was provided focused on providing water service to homes over businesses, so the project was not funded at that time. CBY water system expansion would include the installation of fire hydrants as the rest of the water system includes fire protection. After discussions with the State Fire Marshal's office and review of the pertinent fire codes, it is HDR's understanding the decision on whether or not to include fire protection capability in the design is up to the local authority having jurisdiction, which in this case is the CBY. The cost estimate assumes fire protection would be included. Exhibit 2-2 below summarizes the main advantages and disadvantages, and estimated costs (capital and O&M) for this option. For details regarding this option see HDR's report included in Appendix A.

Exhibit 2-2: Municipal Water System Expansion Advantages, Disadvantages, and Associated Costs

Advantages
The water source is CBY's water system, an established long-term water source managed by a known entity with a proven track record.
CBY would be responsible for ongoing water quality testing and utility management.
Water source is far removed from the PFAS contamination at the YAK.
Should the PFAS groundwater plume spread, or action levels change, service line connections could be added.
Non-PFAS-impacted property owners in the YAK area could connect to the water system at their own expense.
Installation of fire hydrants near the airport would allow improved fire service to the area.
CBY staff believe the extension of the water main and additional water demand from the lodge and the restaurant would not put stress on the existing system.
A partnership with other funding agencies looking into extension of the CBY water system may provide additional funding reducing the overall cost to each funding entity.
Disadvantages
High overall cost and high cost per impacted property compared to the other options presented in this Report.
Fire protection would add costs due to the need for larger pipes and for fire hydrants.
Fire hydrants and valves need to be inspected and tested routinely, assumed to be the responsibility of the CBY.
The long length of larger-diameter pipe would result in high water age at the end points of the system. High water age can result in water quality issues which will need to be addressed during project design.
Due to the long pipe length, a booster station would likely be needed to provide sufficient pressure and flow at the YAK.
Should more sections of the road need to be demolished and rebuilt for water line construction, capital costs would be substantially higher.
Estimated Project Capital Cost: $6,352,500
Capital cost includes water main, fire hydrants, booster station, service connections, well decommissioning[1], contingency, engineering and construction management, and administration and legal.
Estimated Ongoing O&M Cost Per Month: N/A
O&M costs are assumed to be covered by the CBY as a part of operating and maintaining the water system.

NOTES:

1 Existing wells would be decommissioned per the guidelines in 18 AAC 80.015(e).

AAC – Alaska Administrative Code; CBY – City and Borough of Yakutat; DEC – Alaska Department of Environmental Conservation; O&M - operations and maintenance; PFAS - per- and polyfluoroalkyl substances.

2.3 Small-Scale Distribution Systems

This option involves constructing small-scale water distribution systems. One small-scale water system option would connect both the lodge and restaurant to the existing well located at the DOT&PF Shop and Aircraft Rescue and Firefighting (ARFF) facility. This well has tested under the current and former DEC PFAS action levels for drinking water. See Exhibit 2-3 below for further details regarding the DOT&PF well.

Exhibit 2-3: Existing Well Option Information

Well ID	Property Type	Airport Block and Lot	Description	Highest Reported PFAS Analytical Result (ppt)
33060	Commercial	Block 4, Lot 3	DOT&PF Shop and ARFF Facility	22[a]

NOTES:

a. Former DEC PFAS action level for drinking water.

ARFF – Aircraft Rescue and Firefighting; DEC – Alaska Department of Environmental Conservation; DOT&PF - Alaska Department of Transportation & Public Facilities; ng/L – nanograms per liter; PFAS - per- and polyfluoroalkyl substances; ppt – parts per trillion – equivalent to ng/L.

This study also considered the installation of a newly drilled well as an alternate source for a small-scale water distribution system. However, there is significant uncertainty on the exact location and extent of the PFAS plume at the YAK. A new well drilled near YAK could discover levels of PFAS above the action level. HDR and S&W discourage this option and it is not discussed further in this document.

Exhibit 2-4 below summarizes the main advantages and disadvantages, and estimated costs (capital and O&M) for this option using the existing well at the ARFF facility. For details regarding this option see HDR's report included in Appendix A.

Exhibit 2-4: Small-Scale Distribution Systems Advantages, Disadvantages, and Associated Costs

Advantages
The initial capital and monthly O&M costs are low compared to a CBY water system expansion and other alternatives.
Water source would be maintained by the DOT&PF and could be monitored by the State of Alaska for PFAS levels.
Disadvantages
Due to the estimated water use, the number of rooms at the lodge, and the number of patrons at the restaurant, this water system would likely be classified as a transient non-community water system necessitating a PWS review and approval from the DEC as well as regular water quality testing. This would add time to the implementation of this option.
The legal framework would need to be developed to direct the responsibilities of ownership and maintenance of the water supply and water distribution network.
The selected existing well had detectable levels of PFAS, and while continuous testing can be provided, it is impossible to predict if the selected well would remain below the PFAS action level or if additional water usage would have an effect on the concentrations. It is also possible our understanding of PFAS could change in the future and the regulations would not allow for detectable concentrations of PFAS.
This option assumes existing well rehabilitation and installation of a new pump is necessary, increasing costs. The final cost could be lower if the existing well yield is found to be adequate and only a limited amount of rehabilitation work is necessary. If the yield is not adequate, this may not be a viable alternative.
Estimated Project Capital Cost: $302,000
Capital costs include distribution line materials, connection plumbing, well rehabilitation, pump installation and certification, well decommissioning[1], utility formation, easement acquisition, contingency, engineering and construction management, and administration and legal.
Estimated Ongoing O&M Cost Per Month: $1,100
Operation and maintenance costs - the pump electrical costs, utility repairs, water quality testing and other overhead costs such as insurance

NOTES:

1 Existing wells would be decommissioned per the guidelines in 18 AAC 80.015(e).

AAC – Alaska Administrative Code; CBY – City and Borough of Yakutat; DEC – Alaska Department of Environmental Conservation; DOT&PF - Alaska Department of Transportation & Public Facilities; O&M - operations and maintenance; PFAS - per- and polyfluoroalkyl substances; PWS – public water system.

2.4 Individual Point-of-Entry Water Treatment Systems

This option involves designing, installing, and maintaining individual POET systems for each impacted water supply well to reduce PFAS concentrations below applicable action levels. Barr has developed preliminary treatment recommendations for both impacted locations (Appendix B). Barr recommends POET systems consisting of the following elements, depending on the property:

- iron and manganese pretreatment,
- particulate filtration,
- granular activated carbon (GAC) filtration, and
- Ultraviolet (UV) disinfection.

To implement this option, S&W would collect pre-installation water samples to confirm treatment design assumptions, and work with property owners to determine the POET location and necessary piping modifications. The project team would prepare access and maintenance agreements for each property, construct POET outbuildings, and modify existing DEC Drinking Water Program permits for public water systems (PWSs).

Exhibit 2-5 below outlines Barr's treatment requirements and goals for the POET.

Exhibit 2-5: POET System Treatment Requirements and Goals

Primary Treatment Requirement	Primary Treatment Goals	Secondary Treatment Goals
Less than 70 ng/L PFOS and PFOA[1]	Less than 10 µg/L arsenic[2]	Less than 300 µg/L iron[4]
	Less than 70 ng/L sum of five PFAS: PFOA, PFOS, PFHpA, PFNA, and PFHxS[3]	Less than 50 µg/L manganese[5]

NOTES:

1 EPA LHA and DEC action level as of April 2019

2 NPDWR MCL

3 DEC action level prior to April 2019

4 NSDWR SMCL and protective of the PFAS water treatment process to prevent iron fouling

5 NSDWR SMCL and protective of the PFAS water treatment process to prevent manganese fouling

DEC – Alaska Department of Environmental Conservation; EPA – U.S. Environmental Protection Agency; LHA – lifetime health advisory; MCL - Maximum Contaminant Level; µg/L – micrograms per liter; ng/L – nanograms per liter; NPDWR - National Primary Drinking Water Regulation; NSDWR - National Secondary Drinking Water Regulation; PFAS - per- and polyfluoroalkyl substances; PFHpA - perfluoroheptanoic acid; PFHxS - perfluorohexanesulfonic acid; PFNA - perfluorononanoic acid; PFOA - perfluorooctanoic acid; PFOS - perfluorooctanesulfonic acid; SMCL - Secondary Maximum Contaminant Level

Exhibit 2-6 below summarizes the main advantages and disadvantages, and estimated costs (capital and O&M) for this option. Note, estimated costs have been combined for both properties. For details regarding this option see Barr's report included in Appendix B.

Exhibit 2-6: POET System Advantages, Disadvantages, and Associated Costs

Advantages
POET systems are a standalone solution for properties located far from existing utilities.
Depending on the settlement value selected, POET systems could have the least expensive total costs compared to other options.
Disadvantages
POET systems require ongoing maintenance.
DOT&PF would be responsible for managing O&M of POET systems. To confirm proper O&M of the POET system, S&W does not recommend leaving maintenance to home or business owners with impacted water supply wells.
If regulatory standards become more stringent the POET systems may need to be supplemented or redesigned.
DEC will require submittal of POET design drawings, breakthrough calculations, analytical results, material specifications, an O&M plan, and other information for these two properties prior to POET use.
There are many variables (i.e. faster PFAS breakthrough, additional water treatment equipment, etc.) that would increase O&M costs.
The DEC Drinking Water Program consults the Contaminated Sites and Wastewater Divisions as part of their permitting process. DEC Contaminated Sites has indicated it may not approve discharge of untreated backwash water into private septic systems and/or the CBY sewer system, as they have for other projects. Backwash is required for GAC-based POET systems. If they do not approve discharge, additional costs would be incurred for disposal of backwash water or treatment system design modifications (i.e., additional treatment for backwash water or recirculation).
Available indoor space for the POET treatment system may be limited, requiring possible alternatives for storage (i.e. Connex, reorganization of available space, etc.)
Estimated Project Capital Cost[1]: $115,700
Capital costs include sediment filters, water softener, GAC vessels and media, UV disinfection unit, flow restrictor, flow meter, sample taps, insulated and heated Connex, site preparation, system installation, plumbing supplies, freight, contingency, engineering and construction management, and administration and legal.
Estimated Ongoing O&M Cost Per Month: $2,200
O&M costs include annual replacement of GAC, quarterly sampling and analysis for PFAS, miscellaneous maintenance and equipment replacement, salt usage, power, O&M contractor labor, and administrative labor.

NOTES:

1 Cost limitations for these class 5 cost estimates are described in Barr's report, Appendix B.

CBY – City and Borough of Yakutat; DEC – Alaska Department of Environmental Conservation; DOT&PF - Alaska Department of Transportation & Public Facilities; GAC - granular activated carbon O&M - operations and maintenance; PFAS - per- and polyfluoroalkyl substances; POET – Point-of-Entry Water Treatment; UV - ultraviolet

3 LOCAL PREFERENCES

During the preparation of their report, HDR spoke with Kevin Ulrich at ANTHC, the project manager for Yakutat projects, and Jon Erickson the Borough Manager. Jon was very enthusiastic about and supportive of water line extension near the airport to connect homes from water table issues stemming from possible flooding events which occur in Yakutat.

In past conversations with the impacted property manager, the alternative preferred was tanks and water deliveries.

4 OPTION SUMMARY

Table 1, attached, combines the information contained in Exhibits 2-1, 2-2, 2-4, and 2-6 for ease of comparing costs, advantages, and disadvantages of the four long-term alternate water options.

HDR and Barr's cost estimates included herein vary in precision but are considered order-of-magnitude. Once an option or combination of options is selected, the anticipated costs can be refined. These estimates should not be used by contractors to prepare bids. The project team does not have control over the cost of labor, materials, equipment, or work furnished by others; the contractor's actual or proposed construction methods or pricing; competitive bidding; or market conditions. S&W cannot guarantee that proposals, bids, or actual cost will be similar to the enclosed estimates. S&W is not a construction cost estimator or contractor. These opinions of probable cost should not be considered equivalent to the nature and extent of services a construction cost estimator or contractor would provide.

5 DISCUSSION

This Report describes a range of options for providing long-term alternate water to PFAS-impacted properties near the YAK; determining a preferred option will depend on stakeholders' desired balance between effectiveness, implementation, and cost. Because these factors vary considerably among the listed options, S&W is not offering an opinion on a preferred option.

DOT&PF expressed a preference for water storage tanks and deliveries (Section 2.1) with a reliable, long-term water delivery contractor. Municipal water system expansion (Section 2.2) has a considerably higher anticipated cost than the other options. Small-scale distribution supplied by an existing water source (Section 2.3) has the potential for PFAS concentrations in source wells to increase and/or regulatory action levels for drinking water decrease and require ongoing testing and maintenance. Individual POET systems (Section 2.4) require ongoing maintenance to remain effective and the uncertainty overtime could increase costs.

Following your review of this Report, S&W will schedule a follow up meeting to select a preferred option or combination of options.

S&W's assessment is based on:

- S&W's understanding of the project and information provided by the DOT&PF, HDR, Barr, CBY, impacted property owners and occupants, and other contacts in Yakutat.

- Site conditions S&W observed during visits to impacted properties as they existed in August 2020. These observations are specific to the locations and dates these visits occurred and may not be applicable to all areas of the site.
- The results of testing performed on water samples S&W collected from the water supply wells on, near, and downgradient from the YAK.
- S&W's previous experience at and near the YAK.
- Publicly available literature reviewed for this Report.
- The limitations of S&W's approved scope, schedule, and budget described in the April 15, 2020 scope of services.

S&W has prepared the enclosed document "Important Information about Your Environmental Report" to help you and others understand the use and limitations of this Report. Regulatory agencies may reach different conclusions than S&W.

Table 1 - Long-Term Alternative Water Options - Yakutat Airport

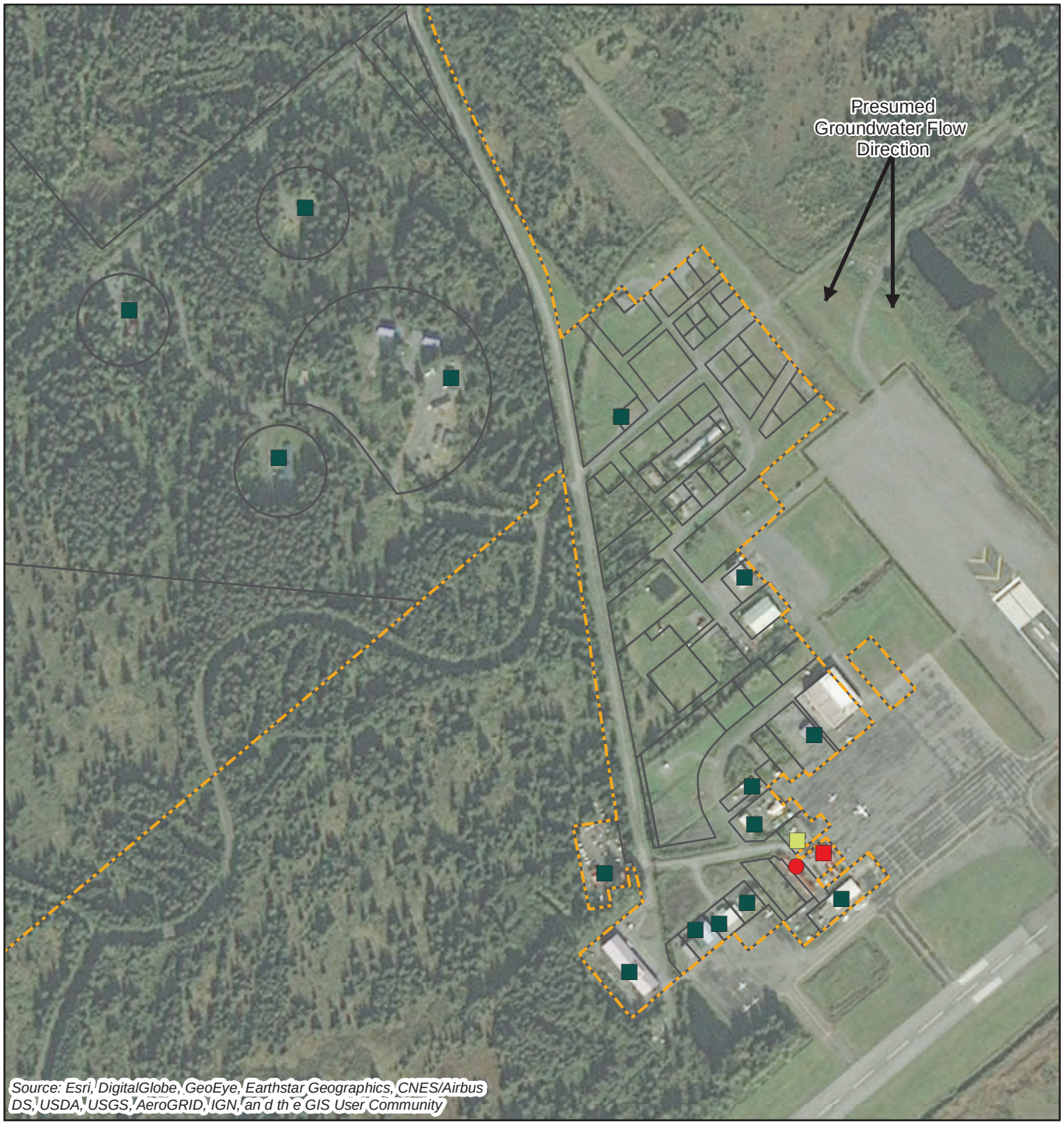
Alternative Option	Capital Costs	O&M Costs per Month	Advantages	Disadvantages
Water Storage Tanks and Deliveries	$410,400	$3,200	▪ The water source is CBY's water system, an established long-term water source managed by a known entity with a proven track record. ▪ CBY would be responsible for ongoing water quality testing and utility management. ▪ Water source is far removed from the PFAS contamination at the YAK. ▪ Underground installation of tanks prevents taking up limited above-ground space on the impacted properties versus above-ground installations.	▪ There is no water truck in Yakutat certified for water delivery. The water truck currently owned by the Borough of Yakutat is unlikely to be approved by DEC for delivery of potable water due to previous uses of the truck. ▪ A new water truck needs to be purchased, including installing a new sanitary connection with backflow prevention that meets requirements of the DEC. ▪ Construction operations would require significant space for excavation and installation of tanks which may temporarily affect the lodge and restaurant business during construction. ▪ There is the possibility of water delivery delays resulting in additional management tasks for the property operators, compared to the ease of using a well or direct connection to the CBY municipal water system. ▪ Underground tank installations would require a small, separate heated space to house the well pump which will take up limited space on the properties.
Municipal Water System Expansion	$6,352,500	N/A	▪ The water source is CBY's water system, an established long-term water source managed by a known entity with a proven track record. ▪ CBY would be responsible for ongoing water quality testing and utility management. ▪ Water source is far removed from the PFAS contamination at the YAK. ▪ Should the PFAS groundwater plume spread, or action levels change, service line connections could be added. ▪ Non-PFAS-impacted property owners in the YAK area could connect to the water system at their own expense. ▪ Installation of fire hydrants near the airport would allow improved fire service to the area. ▪ CBY staff believe the extension of the water main and additional water demand from the lodge and the restaurant would not put stress on the existing system. ▪ A partnership with other funding agencies looking into extension of the CBY water system may provide additional funding reducing the overall cost to each funding entity.	▪ High overall cost and high cost per impacted property compared to the other options presented in this Report. ▪ Fire protection would add costs due to the need for larger pipes and for fire hydrants. ▪ Fire hydrants and valves need to be inspected and tested routinely, assumed to be the responsibility of the CBY. ▪ The long length of larger-diameter pipe would result in high water age at the end points of the system. High water age can result in water quality issues which will need to be addressed during project design. ▪ Due to the long pipe length, a booster station would likely be needed to provide sufficient pressure and flow at the YAK. ▪ Should more sections of the road need to be demolished and rebuilt for water line construction, capital costs would be substantially higher.
Small-Scale Distribution Systems	$302,000	$1,100	▪ The initial capital and monthly O&M costs are low compared to a CBY water system expansion and other alternatives. ▪ Water source would be maintained by the DOT&PF and could be monitored by the State of Alaska for PFAS levels.	▪ Due to the estimated water use, the number of rooms at the lodge, and the number of patrons at the restaurant, this water system would likely be classified as a transient non-community water system necessitating a PWS review and approval from the DEC as well as regular water quality testing. This would add time to the implementation of this option. ▪ The legal framework would need to be developed to direct the responsibilities of ownership and maintenance of the water supply and water distribution network. ▪ The selected existing well had detectable levels of PFAS, and while continuous testing can be provided, it is impossible to predict if the selected well would remain below the PFAS action level or if additional water usage would have an effect on the concentrations. It is also possible our understanding of PFAS could change in the future and the regulations would not allow for detectable concentrations of PFAS. ▪ This option assumes existing well rehabilitation and installation of a new pump is necessary, increasing costs. The final cost could be lower if the existing well yield is found to be adequate and only a limited amount of rehabilitation work is necessary. If the yield is not adequate, this may not be a viable alternative.
Individual POET Systems[2]	$115,700	$2,200	▪ POET systems are a standalone solution for properties located far from existing utilities. ▪ Depending on the settlement value selected, POET systems could have the least expensive total costs compared to other options.	▪ POET systems require ongoing maintenance. ▪ DOT&PF would be responsible for managing O&M of POET systems. To confirm proper O&M of the POET system, S&W does not recommend leaving maintenance to home or business owners with impacted water supply wells. ▪ If regulatory standards become more stringent the POET systems may need to be supplemented or redesigned. ▪ DEC will require submittal of POET design drawings, breakthrough calculations, analytical results, material specifications, an O&M plan, and other information for these two properties prior to POET use. ▪ There are many variables (i.e. faster PFAS breakthrough, additional water treatment equipment, etc.) that would increase O&M costs. ▪ The DEC Drinking Water Program consults the Contaminated Sites and Wastewater Divisions as part of their permitting process. DEC Contaminated Sites has indicated it may not approve discharge of untreated backwash water into private septic systems and/or the CBY sewer system, as they have for other projects. Backwash is required for GAC based POET systems. If they do not approve discharge, additional costs would be incurred for disposal of backwash water or treatment system design modifications (i.e., additional treatment for backwash water or recirculation). ▪ Available indoor space for the POET treatment system may be limited, requiring possible alternatives for storage (i.e. Connex, reorganization of available space, etc.)

NOTES:

1 Existing wells would be decommissioned per the guidelines in 18 AAC 80.015(e).

2 Cost limitations for these class 5 cost estimates are described in Barr's report, Appendix B.

AAC – Alaska Administrative Code; CBY – City and Borough of Yakutat; DEC – Alaska Department of Environmental Conservation; DOT&PF - Alaska Department of Transportation & Public Facilities; GAC - granular activated carbon O&M - operations and maintenance; YAK – Yakutat Airport; PFAS - per- and polyfluoroalkyl substances; POET – Point-of-Entry Water Treatment; PWS – public water system. UV – ultraviolet.



LEGEND

- ≤17 parts per trillion (ppt) †
- 18 to 69 ppt †
- ≥70 ppt †
- Property considered affected before April 2019, compared to former DEC action level *
- Airport_Boundary
- Yakutat Tax Parcels

†Sum of PFOS and PFOA
*Sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA

0 0.1 0.2
Miles

N

Yakutat Airport
Long-term Alternate Water Feasibility Study
Yakutat, Alaska

HIGHEST REPORTED WATER SUPPLY WELL ANALYTICAL RESULTS THROUGH DECEMBER 2020

March 2023 102896-005

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 1

APPENDIX A: HDR - ALTERNATIVE WATER SUPPLY STUDY

Appendix A

HDR, Inc. Yakutat PFAS Contamination - Alternative Water Supply Study

Memo

Date:	January 5, 2021
Project:	Yakutat PFAS Contamination - Alternative Water Supply Study
To:	Ashley Jaramillo, Shannon & Wilson, Inc.
From:	Anson Moxness, PE, and Wescott Bott, PE, HDR
Subject:	Yakutat PFAS Contamination - Alternative Water Supply Study

HDR was contracted by Shannon & Wilson, Inc. (S&W), to examine alternatives for providing reliable and regulatory-compliant drinking water to two properties served by wells with the following issues:

1. The wells have been found to have per- and polyfluoroalkyl substance (PFAS) levels exceeding the U.S. Environmental Protection Agency (EPA) lifetime health advisory (LHA); or
2. The wells have been found to have PFAS levels exceeding the former State of Alaska Department of Environmental Conservation (ADEC) action level.

This memorandum provides the analysis of alternatives and their probable project costs. Referenced figures are attached at the end of the memo.

Background Information

This section provides general background information for the properties meeting the above criteria where alternative water supplies are needed due to PFAS levels, as well as the regulatory and planning criteria and methods used for evaluation of alternative drinking water sources.

The current ADEC action level and EPA LHA level are both 70 parts per trillion (ppt) for the sum of two PFAS compounds: perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). The former ADEC action level was 70 ppt for the sum of five PFAS compounds: PFOS, PFOA, perfluoroheptanoic acid (PFHpA), perflurohexanesulfonic acid (PFHxS), and perfluorononanoic acid (PFNA). Wells considered affected are compared to the action level in effect at the time the samples were collected. The wells discussed in this report were initially sampled when the former ADEC action level was in effect.

Affected Properties

Based on maps and information provided by S&W, two wells on two properties in the vicinity of the Yakutat Airport tested are above EPA and ADEC regulatory levels.. Both properties are DOT&PF lease lots at the Yakutat Airport and are leased by Yakutat Adventures LLC. One well serves a full-service, 52-seat restaurant, and the other well serves a lodge with eight guest rooms and three live-in employees.

Well logs for the wells serving these two properties were not found in the State of Alaska's Well Log Tracking System (WELTS). The operators of the well cannot locate the well logs for the wells.

Water Demand

The existing water supplies to the two buildings are not currently metered; therefore, water demand for the two buildings has been developed based on EPA and American Water Works Association (AWWA) guidelines for water use. In general, there is significant variation of water demand between individuals and commercial facilities. The water demands presented in Table 1 are an estimate of summer period water use per capita. Actual water use may differ from the provided data.

Table 1: Estimated Daily Water Use Per Capita

Use Type (units/seats)	Daily Water Demand (gallons per unit or seat)
Lodge	100
Hotel Employee	10
Dormitory	35
Restaurant	8

RESTAURANT

The 52-seat restaurant is estimated to use approximately 416 gallons per day.

LODGE

The estimated lodge water demand from clients of 800 gallons per day was determined by multiplying the number of available rooms by the lodge water use rate. Employees living on-site are considered to use water at both the lodge employee rate and the dormitory rate; therefore, the estimated total employee use per day is 135 gallons. The estimated total water use for the lodge is 935 gallons per day.

Combined, it is estimated that the two buildings require a total of 1,351 gallons per day.

Existing Municipal Water System

Properties within the City and Borough of Yakutat (CBY) townsite near the harbor are served by the CBY public water system. Figure 1 shows the extent of the existing public water system compared to the location of the affected wells and the airport, which is approximately 3 miles southeast of the city. A 2017 Preliminary Engineering Report (PER)[1] outlines the existing system and proposes possible improvements to the water system, as well as rough cost estimates.

Opinions of Probable Project Cost

The 2017 PER provided estimates for a small selection of water system improvement projects to aid the development of the opinions of probable project cost (OPPCs) in the sections below. OPPCs are based on these estimates and bid tabs from the Municipality of Anchorage, adjusted

[1] Yakutat Water and Sanitation System Preliminary Engineering Report, DOWL 2017

to account for remote Alaska construction. The OPPCs provided below are conceptual rough order of magnitude values that would generally be considered Class 4 level of accuracy under Association for the Advancement of Cost Engineering (AACE) guidelines (AACE 18R-97). As such, the OPPCs below include a 35 percent contingency cost on the construction subtotal to account for the current limited level of design. This contingency factor is based on HDR's professional judgment and is within the guidance provided by AACE 18R-97 for a Class 4 estimate.

Alternatives Analysis

This memorandum examines three alternatives to provide alternative water supply to the affected properties. These alternatives are:

1. Municipal Water System Extension
2. Small-Scale Water Distribution System
3. Water Delivery and Storage

There are other possible solutions not examined in this report. These include alternatives such as point-of-entry and point-of-source treatments. These alternatives were not included for analysis in the HDR's scope of work to evaluate.

Alternative 1: Municipal Water System Extension

This alternative would extend the existing CBY water distribution system from the Yakutat townsite to serve the affected properties. Approximately 18,000 linear feet of 8-inch water main and approximately 150 linear feet of water service lines would be required to connect municipal water service to the two properties. Existing wells at both properties would be decommissioned per the guidelines in 18 AAC 80.015(e), and water service lines would connect with existing water piping in each of the two buildings or where the abandoned well connects into each building.

The proposed routing for the water pipeline would follow the paved Yakutat Road from the present edge of the water distribution system to the airport. The pipe would be constructed within a cleared right-of-way on the side of the existing road. Should the road need to be demolished and rebuilt for the construction of this water line, the cost of this alternative would be substantially higher. Only two segments of pipe—one near the airport and one near the road crossing of Ophir Creek—may require demolition and reconstruction of the road.

Extension of the water main would place additional water demand on the CBY water system. The two wells that serve the CBY have a rated combined production of approximately 470,000 gallons per day. The water treatment facility produces an annual average of 150,000 gallons per day, with increases in summer due to demand from fish processing plants and other related activities. Per CBY Public Works staff, an additional 1,351 gallons per day should not put additional stress on the system. However, due to the long pipe length, a booster station would likely be necessary to provide sufficient pressure and flow at the airport. Should additional homes or businesses connect to the water line, analysis should be completed on the ability of the two water wells to produce sufficient water during high-demand periods.

It is assumed that this municipal water system extension alternative would include some fire protection capability in the airport vicinity, because the rest of the municipal water system includes fire protection. However, after discussions with the State Fire Marshal's office and review of the pertinent fire codes, it is HDR's understanding that the decision on whether or not to include fire protection capability in the design is up to the local authority having jurisdiction—in this case, the CBY. The assumption of including fire protection would add costs due to the need for larger pipes and for fire hydrants.

International Fire Code section 507.2 and Appendix C provide guidance for spacing of fire hydrants depending on fire prevention needs. Specific placement of hydrants and the number required would need to be confirmed by the CBY Fire Chief during design. It is assumed that hydrants would be placed at approximately 600-foot intervals, which mirrors the current system design. A map of the proposed alignment of the water system extension is provided on Figure 2.

A similar expansion of the water system to the airport and surrounding area was proposed in the 2017 PER and put forth to the engineering division of the Alaska Native Tribal Health Consortium (ANTHC) for possible funding. ANTHC priorities include providing water service to homes versus businesses, so the recommended alternative was not funded in the current cycle. The proposed PER water line project would consist of approximately 5.5 miles of piping and would connect all homes and businesses near the airport to the CBY water system. There is the possibility of a partnership to streamline the project process and funding with the various stakeholders. Currently, ANTHC is managing projects in CBY concerning the sewer system, wastewater treatment system, and water treatment facility.

Advantages

The two community water wells serving the CBY water system are located a considerable distance from the presumed source of PFAS (the airport). Therefore, the community wells should provide clean water to the properties under consideration in this study. Owners and users of the facilities on the affected properties would benefit from the reliability and safety of a managed, treated, and regulated public water system.

While initial construction of the water main and service lines would provide water service only to the two affected properties shown on Figure 3, this alternative would allow for possible future expansion to serve other properties in the vicinity of the airport and along the water main route. Should properties with moderate levels of PFAS continue to see increasing levels of PFAS, or should new properties develop PFAS levels above applicable standard, this alternative would allow the future construction of additional service connections to provide CBY water.

Installation of the water main and associated fire hydrants near the airport would allow improved fire service to the area. A hydraulic analysis of the entire water system would be necessary to accurately estimate the available fire flow and the increase in firefighting capacity at the airport.

A partnership with ANTHC to fund this alternative would allow for additional funding from multiple sources and would reduce the overall cost to each funding entity. In addition, ANTHC has extensive experience with construction in Yakutat, including some equipment presently on-

site for other projects. Telephone conversations with Kevin Ulrich, the ANTHC engineer in charge of projects for the Yakutat area, indicated interest in a partnership..

Annual operations and maintenance costs of this alternative would be relatively low and could be managed by the CBY. Fire hydrants and valves would need to be inspected and tested routinely, but little additional maintenance would be necessary.

Disadvantages and Challenges

Alternative 1 would have a large initial capital cost compared to other alternatives. The cost per connection would be high if service was provided only to properties with tested PFAS levels above 70 ppt. There are several other properties along the proposed route that could feasibly connect to a new water main and benefit from piped water service. Even if all potential water service customers were to connect, the cost per connection would still be higher than other alternatives.

The long length of larger-diameter pipe in this alternative would result in high water age at the end points of the system. High water age can result in water quality issues. Several methods to decrease water age include line flushing and water distribution pipe looping. These water age mitigation methods were not considered in development of the OPPC below. However, water quality and potential high water age should be considered during project design.

Opinion of Probable Project Cost

The OPPC for this alternative outlined in Table 2 was based on cost estimates of similar water lines proposed to ANTHC and in the Yakutat Water and Sewer PER. The OPPC does not separately enumerate the costs of mobilization and demobilization, basic re-vegetation, and other civil work; these costs are included within the unit cost of the water mains.

Table 2: Opinion of Probable Project Cost – Alternative 1

Item	Quantity	Units	Unit Cost	Cost
8" Water Main	18,000	LF	$175	$3,150,000
Fire Hydrant	30	EACH	$16,000	$480,000
Booster Station	1	EACH	$200,000	$200,000
Service Connection	2	EACH	$10,000	$20,000
Well Decommissioning	2	EACH	$5,000	$10,000
	Subtotal			**$3,850,000**
	Contingency (35%)			$1,347,500
	Engineering and Construction Management (25%)			$962,500
	Administration and Legal (5%)			$192,500
	Total			**$6,352,500**

Alternative 2: Small-Scale Water Distribution System

This alternative would connect both buildings to share a nearby water well.

Alternative 2 was developed assuming the installation of 2-inch service connection lines for water distribution rather than the 8-inch water mains required for Alternative 1. As it would not be necessary to install fire hydrants in a smaller water distribution system, and the total length of pipe would be shorter, the larger water mains would not be necessary.

Design Summary

In this alternative, both the lodge and restaurant would be connected to the well located at the DOT&PF Shop and Aircraft Rescue and Firefighting facility. This well tested under the advisory level for PFAS contamination. In order to create a small-scale distribution system utilizing this well, approximately 820 linear feet of water supply pipe would need to be installed. Installation of the water pipe would occur within the road right-of-way. The existing wells serving the two properties would be decommissioned per the guidelines in 18 AAC 80.015(e). A map of a proposed alignment is shown on Figure 3.

Due to the estimated water use, the number of rooms at the lodge, and the number of patrons at the restaurant, this water system would likely be classified as a transient non-community water system. This designation necessitates a public water system review and approval from the ADEC as well as regular water quality testing.

The option of utilizing a newly drilled well was considered as part of this alternative. However, there is significant uncertainty of where a PFAS plume may be located. Without significant groundwater modeling and more well testing, it is possible that a new well could be drilled only to have it be contaminated with PFAS. The uncertainty of the location of the PFAS plume discourages the option of drilling a new well unless there are areas that are relatively certain to be free of contamination.

Advantages

Alternative 2 would provide a water source that is maintained by the DOT&PF and could be monitored by the State of Alaska for PFAS levels. A small-scale water distribution system would have low initial capital costs compared to a municipal water system expansion and other alternatives.

Disadvantages and Potential Challenges

There are several potential challenges with developing a small-scale distribution system. The following sections briefly discuss each of these challenges.

SYSTEM MANAGEMENT

Depending on the water use and population served, small-scale water distribution systems could be categorized as “community,” “transient non-community,” or “non-transient” water systems per ADEC guidelines (18 Alaska Administrative Code 80). Water systems that provide water to at least 25 people or 15 residences for more than 60 days per year must have a state public water system classification. In addition to water supply regulations, a legal framework would need to be developed in order to direct the responsibilities of ownership and maintenance

of the water supply and water distribution network. One option includes a small utility managed by DOT&PF as the owner of the water system. Other management schemes could also be available, but the analyis of the process to establish these are outside the scope of this memorandum.

WELL PFAS STATUS

The selected well had detectable levels of PFAS, but tested below the PFAS action level. Without additional groundwater or contaminant modeling, there is no definitive way of determining the extent of possible future contamination issues. Therefore, it is impossible to predict if the selected well would remain below the PFAS action level.

EXISTING WELL DEVELOPMENT

As there is limited information on the yield of the selected well, a well flow test must be performed in order to determine if the existing well has a sufficient supply and recovery rate for the additional buildings that would be connected. The installation of a new, higher-capacity well pump or a water storage tank may be necessary if the well recovery rate is sufficient, but the existing well pump is inadequate to provide the necessary flow or pressure to the system.

Opinion of Probable Project Cost

Table 3 presents an OPPC for the proposed alignment. Well rehabilitation and new well pump installation was assumed to be necessary. The final cost could be lower if the existing well is found to be adequate and only a limited amount of rehabilitation work is necessary.

The OPPC does not enumerate costs such as mobilization and demobilization, which can be quite high in rural areas. Instead, these costs are included within the unit cost of the water distribution lines. If extensive site work is necessary, extra costs would be incurred.

Table 3: Opinion of Probable Project Cost – Alternative 2

Item	Quantity	Units	Unit Cost	Cost
2" Water Distribution Line	820	LF	$150	$123,000
Service Connection Plumbing	2	EACH	$7,500	$15,000
Well Rehab, Pump Installation, Certification	1	EACH	$25,000	$25,000
Well Decommissioning	2	EACH	$5,000	$10,000
Utility Formation and Easement Acquisition	1	LS	$10,000	$10,000
	Subtotal			**$183,000**
	Contingency (35%)			$64,050
	Engineering and Construction Management (25%)			$45,750
	Administration and Legal (5%)			$9,150
	Total			**$301,950**

Opinion of Probable Operations and Maintenance Costs

In order to fully capture the estimated costs of the small-scale water distribution system, operations and maintenance (O&M) costs were estimated. Items included in the rough opinion of probable O&M cost are additional pump electrical costs; employee time for administrative,

testing, and maintenance work; water testing costs; and other costs for items such as repairs, insurance, and general overhead.

PUMP ELECTRICAL COSTS

Electricity costs approximately $0.42 per kilowatt hour for small commercial customers, according to Alaska Village Electric Cooperative publications. While pump selection and anticipated water flow would affect the total power demand by the well supply pump, an estimate of $60 per month was calculated.

ADMINISTRATION/MAINTENANCE EMPLOYEE COSTS

In order to manage billing, utility payment, and utility management; perform required water quality testing; and make any repairs or maintenance necessary to the systems, a part-time employee would be necessary. It was estimated that this work would average 4 hours every 2 weeks. Including a multiplier for overhead and benefit costs, at a wage of $25/hour, the employee would cost approximately $400 per month.

WATER TESTING

All registered water supply systems are required to go through regular water testing. Monthly tests for coliform are generally required, along with lead and copper testing and other tests at longer intervals. In addition, regular PFAS testing is recommended to monitor the levels of contamination in the supply well. These costs were estimated to be $400 per month.

OVERHEAD

Other overhead costs such as parts for repairs and maintenance, and insurance were bundled and estimated at $200 per month (see Table 4).

Table 4: Opinion of Probable O&M Costs – Alternative 2

Item	Cost
Pump Electrical Costs	$60
Administration/Maintenance	$400
Testing (ADEC Required & PFAS)	$400
Other Overhead Costs (Insurance, Repairs, etc.)	$200
Total per month	$1,060

Alternative 3: Water Delivery and Storage

This alternative would develop on-site water storage at each affected property in order to receive scheduled water delivery from the City of Yakutat.

Design Summary

Alternative 3 was developed assuming the installation of a high-density polyethylene (HDPE) water storage tank sized to accommodate 1 week of estimated demand plus a 50 percent buffer. Water delivery would be scheduled either weekly or as needed, depending on the season. Tanks would be connected to the affected buildings with 2-inch supply lines with pumps to supply pressure to the buildings. The existing wells serving the properties would be decommissioned per the guidelines in 18 AAC 80.015(e).

Tanks could be installed either underground or in an above-ground shed. Each option has both advantages and disadvantages. Above-ground installation within a shed provides easy access to the tanks to perform inspections and to visually monitor water levels. However, the shed that houses these tanks would take up significant space on the property. Underground installations do not take up above-ground space on the property, but would require a small, separate heated space to house the well pumps. Underground tanks would likely need to be anchored due to high groundwater within the area. The analysis below assumes that underground tanks are installed at each affected property, although this assumption should be verified during the design phase.

Installation of a water storage tank for the restaurant would likely be located underneath the front parking lot area. Installation of a water storage tank for the lodge would likely be located behind the building near where the current well shed is located. A map of these proposed locations is provided on Figure 4.

Based on the estimated water usage, a 5,000-gallon underground tank would provide approximately 12 days of water demand at the restaurant at 416 gallons per day. A 10,000-gallon underground tank would provide approximately 10 days of water demand for the lodge at 935 gallons per day.

There is no truck in Yakutat certified for water delivery. There is currently a water truck owned by the Borough, although it is likely contaminated from prior usages and would not be approved for delivery of potable water. It is assumed that a new truck would need to be purchased. In addition, a new sanitary connection with backflow prevention that meets requirements of the ADEC would need to be installed in order to fill the water delivery truck.

Advantages

Alternative 3 would provide water from the same source as Alternative 1: Municipal Extension, without the capital expense of water mains. The source of water is far removed from the probable source of PFAS contamination, allowing for local control and delivery of clean, safe drinking water to the affected properties.

Compared to an extension of the City water system, this alternative has relatively low installation costs and low monthly operating costs beyond water delivery costs.

Disadvantages

Installation of an underground tank sized for these commercial operations would require significant space for excavation and installation. For example, a 10,000-gallon underground tank has a footprint that is approximately 30 feet long by 9 feet wide. Depending on the location of the tank, patrons to the restaurant or lodge may be affected during construction as well as during water deliveries. However, after completion of the underground installation, this alternative would typically not affect the users of either building.

Alternative 3 relies on reliable water delivery service from the CBY water system. Should the road be closed for some period of time or if water delivery vehicles were not available, the affected properties could run out of water or require drastic water conservation measures. Scheduled or unscheduled water delivery would be an additional management task for the property owners or operators, compared to the ease of using a well or city-supplied water.

The water delivery vehicle and the storage tanks would likely need to be sampled quarterly for coliform bacteria. This testing cost, in addition to the large ongoing expense of operating a water delivery vehicle, would result in relatively high O&M costs compared to the other alternatives.

Opinion of Probable Project Cost

Table 5 presents the OPPC for Alternative 3, the proposed installation of water storage tanks at each affected property. See Figure 4 for a possible location of the water storage tanks and installed piping. Values shown do not enumerate costs such as mobilization and demobilization, which can be quite high in rural areas. Instead, these costs are included within the unit cost of the water tank installation.

Table 5: Opinion of Probable Project Cost – Alternative 3

Item	Quantity	Units	Unit Cost	Cost
10,000-gallon HDPE Tank with Shipping	1	EACH	$34,750	$34,750
Excavation (10,000-gallon Tank)	200	CY	$80	$16,000
5,000-gallon HDPE Tank with Shipping	1	EACH	$25,000	$25,000
Excavation (5,000-gallon Tank)	100	CY	$80	$8,000
Plumbing/Installation	2	EACH	$20,000	$40,000
Water Delivery Vehicle	1	EACH	$100,000	$100,000
Delivery Truck Connection	1	EACH	$15,000	$15,000
Well Decommissioning	2	EACH	$5,000	$10,000
	Subtotal			**$248,750**
	Contingency (35%)			$87,063
	Engineering and Construction Management (25%)			$62,188
	Administration and Legal (5%)			$12,438
	Total			**$410,438**

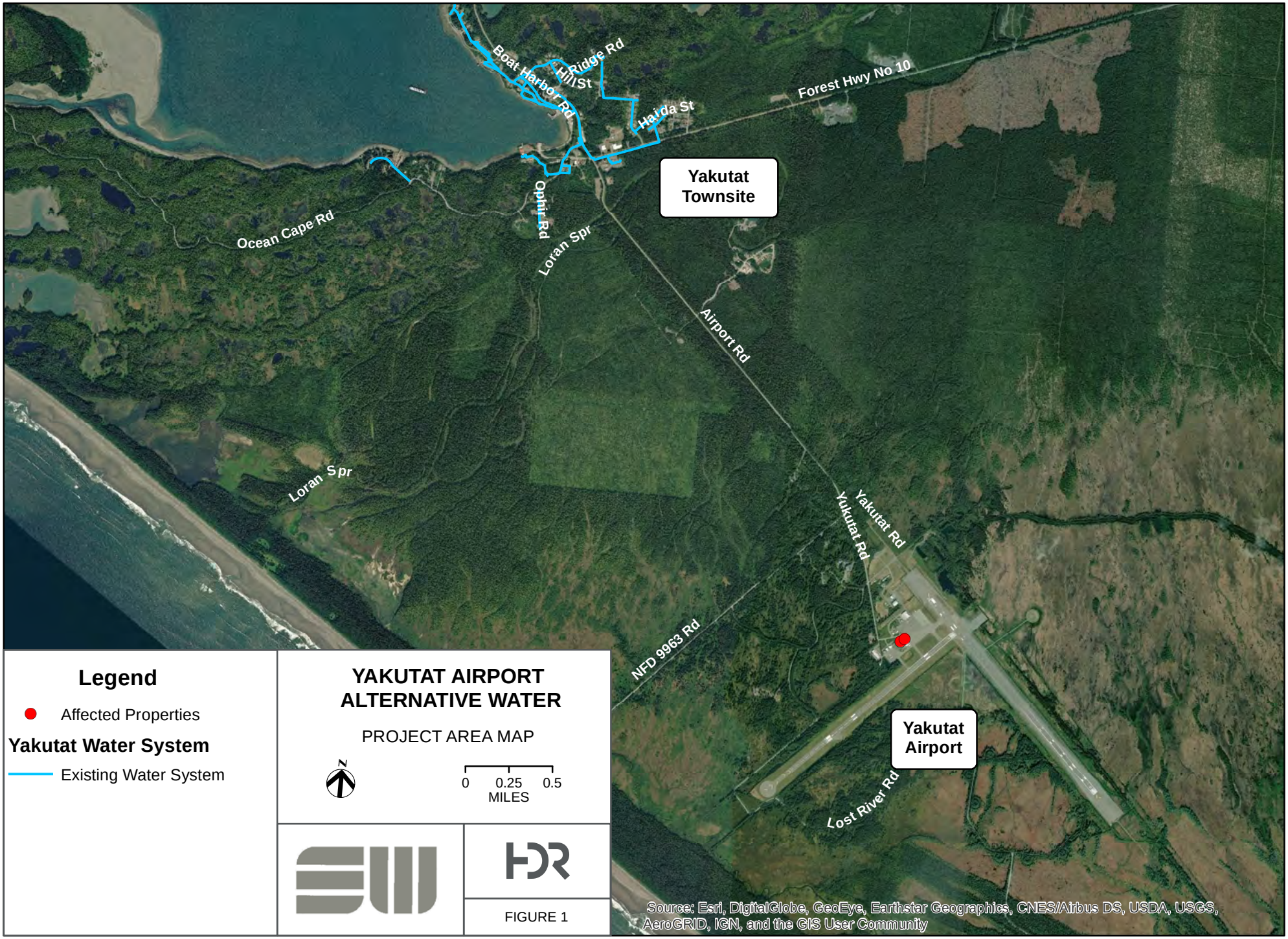
Opinion of Probable Operation and Maintenance Costs

As water must be delivered to the affected properties on a regular basis, there would be an ongoing operation cost higher than the present operational costs of the private wells. O&M costs

analyzed for this alternative included labor for an operator of the vehicle and in charge of maintenance of the installed systems, depreciation of the water delivery vehicle, O&M costs of the vehicle, and some amount for water testing (see Table 6). It was assumed that a 0.25 full time equivalent (FTE) employee would be required. Straight-line depreciation was calculated on the $100,000 truck value over 15 years, with $10,000 salvage value. O&M costs of the vehicle were assumed to be $40 per hour of operation with 15 hours per month of operation. Water testing was assumed to be less than that of Alternative 2 because regular PFAS testing of the water source would not be required.

Table 6: Opinion of Probable O&M Costs – Alternative 3

Item	Cost
Labor (0.25 FTE)	$2,000
Vehicle Depreciation	$500
Maintenance & Operations	$600
Water Testing	$120
Total per month	$3,220



Legend

- Affected Properties

Yakutat Water System

- Existing Water System

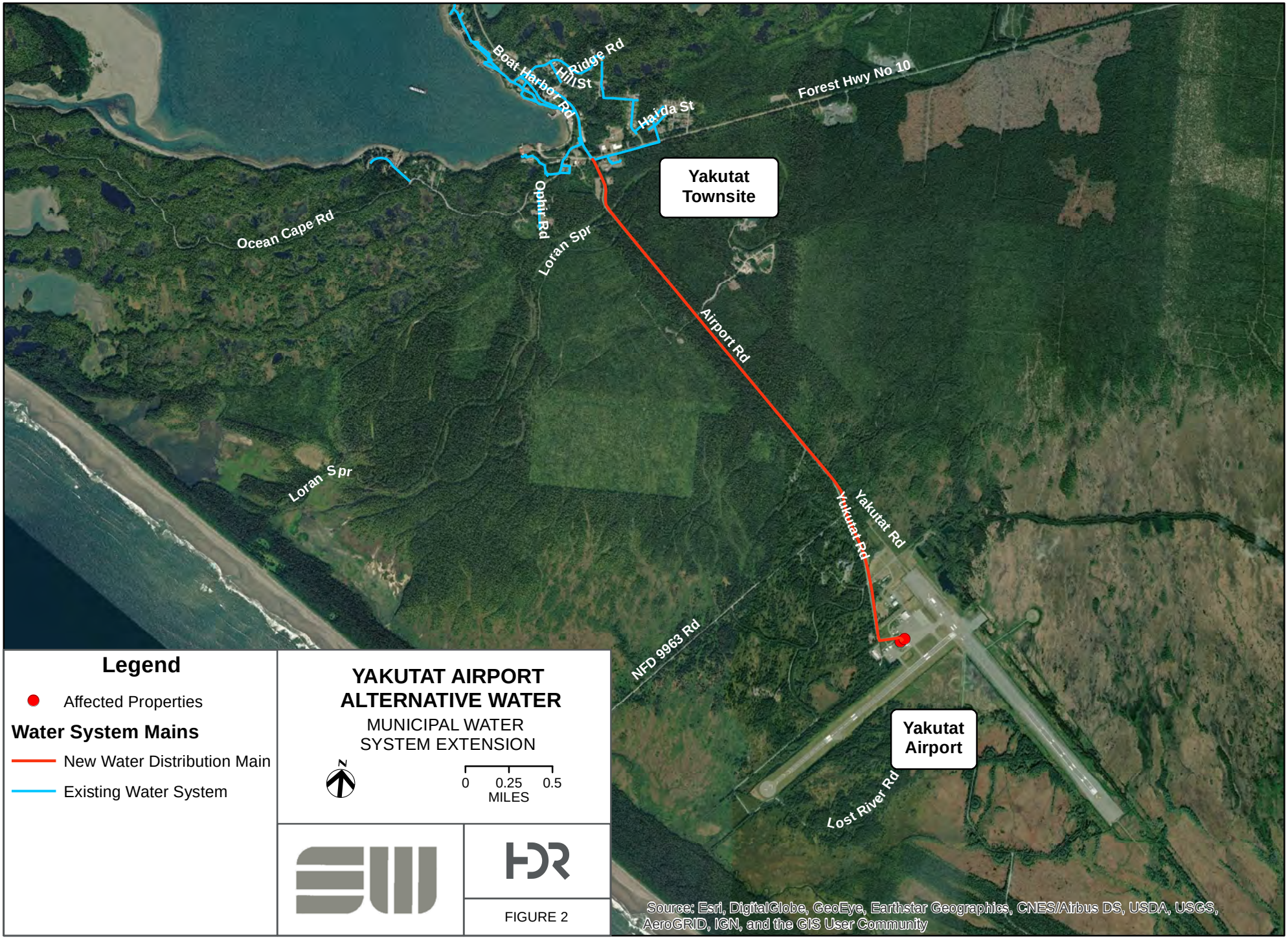
YAKUTAT AIRPORT ALTERNATIVE WATER

PROJECT AREA MAP

N

0 0.25 0.5
MILES

FIGURE 1



Legend

- Affected Properties

Water System Mains

- New Water Distribution Main
- Existing Water System

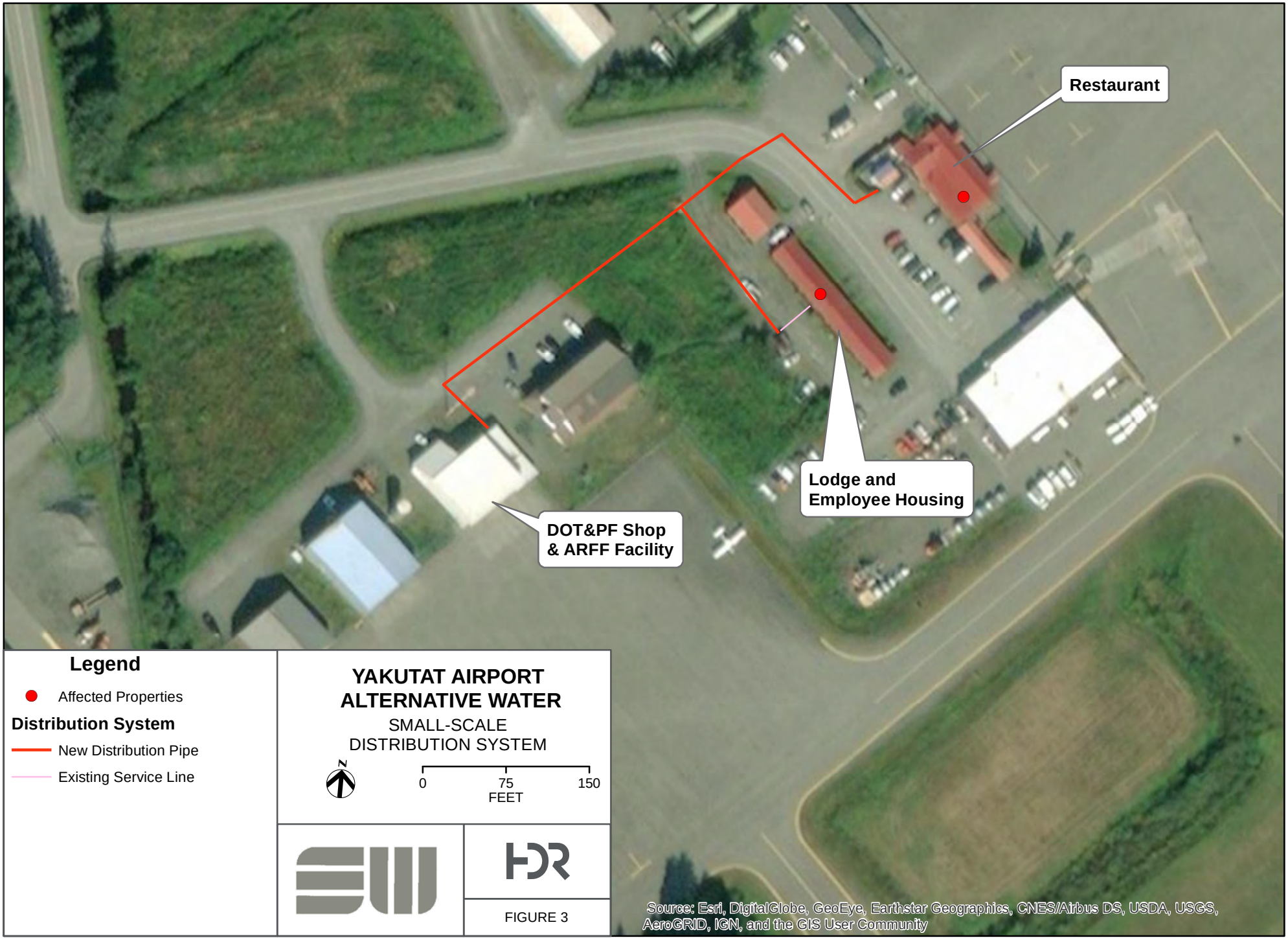
YAKUTAT AIRPORT ALTERNATIVE WATER

MUNICIPAL WATER SYSTEM EXTENSION

N

0 0.25 0.5
MILES

FIGURE 2


Restaurant
Lodge and
Employee Housing
DOT&PF Shop
& ARFF Facility
Legend
Affected Properties
Distribution System
New Distribution Pipe
Existing Service Line
YAKUTAT AIRPORT
ALTERNATIVE WATER
SMALL-SCALE
DISTRIBUTION SYSTEM
N
0
75
150
FEET
FIGURE 3
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Restaurant
Lodge and
Employee Housing
Legend
Affected Properties
Water Storage Systems
New Service Lines
Water Storage Tank Location
YAKUTAT AIRPORT
ALTERNATIVE WATER
WATER STORAGE
AND DELIVERY
N
0
75
150
FEET
FIGURE 4
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

APPENDIX B: BARR - POET FEASIBILITY REPORT AND SUPPORTING INFORMATION

Appendix B

Barr Engineering Co. Yakutat PFAS Point-of-Entry Treatment Feasibility Report and Supporting Information

CONTENTS

Enclosures

- Barr Engineering Co. Yakutat PFAS Point-of-Entry Treatment Feasibility Report
- PFAS Impacted Well Site Assessment Forms and notes for Well ID 33063 (Yakutat Lodge Employee and Guest Lodging) and 33066 (Yakutat Restaurant)
- SGS North America, Inc. (SGS) Lab Report 1204244_rev1 and Laboratory Data Review Checklist (LDRC)
- Water Supply Well Sampling Logs

B.1 ANALYTICAL SAMPLING

On August 13, 2020, S&W field staff collected groundwater samples from two impacted water supply wells (Well IDs 33063 and 33066) to inform Barr's treatment recommendations. Copies of completed Residential Well Sampling Logs are enclosed. The analytical water samples were submitted for determination of total suspended solids, metals, petroleum compounds, pH, organic carbon, and PFAS by SGS North America, Inc. Arsenite, arsenate, dimethylarsinic acid, and monomethylarsonic acid analysis was subcontracted by SGS North America, Inc Brooks Applied Labs. An analytical results summary table is included within Barr's report.

S&W reviewed the analytical results for laboratory quality control samples and conducted a quality assurance (QA) assessment for this project. These QA review procedures allowed S&W to document the accuracy and precision of the analytical data, as well as check the analyses were sufficiently sensitive to detect analytes at levels below regulatory standards. The results are presented in the appended SGS North America, Inc. report 1204244_rev1 and associated DEC LDRC.

S&W considers the samples collected for this project to be representative of site conditions at the locations and times they were obtained. Based on this QA review, no samples were rejected as unusable due to quality control failures. In general, the quality of the analytical data for this project does not appear to have been compromised by analytical irregularities and is adequate for the purposes of this assessment.

APPENDIX B: BARR - POET FEASIBILITY REPORT AND SUPPORTING INFORMATION

BARR'S POINT-OF-ENTRY TREATMENT FEASIBILITY REPORT

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FINAL

Technical Memorandum

To: Ashley Jaramillo (Shannon and Wilson, Inc.)
From: Andy McCabe, Bryan Oakley, and Brian Angerman, Barr Engineering Co. (Barr Engineering, Co.)
Subject: Yakutat PFAS Point-of-Entry Treatment Feasibility Report
Date: February 5, 2020
Project: Shannon & Wilson, Inc., Yakutat Alternative Water Supply
c: Kristen Freiburger (Shannon and Wilson, Inc.)

1.0 Introduction and Background

On behalf of the Alaska Department of Transportation and Public Facilities (DOT&PF), Shannon & Wilson, Inc. (S&W) conducted a water supply well search on and downgradient of the Yakutat Airport property beginning in June 2019 to collect samples for per- and polyfluoroalkyl substances (PFAS). To date, Shannon & Wilson has sampled 21 water supply wells, the majority of which are drinking-water wells. The water supply well search and initial sampling effort occurred primarily in June 2019. Resampling of select wells occurred in December 2019, August 2020, December 2020, and is ongoing.

On April 9, 2019, the Alaska Department of Environmental Conservation (DEC) action level for drinking water was aligned with the U.S. Environmental Protection Agency (EPA) lifetime health advisory (LHA) level of 70 parts per trillion (ppt) for the sum of two PFAS compounds, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). Prior to April 2019, the DEC action level was 70 ppt for the sum of five PFAS compounds: PFOS, PFOA, perfluoroheptanoic acid (PFHpA), perflurohexanesulfonic acid (PFHxS), and perfluorononanoic acid (PFNA). For this feasibility report, the U.S. EPA LHA is considered a treatment requirement, and the prior DEC action level for the sum of five PFAS is retained as a treatment goal.

S&W partnered with Barr Engineering Co. (Barr) to evaluate feasibility of point-of-entry treatment (POET) systems for PFAS at the impacted properties near Yakutat airport. This memorandum includes recommendations for PFAS water treatment systems along with related pre- and post-treatment recommendations for the Yakutat Lodge employee and guest housing ([Lodge], property ID 33063) and Yakutat Lodge Restaurant ([Restaurant], property ID 33066) located immediately south of the Yakutat Airport.

This technical memorandum includes five subsequent sections:

- Section 2.0 – Site Assessment Summary
- Section 3.0 – Water Treatment Design Basis
- Section 4.0 – Water Treatment Process Design
- Section 5.0 – Project Cost Estimates

- Section 6.0 – Project Implementation

Attachments included:

- Attachment 1 – PFAS Impacted Well Site Assessment Forms
- Attachment 2 – Water Chemistry Data Table
- Attachment 3 – Peak Water Demand Estimates
- Attachment 4 – Process Flow Diagrams
- Attachment 5 – Cost Estimate Details

2.0 Site Assessment Summary

On August 13, 2020, a representative from S&W visited the Lodge and Restaurant to collect details on current water use, available space for water treatment equipment, and, if present, existing water treatment systems. Water samples were collected to assess the water quality at the site to inform primary and secondary treatment requirements. The complete site visit assessment reports are provided in Attachment 1.

The Lodge and the Restaurant each have one well that uses a shallow well jet pump. The well at the Lodge is located in an insulated outbuilding and the well for the Restaurant is located indoors. Daily water use estimates based on the site visits are summarized in Table 1. Average water usage logs were not available for either property. Water usage varies seasonally (higher demand during summer) at both properties, but some water use occurs year round. The Restaurant is open April through October, but the well is on year-round.

Table 1 Summary of site occupancy and estimated daily water use

Property ID Number	Property Description	Number of People	Est. Daily Water Use (gpd)
33063	Lodge	• Guest housing (maximum 16 people) • Employee housing (3 people)	800 (peak) 310 (off-season)
33066	Restaurant	56 seats	1,200 (peak, assuming 150 people served daily) 400 (off-season, assuming 50 people served daily)

Water pressure-related concerns were noted at the Restaurant and intermittently at the Lodge (related to fouling of sediment filters). The water pressure recorded during the site assessment at the tap closet to the well at the Lodge was 60 pounds per square inch (PSI) and 42 PSI at the Restaurant. Iron staining on plumbing fixtures was noted at both properties and a sulfur odor was noted in the Restaurant.

The Lodge currently has one sediment and two carbon cartridge filters (5 micron and coconut carbon, respectively; intended for taste, odor, and fine sediment removal). The Restaurant has one sediment filter, one carbon filter, and a single-use, salt-free water conditioner.

3.0 Water Treatment Design Basis

3.1 Treatment Requirements

The minimum primary treatment requirements for the water treatment systems include:

- <70 nanograms per liter (ng/L) PFOS and PFOA (EPA LHA and DEC action level as of April 2019)

In addition to the treatment requirements, treatment goals for the water treatment systems include:

- <10 micrograms per liter (µg/L) arsenic (National Primary Drinking Water Regulation [NPDWR] Maximum Contaminant Level [MCL])
- <70 ng/L sum of five PFAS: PFOA, PFOS, PFHpA, PFNA, and PFHxS (DEC action level prior to April 2019)

Secondary treatment goals for the water treatment systems include:

- <300 µg/L iron (National Secondary Drinking Water Regulation [NSDWR] Secondary Maximum Contaminant Level [SMCL] and protective of the PFAS water treatment process to prevent iron fouling)
- <50 µg/L manganese (NSDWR SMCL and protective of the PFAS water treatment process to prevent manganese fouling)

3.2 Water Quality

Water chemistry parameters are summarized in Table 3 (complete water chemistry data are provided in Attachment 2).

Table 2 Summary of water chemistry parameters

Parameter	units	Treatment goals	Lodge 33063	Restaurant 33066
General Parameters				
pH	pH units	N/A	7.8	7.7
Conductivity	µmhos/cm	N/A	306	349
Hardness, as $CaCO_3$	mg/L	N/A	142	178
Organic carbon, total	mg/L	N/A	1.20	1.54
Solids, total dissolved	mg/L	N/A	181	204
Solids, total suspended	mg/L	N/A	<0.31	1.52
Metals				
Iron, total	µg/L	300	<780	721
Manganese, total	µg/L	50	105	144
Arsenite(III), dissolved	µg/L	10	4.05	5.98
Arsenate(V), dissolved	µg/L		0.246	0.665

Based on the August 2020 sampling results, arsenic concentration at both properties do not exceed the primary arsenic treatment goal and arsenic treatment is not required for either property.

The iron concentration at the Restaurant exceeds the secondary treatment goal. Elevated detection limits in the sample for the Lodge precluded analysis of iron down to the concentration level of the secondary treatment goal. Due to proximity of these two wells, it is assumed that iron exceeds the secondary treatment goal at the Lodge. Manganese concentrations at both properties exceed the secondary treatment goal for manganese. Thus, iron and manganese pretreatment is required at both properties to meet secondary treatment targets and to be protective of PFAS treatment media.

PFAS data for both properties are summarized in Table 3. Complete PFAS sample results are provided in Attachment 2.

Table 3 Summary of PFAS concentrations

Parameter	units	Treatment goals	Lodge 33063	Restaurant 33066
PFOA	ng/L	N/A	4.7 J	5.8 J
PFOS	ng/L	N/A	39.3	88.6
PFHpA	ng/L	N/A	2.7 J	2.9 J
PFNA	ng/L	N/A	< 4.2	< 4.2
PFHxS	ng/L	N/A	23.5	42.1
LHA(1) Combined (PFOS + PFOA)	ng/L	70	44.0	**94.4**
Sum of Five Combined PFAS(2)	ng/L	70	**70.2**(3)	**139.4**(3)

ng/L - nanograms per liter.
J - Estimated concentration, detected greater than the MDL and less than the reporting limit (RL). Flag applied by the laboratory.
(1) EPA's LHA level is 70 ppt for PFOS and PFOA combined. **Bold** values indicate combined values that are above the LHA level.
(2) The combined sum of five PFAS include: PFOA, PFOS, PFHpA, PFNA, and PFHxS. **Bold** values indicate concentrations above the treatment goal.
(3) Minimum concentration, the LHA combined or sum of five combined PFAS action level concentration includes one or more results that is not detected greater than the MDL.

Based on the August 2020 data, PFAS concentrations at the Restaurant exceed both the LHA combined (PFOS and PFOA) treatment requirement and the sum of five combined PFAS (PFOA, PFOS, PFHpA, PFNA, and PFHxS) treatment goal. PFAS concentrations at the Lodge exceed the sum of five combined PFAS treatment goal, but not the LHA combined treatment requirement.

If water treatment is selected for these two properties, samples should be collected prior to final design to confirm treatment requirements.

3.3 Peak Water Demand

This section outlines methods used to estimate peak water demands. These estimates are used to size equipment needed for the POET systems. Design flow rates are selected based on the nearest 8 gpm increment, which is constrained by the size and target empty bed contact time (EBCT) of the granular activated carbon (GAC) vessels for typical residential PFAS treatment (discuss further in Section 4.1).

Flow monitoring data were not available for either property. For this feasibility report, peak water demand was estimated in three ways:

1. Service flow capacity of the well pumps (which estimates the maximum achievable flow),
2. Commercial and/or residential category of the property, and
3. Fixture counts.

Peak demand estimates for the second and third methods were made following guidance provided in DEC's document of best management practice recommendations for private water systems[1] (see Appendix A, Tables 2 through 4 in the cited reference; Table 2 of this reference is consistent with the Uniform Plumbing Code fixture count method).

The make, model, and service flow capacities of the pumps are summarized in Table 4.

Table 4 Well pump capacity estimates

Property	Pump Make	Pump Model	Service Flow(1,2)
Lodge 33063	Everbilt	J200A3	9 gpm (0 ft well at 40 PSI backpressure) 6 gpm (25 ft well at 40 PSI backpressure
Restaurant 33066	F&W	CPJ105S	14.8 gpm (5 ft well at 40 PSI backpressure) 12.2 gpm (15 ft well and 40 PSI backpressure)

(1) Based on available pump information from manufacturer websites.

(2) Depths of the wells were not available, so a range of service flow rates are provided.

Peak demand estimates based on the property category and fixture counts are provided in Table 5 and additional details are provided in Attachment 3. The categorization of the properties and fixture counts were completed based on information from the site assessments. A detailed fixture count was not available. The peak demand estimates presented may be refined if additional information is gathered at a later stage of design, either with detailed fixture counts, flow monitoring, or pumping tests.

Table 5 Peak water demand estimates

Property	Property Category Peak Demand Estimate (gpm)	Fixture Count Peak Demand Estimate (gpm)
Lodge 33063	24	32
Restaurant 33066	56	13

Both peak demand estimates in Table 5 for the Lodge are higher than the service flow capacity of the well pump. Only intermittent pressure-related issues were noted at this property and reportedly could be alleviated with filter exchanges. Capacity issues were not noted. It is assumed that the current pump capacity for the Lodge is adequate to meet the peak demand. Thus, the design flow for the Lodge is expected to be within the service flow range of the current pump (6-9 gpm). While the depth of the well

[1] State of Alaska, Department of Environmental Conservation, Drinking Water Program. Best Management Practices for Private Drinking Water Systems. 2017.

drawdown is not known, it is assumed to be within 5-15 ft of the ground surface. Thus, linearly interpolating between the flow data available from the manufacturer (refer to 7), the system is expected to have peak demand of 7.2-8.4 gpm.

The peak demand estimate for the Restaurant based fixture counts falls within the expected range of service flow rate of the pump. In contrast, the peak demand based on the property category is four times higher than the fixture count peak demand estimate and the service flow capacity of the pump. It is assumed that the peak demand of the Restaurant is lower than the water use of a categorical Restaurant (1 gpm per seat), which may be more applicable to a Restaurant in an urban setting. Thus, the Restaurant is expected to have a peak water demand of 12.2-14.8 gpm.

3.4 Available Space and System Siting

Based on the site assessment, the preferred location of the treatment system at the Lodge is in an outbuilding. The existing well house does not appear to be reusable due to poor condition of building materials and is assumed to require replacement. A replacement well-house could either be an insulated Conex box or constructed outbuilding. For this evaluation, a system constructed off site and transported to the site is assumed. The preferred location of the treatment system at the Restaurant is indoors, near the well and existing treatment equipment.

Existing infrastructure, including piping and appurtenances, will need to be evaluated prior to selection of a treatment system location. A general arrangement CAD drawing will be prepared to evaluate space and equipment clearances once treatment system sizing and process flow has been finalized.

The estimated treatment system footprint for both properties and space availability for the Lodge are summarized below in Table 7. Space availability and system locations will be confirmed once designs have been finalized.

It is assumed that existing filters and water softeners will be replaced and unused water treatment equipment will be removed. Existing well pumps, bladder pressure tanks, and appliances (e.g., water heaters) will be evaluated and will remain in service if found to be in good repair. This evaluation assumes this equipment can be salvaged and reused in the new system. Existing space configuration, access, and other limitations may affect the actual space required for treatment systems. To size the footprint of the required treatment systems, it is assumed that PFAS treatment vessels, softening vessels, and salt tanks will each require approximately 4 square feet (refer to Section 4.1 for treatment equipment recommendations). Other treatment equipment, such as particulate filters and UV units, can be wall mounted, and do not require significant floor space. To allow sufficient space for working areas, process piping, and valves, the total space for the vessels and softening equipment is doubled.

Table 6 Treatment system space requirements

Property	Approximate Space Available	Approximate Treatment System Requirements (sq ft)
Lodge 33063	To be located in outbuilding or Conex box	32
Restaurant 33066	16(1)	48

(1) Constrained by doorway/walkway, well pump, and hot water heater. Total area of existing room with well pump, filtration equipment, and water heater is 45 square feet.

Based on the high level review of treatment system sizing and space availability inside the Restaurant, there does not appear to be sufficient, existing indoor space for the treatment system as sized. However, the existing room with the well pump is 45 square feet, so it may be possible to reorganize the space to fit the majority of the recommended treatment equipment. Some equipment may need to be sited outside the existing room. This may be a viable option if it does not interfere with other functions. If additional space is not available, the proposed equipment can be furnished in a Conex box.

4.0 Water Treatment Process design

4.1 Unit Process Descriptions

The treatment systems installed at these properties will be on-demand, POET systems. Water will be pumped through iron and manganese pretreatment, particulate filtration, GAC vessels in a lead/lag configuration, and UV disinfection. The water treatment system will include flow meters and flow restrictors as necessary. A diverter line post-GAC will be included to allow forward flow during low-flow periods. A treatment bypass will also be included in the Restaurant for the fire suppression system. General process flow diagrams for the proposed water treatment systems are included in Attachment 4. Due to uncertainty associated with performance and to ensure adequate pretreatment for PFAS removal, existing water softening and filtration systems will be removed and replaced.

4.1.1 Pretreatment – Iron Removal and Particulate Filtration

GAC is susceptible to iron and manganese fouling causing less effective PFAS treatment when concentrations are greater than approximately 1,000 µg/L (1.0 mg/L) total. At elevated concentrations, precipitate formation can foul GAC media and cause back pressure issues and physical blockage of GAC adsorption sites. Pretreatment should be considered when concentrations are greater than the SMCLs.

At concentrations lower than approximately 10,000 µg/L (10 mg/L) total iron and manganese, ion exchange water softening is commonly used in Alaska for iron and manganese removal. Based on the data collected in August 2020, both properties will require iron and manganese pretreatment.

The regeneration solution from the water softener systems will include PFAS at concentrations similar to the influent. DEC has previously allowed regeneration flows to be discharged to onsite septic systems without PFAS treatment if they support operation of a PFAS removal system. The existing septic systems should be evaluated for capacity to handle the regeneration solution flow. For the softener at the Lodge, it is estimated that the unit would need to regenerate every 4 to 5 days and use approximately 40 gallons of water per regeneration. For the softener at the Restaurant, it is estimated that the unit would need to regenerate every 5 to 6 days and use approximately 110 gallons of water per regeneration. These estimates are based on maximum daily water use estimates in Table 1, hardness concentrations in Table 2, and information about the hardness bed capacities and regeneration water volumes provided by the equipment vendor. The regenerant would be approximately 1.5 to 2% of the treated water volume at peak use.

Particulate filtration is recommended ahead of iron and manganese pretreatment to remove large particles that could impact the softening system and downstream GAC vessels. Particulates can cause physical blockage of GAC adsorption sites and fill pore space in the GAC vessels that could cause an increase in vessel backpressure and reduce PFAS removal efficiency. Ten (10)-micron filtration is recommended. Particulate filtration will consist of cartridge filters. Each filter housing will include a pressure gauge for pressure monitoring to inform filter change-out.

4.1.2 PFAS Treatment

The recommended technology for PFAS water treatment is GAC media adsorption. This is considered one of the best available technologies for PFAS water treatment and is the most mature of the PFAS water treatment technologies. PFAS adsorbs to GAC when an adequate EBCT is provided. EBCT is a measure of the approximate time water is in contact with the GAC media inside an individual vessel.

PFAS treatment will consist of lead and lag GAC vessels with approximately 2 cubic feet of media in each vessel. An EBCT of 2 minutes for the lead vessel will be targeted, a total 4 minutes EBCT between the lead and lag vessels at a flow rate of 8 gpm. This EBCT has successfully demonstrated PFAS removal in POET systems and is approved by regulators at other residential and commercial applications in multiple states, including New York, Vermont, and Alaska.[2,3] While a 4-minute EBCT across each lead/lag vessel system (train) is maintained at up to the flow-restricted 8 gpm per train, the typical operational flow rate will be less than the flow-restricted amount resulting in longer EBCT.

[2] Example POET Operation, Maintenance and Monitoring (OM&M) for installations in Bennington, Vermont, approved by State of Vermont Department of Environmental Conservation: https://anrweb.vt.gov/PubDocs/DEC/PFOA/Corrective%20Action%20Plan%20OUB/Final-CAP-OUB-2018-0509.pdf

[3] Shannon & Wilson, Inc. and Barr Engineering Co. Gustavus Inn PFAS Water Treatment Action Plan. Submitted to Alaska Department of Environmental Conservation, February 2019.

12x40 reagglomerated, bituminous coal-based GAC is typically used in PFAS water treatment and is recommended for this application for use in both the lead and the lag vessel of each train. GAC will be NSF certified for drinking water use. Due to the remote nature of the site, using the same size and type of GAC vessel at both properties will make operations and maintenance more efficient.

Spent GAC requires offsite disposal by a regulated waste-disposal company. This service will be provided by the selected water treatment maintenance contractor under an operation and maintenance contract.

4.1.3 Post-treatment – UV Disinfection

UV disinfection is recommended as the final, post-PFAS-treatment step in order to inactivate any bacteria in the treated water prior to distribution and use. UV disinfection will consist of a single reactor for each property sized to meet the design flow rate.

4.2 Instrumentation and Controls

Instrumentation and controls for the water treatment systems consist of the following:

- Pressure gauges – one per well, one per particulate filtration housing, one per GAC vessel
- Treated effluent flow meter – displays instantaneous flow, records totalized flow
- Treated effluent flow restrictors – one per GAC train

Softening system will be programmed to regenerate periodically based on use. During low-flow periods, water will be automatically pumped through GAC filters to prevent water stagnation. Based on responses in the site assessments, water usage is seasonal at both properties, but some use is expected year-round. Because the preliminary design for the treatment system at the Restaurant includes two GAC trains, one of the two trains may be taken offline during the winter.

5.0 Project Cost Estimates

The estimated total capital costs and operations and maintenance (O&M) costs for each water treatment system are summarized in Table 10. For purposes of this feasibility report, costs are based on equipment from Arctic Home Living of Fairbanks, Alaska (AHL). AHL has experience installing similar treatment systems in Alaska and understands regional logistics necessary for equipment transport and maintenance. However, alternative equipment vendors could be selected at later stages of design.

O&M costs include:

- Annual replacement of GAC in the lead vessel of each train
- Quarterly sampling and analysis for PFAS
- Miscellaneous maintenance and equipment replacement (e.g., outbuilding, UV lamps)
- Salt usage
- Power

- O&M contractor labor
- Administrative labor

Detailed capital and O&M costs as well as assumptions are summarized in Attachment 5. An estimated cost for site preparation (grading, pad, electrical, drain hook-up) has been included for the treatment system located at the Lodge. However, this cost should be refined at a later stage of design. The cost to remove or modify existing building structures or water treatment equipment have not been included.

Table 7 Total capital cost and O&M cost estimates

Property	Capital Cost Estimate(1)	Est. Annual Maintenance Cost(2)
Lodge 33063	$ 68,100	$ 11,700
Restaurant 33066	$ 47,600	$ 14,200

ENRCCI = 11496 Jan 2020

(1) This is a Class 5 cost estimate with a +50/-30% uncertainty as applicable for projects at less than 2% of full project definition per AACE International 17R-97.

(2) O&M costs are based on a Class 5 capital cost estimate with a +50/-30% uncertainty as applicable for projects at less than 2% of full project definition per AACE International 17R-97. O&M Costs are also expected to have a +50/-30% uncertainty.

While this feasibility report attempted to capture the existing site conditions, the following items could result in increased O&M costs relative to those presented above:

- Additional water treatment equipment
- Additional parameters for sampling and analysis
- More frequent sampling requirements
- Higher PFAS loading to the system
- Faster PFAS breakthrough
- Higher water usage
- Higher iron loading

6.0 Project Implementation

6.1 Equipment Lead Times and Schedule

Based on quotes from AHL, equipment lead times for shipment to Yakutat from Anchorage are expected to be approximately 60 to 90 days from order submittal.

6.2 Permitting and Permissions

Installation and operation of the water treatment system will comply with applicable building codes. Permitting needs associated with the installation of a water treatment system for drinking water supply will be evaluated by S&W.

Any access agreements required for operations and maintenance and routine monitoring will be obtained by S&W ahead of water treatment system start-up.

6.3 Process Safety Overview

A process safety overview with property owners, managers, and/or residents will be completed after installation and before start-up of the water treatment systems. The objective of the process safety overview is for personnel involved in system use, operation, and monitoring to understand safety considerations associated with the water treatment equipment and associated chemicals. If any additional safety concerns are identified during the process safety overview, these will be addressed and mitigated prior to system start-up.

6.4 Pre-start-up Activities and Treatment Verification

The complete treatment system will be disinfected by the vendor after assembly and prior to delivery. All system components will be flushed with a chlorine solution, except the treatment media itself and the interior of some equipment once filled with media (e.g., softeners and GAC vessels).

During installation of the PFAS water treatment system, the well pump will be shut down for a short duration (anticipated to last less than 8 hours) while the new treatment system equipment is installed. Tap water for drinking water use or otherwise will not be available during this time.

GAC vessels will be filled with water from the onsite wells after system delivery and before installation, and a 24-hour GAC soak will start in order to hydrate the carbon and loosen fines. Following installation, the system will be backwashed at the design flow rate (8 gpm) for 15 minutes to remove fines. A 30-minute flush at the design flow rate will follow the soak in order to remove air and remaining fines from the GAC vessels after installation of the system. Flush water will be directed to an exterior drainage area and not to the septic system or municipal sewer. This procedure is subject to change based on vendor recommendations and site constraints.

Treated water samples will be collected for PFAS analytical evaluation after the 30-minute flush, before continuous operation and treated water distribution for drinking water purposes. A minimum of one confirmatory sample will be collected to demonstrate treatment system effectiveness. The treatment system can be used for non-drinking water uses until sample results are received confirming treatment goals are being achieved.

The water treatment maintenance contractor and the property owner will receive training by the water treatment system vendor within one week of treatment system pre-start-up activities and treatment verification, prior to continuous operation of the system.

6.5 System Start-up and Continuous Operation

After pre-start-up sample results are received and reviewed, if all treatment requirements outlined in Section 3.1 are met, continuous operation and monitoring will start. If the water treatment system was intentionally shut down after pre-start-up activities for more than 24-hours, treated water will be diverted to an exterior drainage area for approximately 30 minutes following start-up to adequately flush the system.

6.6 Operation, Monitoring, and Maintenance

An Owner's Manual with equipment information and troubleshooting guidance will be provided to the property owners prior to start-up of the water treatment system. The Owner's Manual will include directions to only use drinking water from taps that supply water treated through the system for PFAS removal.

Additionally, an O&M Manual will be prepared and provided to the selected water treatment maintenance contractor. The O&M Manual will cover start-up testing, routine monitoring (including sample collection), particulate filter replacement, GAC vessel change-out, and UV lamp cleaning and replacement.

Initially, quarterly monitoring of the water treatment system is recommended, which includes flow tracking, differential pressure monitoring, and analytical sampling locations. Monitoring will verify the system's efficacy and determine when the GAC vessels need to be replaced. Once a lead-vessel breakthrough curve has been established, the frequency of analytical sampling may be reduced.

Depending on solids loading, the particulate filters may require more frequent replacement than on a quarterly basis. This replacement can be done by property owners when the pressure drop across the filter exceeds the set-point discussed during training.

Depending rate of use, property owners may also be responsible for refilling the regeneration salt tank. Softening resin is expected to last 20-30 years and likely will not require replacement for the life of the POET system.

The frequency of GAC replacement will depend on water usage, PFAS loading, and the final operational set-points (e.g., differential pressure recommendations for particulate filters). If quarterly monitoring results indicate that the sum of five PFAS: PFOS, PFOA, PFHxS, PFNA, and PFHpA is >35 ng/L at the midpoint sample point (after the lead GAC vessels but prior to the lag GAC vessels), GAC vessel change-out will occur. GAC replacement will be scheduled to occur after quarterly monitoring results for the installed system have been received, but before the next quarterly sampling event. For this feasibility report, one GAC vessel replacement is assumed per year per train. However, GAC media may need to be replaced more frequently than on a yearly basis because short-chain PFAS, such as PFHxS and PFHpA, are present in the wells and may break through more quickly than long-chain PFAS, such as PFOA and PFOS.

Routine GAC vessel change-out will be conducted as follows:

- Remove the lead GAC vessel;
- Disconnect the lag GAC vessel and install in the lead position; and
- Install a replacement GAC vessel in the lag position.

The UV lamp will be replaced as indicated by the manufacturer's recommendation and anticipated to be on a 12-month basis. Cleaning of the UV quartz sleeve is dependent on water hardness. Cleaning should be conducted based on the manufacturer's recommendation, but at least on an annual basis.

6.7 Residuals Management

Water treatment residuals include the following:

- Water softener regeneration solution
- Spent particulate filters
- Spent GAC
- Spent UV disinfection lamps

This report assumes water softener regeneration solution and backwash can be discharged to the existing onsite septic system or municipal sewer. This will need to be confirmed with DEC.

Spent particulate filters should be collected for disposal in a waste container that will be emptied when the selected water treatment system maintenance contractor services the GAC vessels. The frequency of filter replacement will depend on the amount of sediment produced in the water supply well.

The selected water treatment maintenance contractor will facilitate spent GAC change-out. It is assumed that each property will have one vessel on standby for each train in the event that routine PFAS monitoring results indicates change-out is required. The selected vendor will collect individual vessels for servicing, which includes transport of vessels to and from the servicing location, removal of spent GAC from the vessels, rinsing and decontamination of empty vessels, and refilling virgin GAC into the vessels. The selected vendor will transport spent GAC along with the particulate filters to the nearest appropriate disposal facility that will accept PFAS-impacted GAC/materials.

Spent UV lamps will be handled per the manufacturers recommendations and will be managed by the selected water treatment maintenance contractor.

Attachments

Attachment 1 – PFAS Impacted Well Site Assessment Form
Attachment 2 – Water Chemistry Data Table
Attachment 3 – Peak Water Demand Estimates
Attachment 4 – Process Flow Diagrams
Attachment 5 – Cost Estimate Details

Attachment 1 – PFAS Impacted Well Site Assessment Forms

PFAS Impacted Well Site Assessment Form

Date/Time Range of Visit: 8/13/20

Employee(s): RLW

Property ID: 33063 Yakutat Lodge Guest + Employee Housing

CHECKLIST

INTERVIEW

- [x] Description of structure and well use: Well for Employee housing building (~3 people) + Guest housing (8 rooms / 2 people each)
- Permission to take photos? [ ] no [x] yes
- [x] Any concerns with existing pressure being too low? [x] no [ ] yes, when is it noticeable:
- [x] Other non-PFAS concerns with water (e.g., taste, odor, chemical)? [ ] no [x] yes, describe: Staining, not as bad as relevant
- [x] Is anyone tracking water usage? [x] no [ ] yes, estimate monthly water usage (gallons):
- [x] Preferred POET system location [ ] indoor [x] outdoor
- [x] Questions/concerns: Well house in bad shape. Maintenance staff is planning on re-doing structure. Carbon filters replaced every 2-3 weeks, or when pressure is bad

WATER USE

- [x]

No. of occupants:	max 16 * 3	Square footage:		No. of bathrooms:	9	No. of bedrooms:	13
Washer/Dryer (Y/N):	1	Dishwasher (Y/N):	—	No. of sinks:	9	Year built:	

- [x] High-use items (circle if apply): outdoor irrigation, fire-suppression system, radiant heat, etc. none
- [x] Is well use seasonal? Yes.

WATER QUALITY

- [x] Water softener present? [x] no [ ] yes, make/model: — serial number: — age: —
- [x] Existing totalizer flowmeter reading, if present (gal): n/a time of reading
- [x] Treatment equipment in place (e.g., iron filter, RO, ion exchange, alumina)? type: Sediment filters, 2 carbon filters make/model: iSpring CTO Carbon Filter serial number: Model FC25B (5 micron big blue)
- [x] Is there staining on fixtures that would indicate iron or manganese? [ ] no [x] yes, photo document (pg 2) not as bad as relevant

SKETCH EXISTING SYSTEM

- [x] Sketch existing system (e.g., P&ID) on pg. 2 (bladder tank, valves, treatment, pipe sizes, existing equipment to remain)
- [x] Bladder tank make/model: HT20 serial number: 14925304 volume: age: 9/9/2004 pressure: 100 PSI
- [x] Water pressure at closest tap to well when water is not being used: 60 psi
- [ ] Distribution system flowrate at closest tap to well when water is not being used elsewhere: gallons per minute. Empty bucket into drain [ ]
- [x] Check the overall distribution system piping. Any damage, leaks stains? [x] no [ ] yes, document on sketch/photos (pg. 2)
- [x] Material of construction of distribution piping at influent (e.g., copper, PEX, CPVC, etc.): 2.25 metal

PUMP

- [x] Pump type: Shallow Well Jet Pump Submersible? [x] no [ ] yes Serial Number: 040774
- Housepower/size: 115 / 230V Depth (if known): — Year installed: ?
- [ ] Well production (gallons/minute): Well log? [x] no [ ] yes

POWER

- [x] Note and photo document available space on circuit board Service amperage:
- [x] Is there a 120 V, 20 A circuit available? [ ] no [x] yes
- [x] Is there clear access from the panel to the preferred location of the POET? [x] yes [ ] no, describe lots of veg.

INSTALLATIONS

INTERIOR

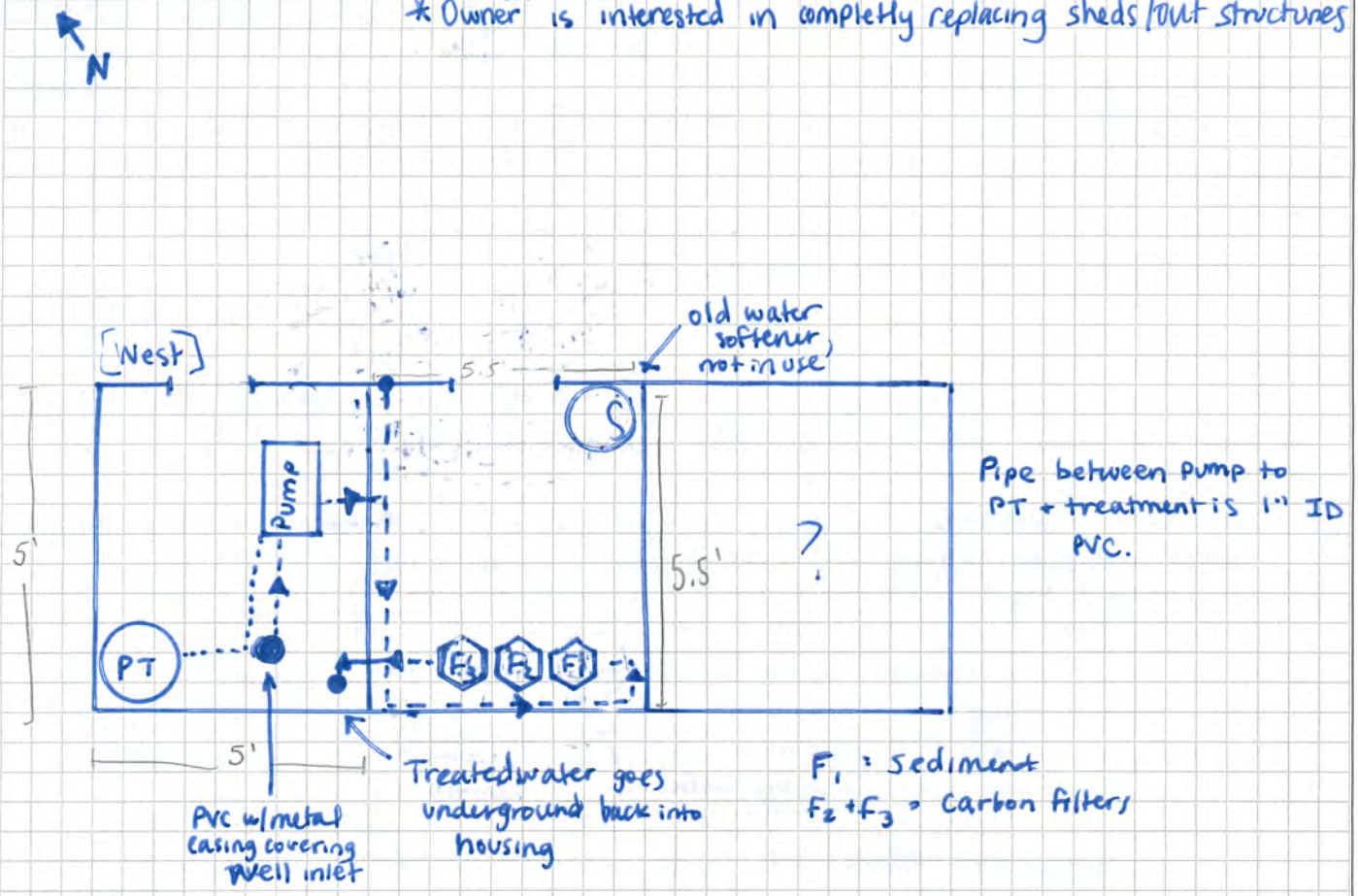
- [x] Floor area available in home or existing out building for water treatment equipment (square feet): no
- [x] Wall space available for attachment of treatment units, instrumentation, and piping (square feet): no
- [x] Is the area heated sufficiently to prevent freezing? [x] no [ ] yes small space heater for winter
- [x] Is there access for maintenance and filter change out? [ ] no [x] yes, describe delivery path:

EXTERIOR

- [ ] Available space near well (square feet): ? Location of septic system: ?
- [ ] Septic dimensions: ? Septic capacity (if known): ? Year installed: ?
- [ ] Access to service line, describe:

Sketches ~~Indoor~~ outdoor

* Maintenance worker said Owner is interested in completly replacing sheds/out structures



Out building is ~ 40-50' from (south of) housing. Electric panel ~ 70' from structure (S of building)

Buildings: 3 shed/out buildings next to each other. W building has PT tank, pump, well

Center building has 3 carbon filters. Side walls all covered w/ insulation material.

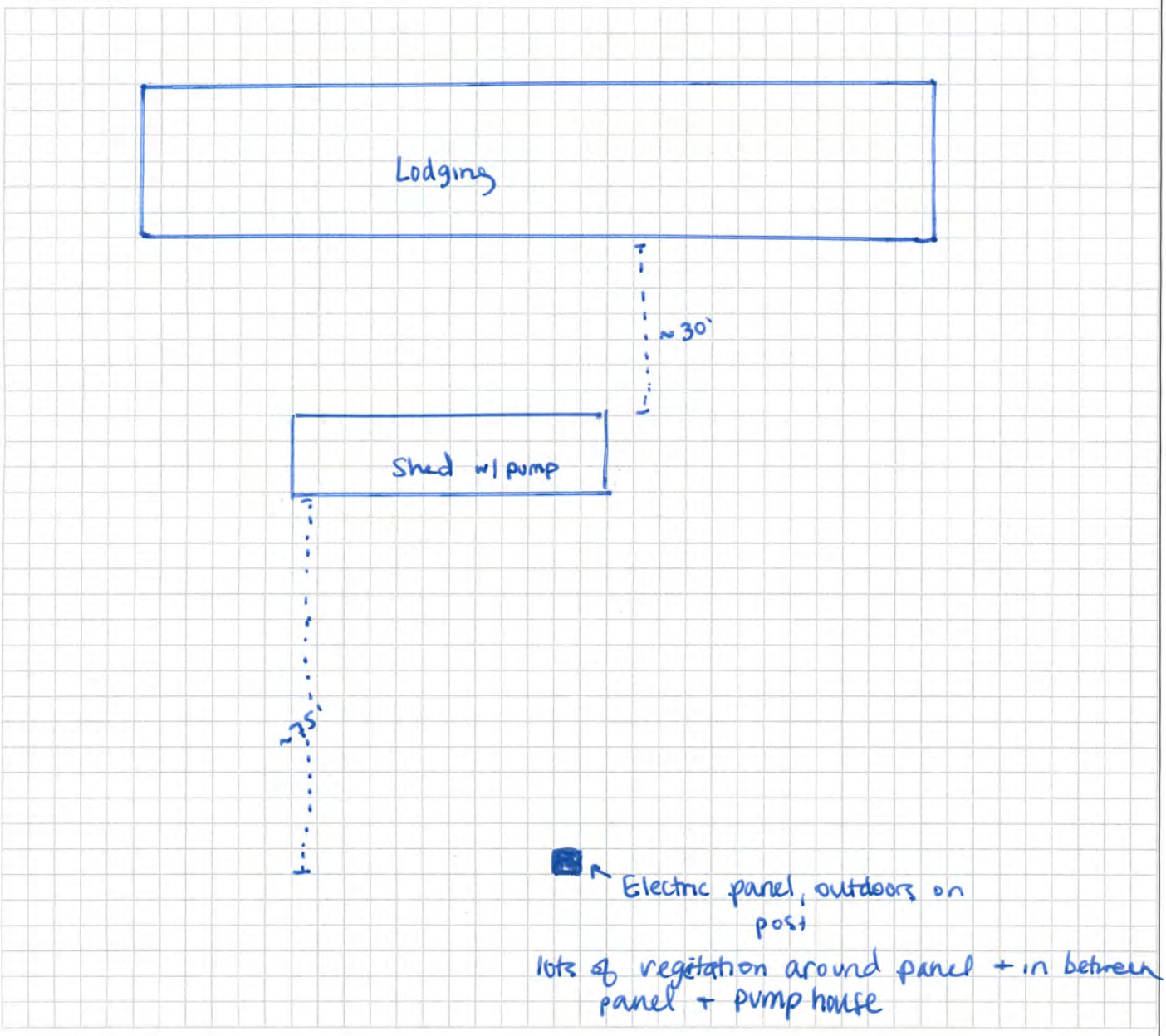
Photos

Time taken	Direction facing	Description of photo

Other Information / Notes

Δ filters once every 2-3 weeks

Sketches Outdoor



Photos

Time taken	Direction facing	Description of photo

Other Information / Notes

10-1230

PFAS Impacted Well Site Assessment Form

Date/Time Range of Visit: 8/13/20

Employee(s): RLW

Property ID: 33066 Yakutat Lodge Restaurant

CHECKLIST

INTERVIEW

- [x] Description of structure and well use: Restaurant + office space
- Permission to take photos? ☐ no ☒ yes
- [x] Any concerns with existing pressure being too low? ☐ no ☒ yes, when is it noticeable: often always trickles, constantly & out filters
- [x] Other non-PFAS concerns with water (e.g., taste, odor, chemical)? ☐ no ☒ yes, describe: Sulfury odor
- [x] Is anyone tracking water usage? ☒ no ☐ yes, estimate monthly water usage (gallons):
- [x] Preferred POET system location ☐ indoor ☐ outdoor (indoors if possible)
- [ ] Questions/concerns:

WATER USE

- [x] No. of occupants: 56 seats in restaurant | Square footage: | No. of bathrooms: 2 | No. of bedrooms: —
- Washer/Dryer (Y/N): N | Dishwasher (Y/N): N | No. of sinks: 2 bath 2 kitchen | Year built:
- [x] High-use items (circle if apply): outdoor irrigation, fire-suppression system, radiant heat, etc.
- [x] Is well use seasonal? High in summer (open April → October) Stove on yr. round

WATER QUALITY

- [x] Water softener present? ☐ no ☒ yes, make/model: HAHN FILTRATION serial number: HF-600 age: ?
- [x] Existing totalizer flowmeter reading, if present (gal): n/a time of reading
- [x] Treatment equipment in place (e.g., iron filter, RO, ion exchange, alumina)? type: 1 sediment / 1 carbon (see photos)
- make/model: serial number:
- [x] Is there staining on fixtures that would indicate iron or manganese? ☐ no ☒ yes, photo document (pg 2)

SKETCH EXISTING SYSTEM

- [x] Sketch existing system (e.g., P&ID) on pg. 2 (bladder tank, valves, treatment, pipe sizes, existing equipment to remain)
- [x] Bladder tank make/model: HT20 serial number: 14912024 volume: age: 7/20/2004 pressure: 100
- [x] Water pressure at closest tap to well when water is not being used: 42 psi
- [ ] Distribution system flowrate at closest tap to well when water is not being used elsewhere: gallons per minute.
- Empty bucket into drain ☐
- [x] Check the overall distribution system piping. Any damage, leaks stains? ☒ no ☐ yes, document on sketch/photos (pg. 2)
- [x] Material of construction of distribution piping at influent (e.g., copper, PEX, CPVC, etc.): copper ?

PUMP

- [x] Pump type: Flint + Walling Submersible? ☒ no ☐ yes Serial Number: 139966
- Housepower/size: 172 (?) label worn Depth (if known): — Year installed: —
- [ ] Well production (gallons/minute): Well log? ☒ no ☐ yes

POWER

- [x] Note and photo document available space on circuit board Service amperage: 225 Amp max
- [x] Is there a 120 V, 20 A circuit available? ☐ no ☒ yes 1 space? Space could be made
- [ ] Is there clear access from the panel to the preferred location of the POET? ☐ yes ☒ no, describe Shelving / cabinet

INSTALLATIONS — INTERIOR

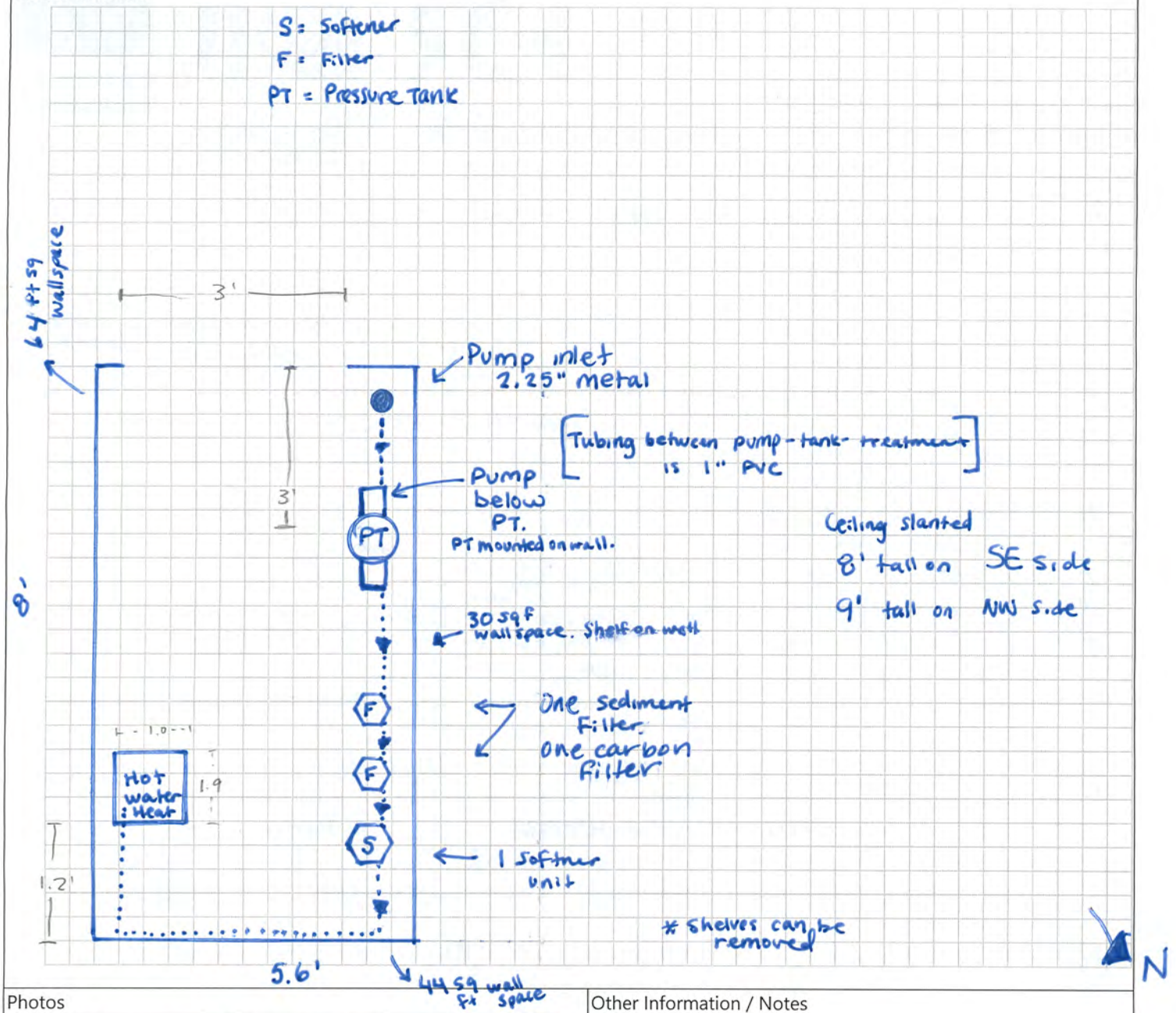
- [x] Floor area available in home or existing out building for water treatment equipment (square feet): 8'x5.6' = 44.8'
- [x] Wall space available for attachment of treatment units, instrumentation, and piping (square feet): see diagram
- [x] Is the area heated sufficiently to prevent freezing? ☐ no ☒ yes Can move shelving
- [x] Is there access for maintenance and filter change out? ☐ no ☐ yes, describe delivery path: ?

INSTALLATIONS — EXTERIOR

- [ ] Available space near well (square feet): Location of septic system: unknown
- [ ] Septic dimensions: Septic capacity (if known): Year installed:
- [ ] Access to service line, describe:

Consumption water imported from in town drinking water

Sketches Indoor



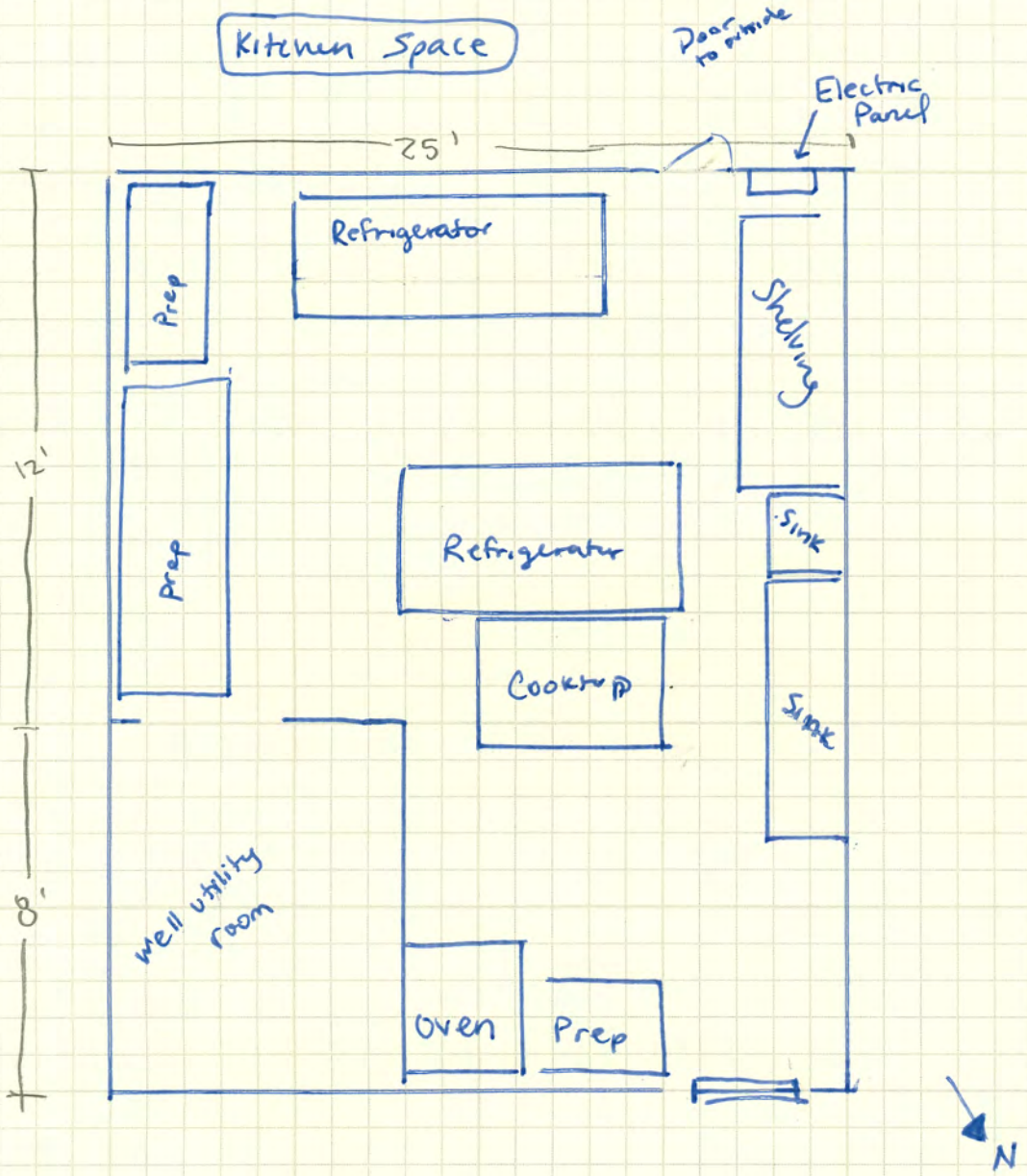
Photos

Time taken	Direction facing	Description of photo

Other Information / Notes

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

JOB NAME _____ JOB NO. _____
SUBJECT 33066 Yakutat Lodge Restaurant DATE 3/13/20
BY RLW CHK'D _____ SHEET 1 of _____



Attachment 2 – Water Chemistry Data Table

Attachment 2
Yakutat - Water Chemistry Data Table

			Location	33063	33066
			Date	8/13/2020	8/13/2020
Parameter	Total or Dissolved	Analysis Location	Units		
General Parameters					
Carbon, total organic	NA	Lab	mg/l	**1.2**	**1.54**
Chloride	NA	Lab	mg/l	**5.22**	**4.37**
Fluoride	NA	Lab	mg/l	**0.0580 J**	**0.0550 J**
Hardness, as CaCO3	NA	Lab	mg/l	**142**	**178**
Nitrogen, nitrate + nitrite, as N	NA	Lab	mg/l	< 0.1 U	< 0.1 U
Nitrogen, total kjeldahl (TKN)	NA	Lab	mg/l	< 0.5 U	< 0.5 U
Oil and Grease	NA	Lab	mg/l	< 2.02 U	< 2.04 U
pH	NA	Lab	pH units	**7.8**	**7.7**
Solids, total dissolved	NA	Lab	mg/l	**181**	**204**
Solids, total suspended	NA	Lab	mg/l	< 0.5 U	**1.52**
Specific conductance @ 25 ºC	NA	Lab	umhos/cm	**306**	**349**
Sulfate, as SO4	NA	Lab	mg/l	**11.9**	**15.5**
Sulfide, as S^{2-}	NA	Lab	mg/l	< 0.0500 U	< 0.0500 U
Metals					
Arsenic III	Dissolved	Lab	ug/l	**4.05**	**5.98**
Arsenic V	Dissolved	Lab	ug/l	**0.246**	**0.665**
Dimethylarsinic acid	Dissolved	Lab	mg/l	< 0.000050 U	< 0.000050 U
Monomethylarsonic acid	Dissolved	Lab	mg/l	< 0.000040 U	< 0.000040 U
Calcium	Total	Lab	ug/l	**51100**	**63700**
Chromium	Total	Lab	ug/l	< 10.0 U	< 1.00 U
Iron	Total	Lab	ug/l	< 1250 U	**721**
Magnesium	Total	Lab	ug/l	**3530**	**4550**
Manganese	Total	Lab	ug/l	**105**	**144**
Potassium	Total	Lab	ug/l	**4460 J**	**3260**
Sodium	Total	Lab	ug/l	**6380**	**4060**
Volatile Organic Compounds					
Benzene	NA	Lab	ug/l	**0.150 J**	**0.800**
Ethyl benzene	NA	Lab	ug/l	< 0.500 U	< 0.500 U
Toluene	NA	Lab	ug/l	< 0.500 U	< 0.500 U
Xylene, m & p	NA	Lab	ug/l	< 1.00 U	< 1.00 U
Xylene, o	NA	Lab	ug/l	< 0.500 U	< 0.500 U
Xylene, total	NA	Lab	ug/l	< 1.50 U	< 1.50 U
Total Petroleum Hydrocarbons					
Diesel Range Organics, C10-C28	NA	Lab	mg/l	**0.206 J**	**0.206 J**
Gasoline Range Organics, C6-C10	NA	Lab	mg/l	**0.0394 J**	**0.0331 J**
Residual Range Organics	NA	Lab	mg/l	**0.175 J**	**0.300 J**
Per- and Polyfluoroalkyl Substances					
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	NA	Lab	ng/l	< 8.3 U	< 8.3 U
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NA	Lab	ng/l	< 8.3 U	< 8.3 U
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NA	Lab	ng/l	< 8.3 U	< 8.3 U
n-Ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	NA	Lab	ng/l	< 17 U	< 17 U
n-Methyl perfluorooctanesulfonamidoacetic acid (MeFOSAA)	NA	Lab	ng/l	< 17 U	< 17 U
Perfluorobutanesulfonic acid (PFBS)	NA	Lab	ng/l	**2.6 J**	**2.3 J**
Perfluorobutanoic acid (PFBA)	NA	Lab	ng/l	**4.4 J**	**5.3 J**
Perfluorodecanesulfonic acid (PFDS)	NA	Lab	ng/l	< 4.2 U	< 4.2 U
Perfluorodecanoic acid (PFDA)	NA	Lab	ng/l	< 4.2 U	< 4.2 U
Perfluorododecanoic acid (PFDoA / PFDoDA)	NA	Lab	ng/l	< 4.2 U	< 4.2 U
Perfluoroheptanesulfonic acid (PFHpS)	NA	Lab	ng/l	< 4.2 U	< 4.2 U
Perfluoroheptanoic acid (PFHpA)	NA	Lab	ng/l	**2.7 J**	**2.9 J**
Perfluorohexanesulfonic acid (PFHxS)	NA	Lab	ng/l	**23.5**	**42.1**
Perfluorohexanoic acid (PFHxA)	NA	Lab	ng/l	**6.5 J**	**7.1 J**
Perfluorononanesulfonic acid (PFNS)	NA	Lab	ng/l	< 4.2 U	< 4.2 U
Perfluorononanoic acid (PFNA)	NA	Lab	ng/l	< 4.2 U	< 4.2 U
Perfluorooctanesulfonamide (PFOSA / FOSA)	NA	Lab	ng/l	< 4.2 U	< 4.2 U
Perfluorooctanesulfonic acid (PFOS)	NA	Lab	ng/l	**39.3**	**88.6**
Perfluorooctanoic acid (PFOA)	NA	Lab	ng/l	**4.7 J**	**5.8 J**
Perfluoropentanesulfonic acid (PFPeS)	NA	Lab	ng/l	**4.3 J**	**6.5 J**
Perfluoropentanoic acid (PFPeA)	NA	Lab	ng/l	**9.2**	**8.9**
Perfluorotetradecanoic acid (PFTA / PFTeDA / PFTeA)	NA	Lab	ng/l	< 4.2 U	< 21 U
Perfluorotridecanoic acid (PFTrDA / PFTriA)	NA	Lab	ng/l	< 4.2 U	< 21 U
Perfluoroundecanoic acid (PFUnA / PFUnDA)	NA	Lab	ng/l	< 4.2 U	< 4.2 U

Notes

J = Estimated detected value. Either certain QC criteria were not met or the concentration is between the laboratory's detection and quanitation limits.

U = The analyte was analyzed for, but was not detected.

Attachment 3 – Peak Water Demand Estimates

Attachment 3
Peak Water Demand Estimates

Peak demand by fixture count	Fixture Units	Lodge 33063		Restaurant 33066	
		Count	Total Units	Count	Total Units
Bar Sink	1	0	0	1	1
Clothes Washer	4	1	4	0	0
Hose Bib	2.5	1	2.5	1	2.5
Kitchen Sink	1.5	1	1.5	2	3
Lavatory	1	9	9	4	4
Service Sink	1.5	1	1.5	1	1.5
Shower, per head	2	9	18	0	0
Water Closet, 1.6 GFP Gravity Tank	2.5	9	22.5	2	5
		Total Fixture Units	59		17
		Peak Demand (gpm)	32		13

Peak demand by property category	Lodge 33063	Restaurant 33066
First Category	Motel, hotel	Restaurant
Flow (GPM) per unit	2	1
Total Units	8	56
Subtotal	16	56
Second Category	0-5 residences served	--
Flow (GPM) per unit	8	--
Total Units	1	--
Subtotal	8	--
Peak Demand (gpm)	24	56

Attachment 4 – Process Flow Diagrams

Well Pump
Everbilt J200A3
¾ HP, 7-8 gpm

Pressure Tank
WaterWorker HT20
Max. working pressure: 100 PSI

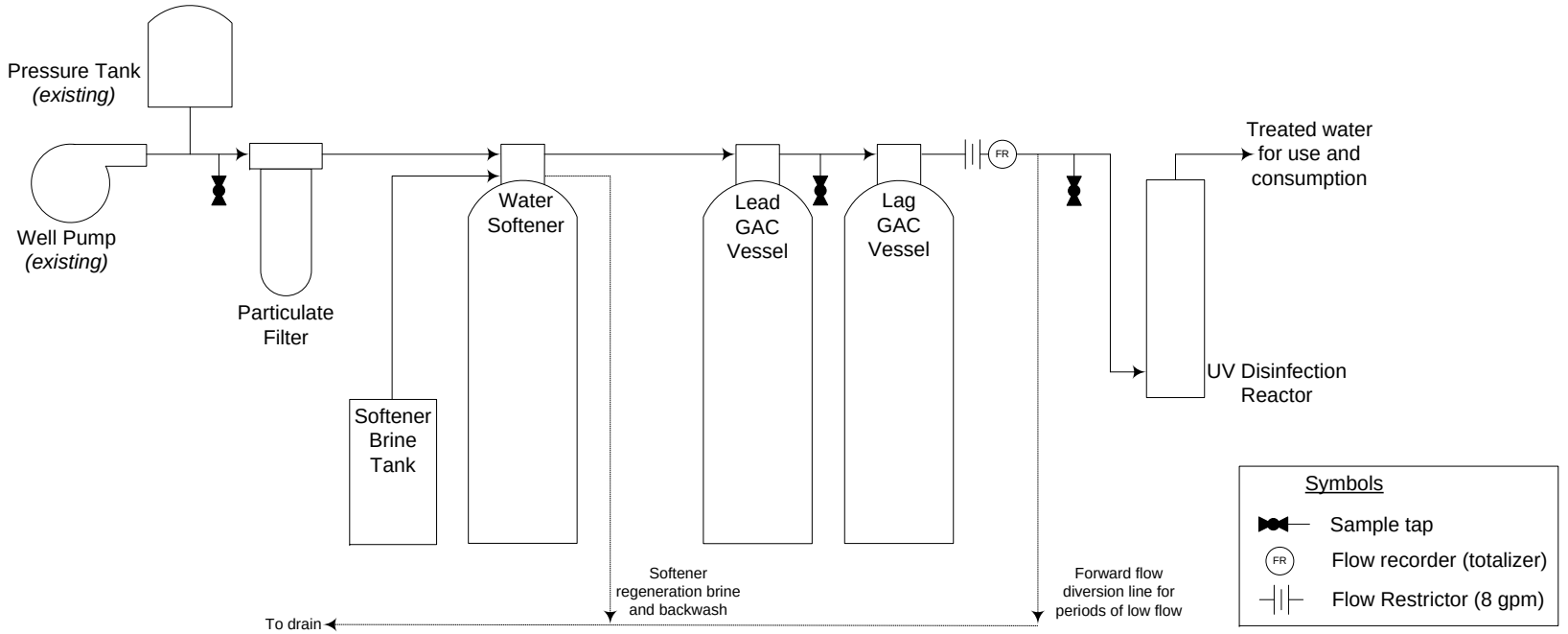
Particulate Filter
#20 Big Blue
4.5"x20" Cartridge Filter
(5-10 micron)
20 gpm max

Water Softener
EcoWater ECR3702 R-30 (10"x35")
11 gpm certified forward flow
38 gal per regeneration

GAC Vessels
Pentair Structural Polyglass Vessel
CH30745 (14"x47")
2.5 cu ft media
8 gpm forward flow

GAC Media
Prominent Systems
Filter Media
PS-CL1240AW
Coal-based, 12x40 Mesh

UV Disinfection Reactor
UV Max Pro10
(22"x4"; 316L SST)
10 gpm max forward flow
10-100 PSI operating pressure



Attachment 4
Process flow diagram for Yakutat Lodge
Lodge (33063)
Design Flow: 8 gpm

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
4300 MARKETPOINTE DRIVE
Suite 200
MINNEAPOLIS, MN 55435
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Well Pump
F&W CPJ105S
½ HP, 12-15 gpm

Pressure Tank
WaterWorker HT20
Max. working pressure: 100 PSI

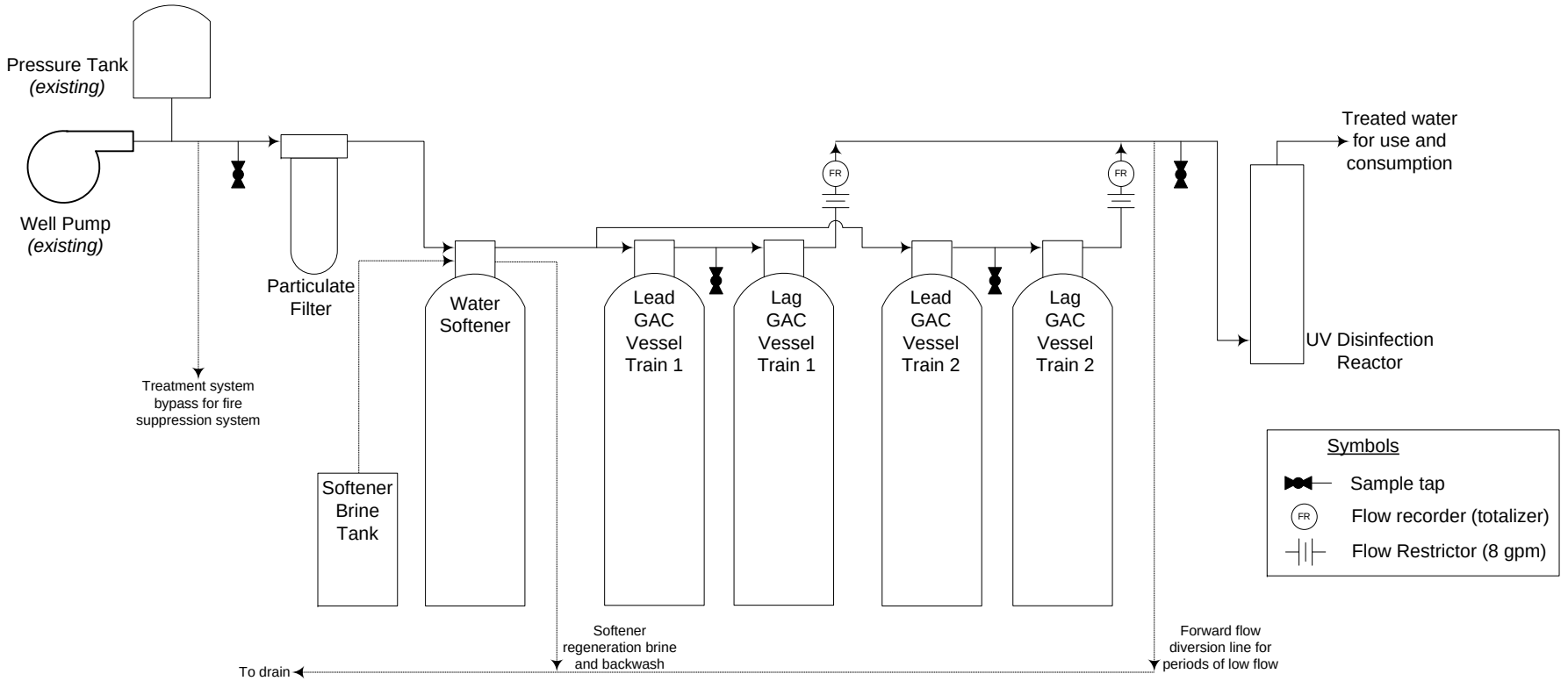
Particulate Filter
#20 Big Blue
4.5"x20" Cartridge Filter
(5-10 micron)
20 gpm max

Water Softener
EcoWater 5000
Commercial Series
EWS070 (12.3"x55")
20 gpm max forward flow
108 gal per regeneration

GAC Vessels
Pentair Structural Polyglass Vessel
CH30745 (14"x47")
2.5 cu ft media
8 gpm forward flow

GAC Media
Prominent Systems
Filter Media
PS-CL1240AW
Coal-based, 12x40 Mesh

UV Disinfection Reactor
UV Max Pro20
(31"x4"; 316L SST)
20 gpm max forward flow
10-100 PSI operating pressure



Attachment 4
Process flow diagram for Yakutat Lodge
Restaurant (33066)
Design Flow: 16 gpm

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
4300 MARKETPOINTE DRIVE
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MINNEAPOLIS, MN 55435
Ph: 1-800-632-2277
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www.barr.com

Attachment 5 – Cost Estimate Details

Attachment 5
Capital Cost Estimate Detail

Property: 33063
Peak Demand: 8 gpm

Item	Item Description	Unit	Quantity	Unit Cost	Item Cost	Notes
1	Sediment Pre-filters (Big Blue, 20 gpm max, 10 micron, 20"x4.5"; housing, filter, bracket)	Ea	2	$ 225	$ 500	
2	Water Softener (EcoWater ECR3702 R-30; with resin)	Ea	1	$ 2,890	$ 2,900	
3	Water Softener - initial salt fill (per bag)	Ea	8	$ 12	$ 100	
4	GAC vessels (Pentair CH30745, 3.7 cu ft capacity, 2.5 cu ft bed)	Ea	3	$ 1,100	$ 3,300	Includes 1 spare per train
5	GAC Media (Prominent Systems PS-CL1240AW bituminous coal-based carbon, NSF certified)	cu ft	7.5	$ 153	$ 1,200	2.5 cu ft beds per vessel
6	UV Disinfection Unit (Viqua UV Light Pro Series Pro 10, 10 gpm max)	Ea	1	$ 3,625	$ 3,700	
7	8 gpm flow restrictor	Ea	1	$ 170	$ 200	
8	Totalizing flow meter	Ea	1	$ 825	$ 900	
9	Sample Taps	Ea	3	$ 83	$ 300	
10	Insulated and heated Connex box	Ea	1	$ 16,000	$ 16,000	
	Site Preparation	LS	1	$ 5,000	$ 5,000	Includes dirt work, pad construction, drain system, and electrical
	Installation	LS	1	$ 10,000	$ 10,000	Estimated based on rates and time estimates from AHL (includes estimated labor and travel expenses)
	Plumbing, piping, fittings, valves	LS	1	$ 2,400	$ 2,400	Estimated quote from AHL
	Freight	Ea	1	$ 2,750	$ 2,800	Estimated quote from AHL
	Equipment Subtotal				$ 49,300	
	Contingency			15% of subtotal	$ 7,400	
	Construction Subtotal				$ 56,700	
	Engineering, Legal, Administrative			20% of construction costs	$ 11,400	
	Estimated Required Treatment System Cost				$ 68,100	All item costs are rounded up to the nearest $100. ENRCCI = 11579 Nov 2020 This is a Class 5 cost estimate with a +50/-30% uncertainty as applicable for projects at less than 2% of full project definition per AACE International 17R-97.

Property: 33066
Peak Demand: 16 gpm

Item	Item Description	Unit	Quantity	Unit Cost	Item Cost	Notes
1	Sediment Pre-filters (Big Blue 20 gpm max, 10 micron, 20"x4.5"; housing, filter, bracket)	Ea	2	$ 225	$ 500	
2	Water Softener (EWS070; with resin)	Ea	1	$ 3,750	$ 3,800	
3	Water Softener - initial salt fill (per bag)	Ea	16	$ 12	$ 200	
4	GAC vessels (Pentair CH30745, 3.7 cu ft capacity, 2.5 cu ft bed)	Ea	6	$ 1,100	$ 6,600	Includes 1 spare per train
5	GAC Media (Prominent Systems PS-CL1240AW bituminous coal-based carbon, NSF certified)	cu ft	15	$ 153	$ 2,300	2.5 cu ft beds per vessel
6	UV Disinfection Unit (Viqua UV Light Pro Series Pro 20, 20 gpm max)	Ea	1	$ 4,250	$ 4,300	
7	8 gpm flow restrictor	Ea	2	$ 170	$ 400	
8	Totalizing flow meter	Ea	2	$ 825	$ 1,700	
9	Sample Taps	Ea	4	$ 83	$ 400	
	Installation	LS	1	$ 9,000	$ 9,000	Estimated based on rates and time estimates from AHL (includes estimated labor and travel expenses)
	Plumbing, piping, fittings, valves	LS	1	$ 2,400	$ 2,400	Estimated quote from AHL
	Freight	Ea	1	$ 2,750	$ 2,800	Estimated quote from AHL
	Equipment Subtotal				$ 34,400	
	Contingency			15% of subtotal	$ 5,200	
	Construction Subtotal				$ 39,600	
	Engineering, Legal, Administrative			20% of construction costs	$ 8,000	
	Estimated Required Treatment System Cost				$ 47,600	All item costs are rounded up to the nearest $100. ENRCCI = 11579 Nov 2020 This is a Class 5 cost estimate with a +50/-30% uncertainty as applicable for projects at less than 2% of full project definition per AACE International 17R-97.

Attachment 5
Operation and Maintenance Cost Estimate Details

Property: 33063
Peak Demand: 8 gpm

Item	Item Description	Unit	Quantity	Unit Cost	Item Cost	Notes
1	GAC Media Replacement (per vessel)	Ea	1	$ 1,000	$ 1,000	Assume annual replacement of lead vessels
2	Salt Usage	pounds	730	$ 0.30	$ 300	Assume 2lbs/day, $12 per 40lb bag
3	Analysis	Ea	12	$ 300	$ 3,600	Quarterly sampling; Influent, Effluent, between lead/lag vessels
4	Sampling	hour	24	$ 90	$ 2,200	Assume 4 hrs of travel per property for quarterly sampling plus 2 hrs for sample collection
5	Equipment Maintenance and Replacement	--	--	--	$ 1,400	3% of the equipment subtotal
6	Power	kW-hr	100	$ 0.40	$ 100	Unit cost from Alaska Village Electric Cooperative, Inc.
7	Labor	hour	8	$ 75	$ 600	
	Subtotal				$ 9,200	
	Contingency			15% of subtotal	$ 1,400	
	Annual Maintenance Cost Total				$ 10,600	
	Administrative			10% of annual maintenance cost	$ 1,100	
	Estimated Annual Cost Total				$ 11,700	All item costs are rounded up to the nearest $100. O&M costs are based on a Class 5 capital cost estimate with a +50/-30% uncertainty as applicable for projects at less than 2% of full project definition per AACE International 17R-97. O&M Costs are also expected to have a +50/-30% uncertainty.

Property: 33066
Peak Demand: 16 gpm

Item	Item Description	Unit	Quantity	Unit Cost	Item Cost	Notes
1	GAC Media Replacement (per vessel)	Ea	2	$ 1,000	$ 2,000	Assume annual replacement of lead vessels
2	Salt Usage	pounds	1,460	$ 0.30	$ 500	Assume 4lbs/day, $12 per 40lb bag
3	Analysis	Ea	16	$ 300	$ 4,800	Quarterly sampling; Influent, Effluent, between lead/lag vessels
4	Sampling	hour	24	$ 90	$ 2,200	Assume 4 hrs of travel per property for quarterly sampling plus 2 hrs for sample collection
5	Equipment Maintenance and Replacement	--	--	--	$ 1,000	3% of the equipment subtotal
6	Power	kW-hr	100	$ 0.40	$ 100	Unit cost from Alaska Village Electric Cooperative, Inc.
7	Labor	hour	8	$ 75	$ 600	
	Subtotal				$ 11,200	
	Contingency			15% of subtotal	$ 1,700	
	Annual Maintenance Cost Total				$ 12,900	
	Administrative			10% of annual maintenance cost	$ 1,300	
	Estimated Annual Cost Total				$ 14,200	All item costs are rounded up to the nearest $100. O&M costs are based on a Class 5 capital cost estimate with a +50/-30% uncertainty as applicable for projects at less than 2% of full project definition per AACE International 17R-97. O&M Costs are also expected to have a +50/-30% uncertainty.

APPENDIX B: BARR - POET FEASIBILITY REPORT AND SUPPORTING INFORMATION

PFAS IMPACTED WELL SITE ASSESSMENT FORMS

Ashley Jaramillo

From: Moxness, Anson <Anson.Moxness@hdrinc.com>
Sent: Wednesday, July 1, 2020 1:40 PM
To: Ashley Jaramillo
Cc: Bott, Wescott
Subject: Yakutat Info

Follow Up Flag: Follow up
Flag Status: Flagged

Ashley,

I know you talked about reaching out to the owner of the lodge/restaurant, here's some specific information to gather for our report. If it's easier for you to wait until you go down and do a site visit, that works as well. It's similar to what we got in Dillingham. I also put at the end a few questions about the DOT ARFF facility that we could use as an existing source. The other question I have is: do you have a contact at the City of Yakutat? I was going to reach out to Ron Beattie the Public Works Director, but if you have someone else you've been talking to that'd be great.

Information on the Lodge:

- How many rooms or what is the maximum occupancy? 8 rooms / 2 people each
- How many employees? 3 that live in bunks
- Is there an attached restaurant or kitchen or are guests served across the street?. NO
- Are there any water meter records or past well flow information? NO
- Is there a well log for the existing well? Unknown

Restaurant Information

- How many seats in the restaurant or what is the maximum occupancy 52 (seats)
- What are the operating hours/what type of restaurant is it? Full (Breakfast lunch dinner) 6 am – 10pm
- How many employees? 25-30 employees (most stay off site)
- Are there any water meter records or past well flow information? Unknown (likely no)
- Is there a well log for the existing well? Unknown

DOT&PF ARFF Facility → All unknown by ARFF staff

- Is there a well log? I have found one in the state database for a state owned well in the area, but there is not enough information to identify where it actually is located.
- Are there any records of well flow tests that have been performed?
- Are there any water meter records of past well flow information?
- Is there a PWSID that may not be in the State database or under a different name which would make it hard to find?

Thanks!

Anson Moxness, PE
Water/Wastewater Engineer

HDR
2525 C Street, Suite 500
Anchorage, AK 99503
D 907.644.2027 **M** 907.242.5995
Anson.Moxness@hdrinc.com

PFAS Impacted Well Site Assessment Form

Date/Time Range of Visit: 8/13/20

Employee(s): RLW

Property ID: 33063 Yakutat Lodge Guest + Employee Housing

CHECKLIST

INTERVIEW

- [x] Description of structure and well use: Well for Employee housing building (~3 people) + Guest housing (8 rooms / 2 people each)
  Permission to take photos? ☐ no ☒ yes
- [x] Any concerns with existing pressure being too low? ☒ no ☐ yes, when is it noticeable:
- [x] Other non-PFAS concerns with water (e.g., taste, odor, chemical)? ☐ no ☒ yes, describe: Staining, not as bad as restaurant
- [x] Is anyone tracking water usage? ☒ no ☐ yes, estimate monthly water usage (gallons):
- [x] Preferred POET system location ☐ indoor ☒ outdoor
- [x] Questions/concerns: Well house in bad shape. Maintenance staff is planning on re-doing structure. Carbon filters replaced every 2-3 weeks, or when pressure is bad

WATER USE

- [x]

No. of occupants:	max 16 * 3	Square footage:		No. of bathrooms:	9	No. of bedrooms:	13
Washer/Dryer (Y/N):	1	Dishwasher (Y/N):	—	No. of sinks:	9	Year built:	

- [x] High-use items (circle if apply): outdoor irrigation, fire-suppression system, radiant heat, etc. none
- [x] Is well use seasonal? Yes.

WATER QUALITY

- [x] Water softener present? ☒ no ☐ yes, make/model: — serial number: — age: —
- [x] Existing totalizer flowmeter reading, if present (gal): n/a time of reading
- [x] Treatment equipment in place (e.g., iron filter, RO, ion exchange, alumina)? type: Sediment filters, 2 carbon filters
  make/model: iSpring CTO Carbon Filter serial number: Model FC25B (5 micron big blue)
- [x] Is there staining on fixtures that would indicate iron or manganese? ☐ no ☒ yes, photo document (pg 2) not as bad as restaurant

SKETCH EXISTING SYSTEM

- [x] Sketch existing system (e.g., P&ID) on pg. 2 (bladder tank, valves, treatment, pipe sizes, existing equipment to remain)
- [x] Bladder tank make/model: HT20 serial number: 14925304 volume: age: 9/9/2004 pressure: 100 PSI
- [x] Water pressure at closest tap to well when water is not being used: 60 psi
- [ ] Distribution system flowrate at closest tap to well when water is not being used elsewhere: gallons per minute.
  Empty bucket into drain ☐
- [x] Check the overall distribution system piping. Any damage, leaks stains? ☒ no ☐ yes, document on sketch/photos (pg. 2)
- [x] Material of construction of distribution piping at influent (e.g., copper, PEX, CPVC, etc.): 2.25 metal

PUMP

- [x] Pump type: Shallow Well Jet Pump Submersible? ☒ no ☐ yes Serial Number: 040774
  Housepower/size: 115 / 230V Depth (if known): — Year installed: ?
- [ ] Well production (gallons/minute): Well log? ☒ no ☐ yes

POWER

- [x] Note and photo document available space on circuit board Service amperage:
- [x] Is there a 120 V, 20 A circuit available? ☐ no ☒ yes
- [x] Is there clear access from the panel to the preferred location of the POET? ☒ yes ☐ no, describe lots of veg.

INSTALLATIONS

INTERIOR

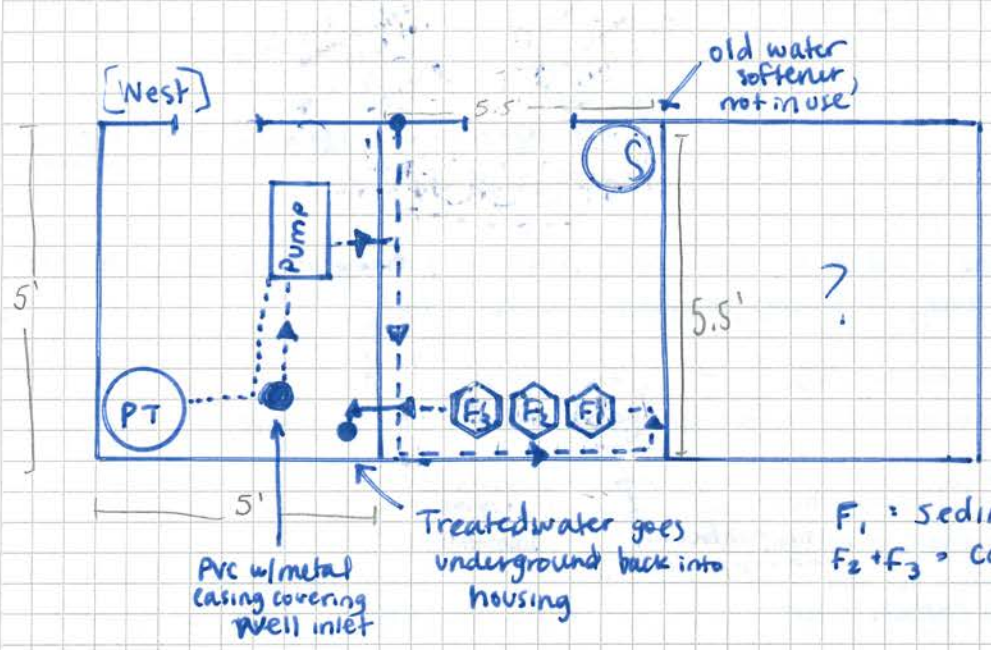
- [x] Floor area available in home or existing out building for water treatment equipment (square feet): NO
- [x] Wall space available for attachment of treatment units, instrumentation, and piping (square feet): NO
- [x] Is the area heated sufficiently to prevent freezing? ☒ no ☐ yes small space heater for winter
- [x] Is there access for maintenance and filter change out? ☐ no ☒ yes, describe delivery path:

EXTERIOR

- [ ] Available space near well (square feet): ? Location of septic system: ?
- [ ] Septic dimensions: ? Septic capacity (if known): ? Year installed: ?
- [ ] Access to service line, describe:

Sketches ~~Indoor~~ outdoor

* Maintenance worker said Owner is interested in completly replacing sheds/out structures



Pipe between pump to PT + treatment is 1" ID PVC.

F_1 : sediment
$F_2 + F_3$ = carbon filters

Out building is ~ 40-50' from (South of) housing. Electric panel ~ 70' from structure (S of building)

Buildings: 3 shed/out buildings next to each other. W building has PT tank, pump, well

Center building has 3 carbon filters. Side walls all covered w/ insulation material.

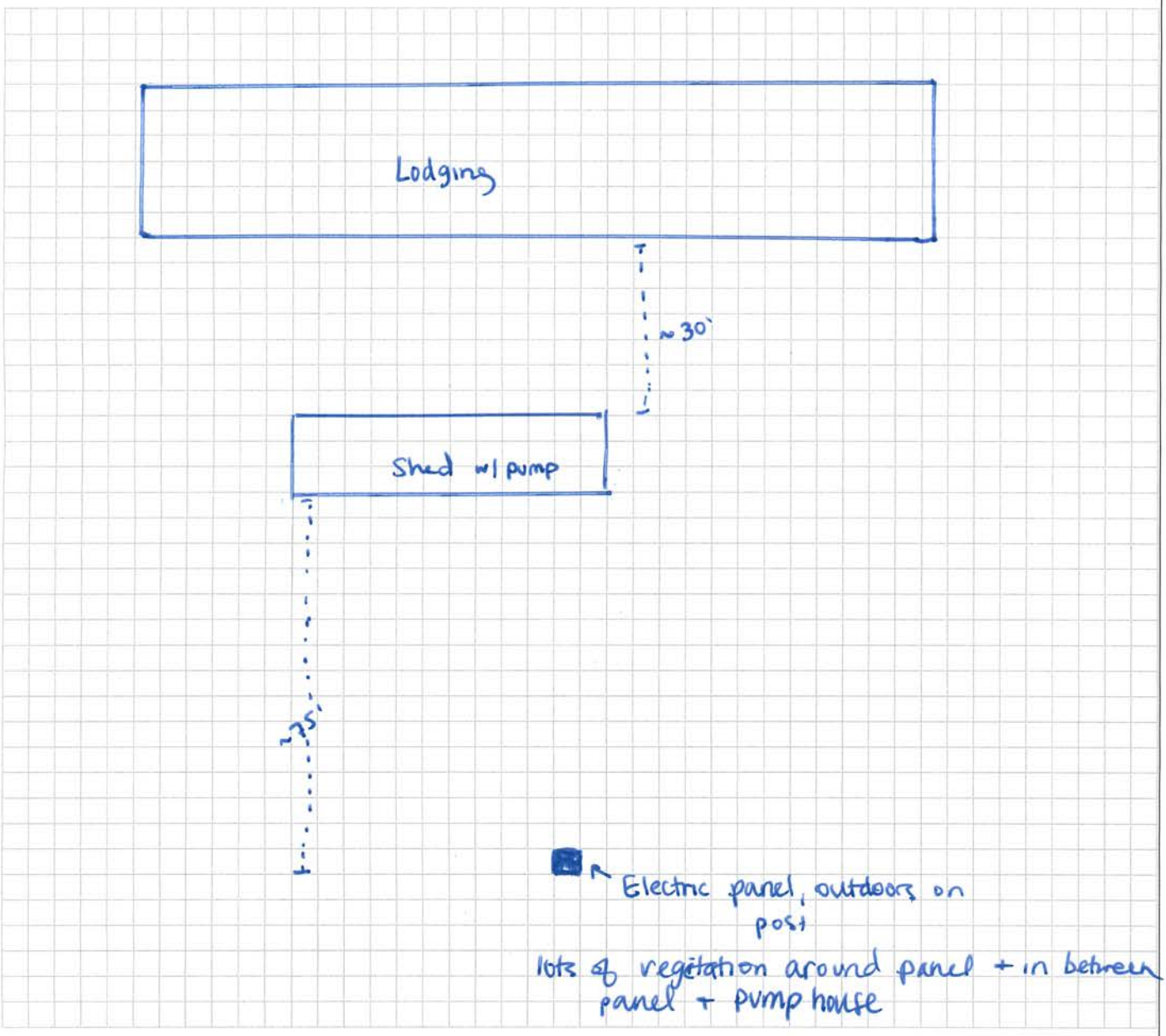
Photos

Time taken	Direction facing	Description of photo

Other Information / Notes

Δ filters once every 2-3 weeks

Sketches Outdoor



Photos

Time taken	Direction facing	Description of photo

Other Information / Notes

10-1230

PFAS Impacted Well Site Assessment Form

Date/Time Range of Visit: 8/13/20

Employee(s): RLW

Property ID: 33066 Yakutat Lodge Restaurant

CHECKLIST

INTERVIEW

- [x] Description of structure and well use: Restaurant + office space
- Permission to take photos? ☐ no ☒ yes
- [x] Any concerns with existing pressure being too low? ☐ no ☒ yes, when is it noticeable: often always trickles, constantly clogs out filters
- [x] Other non-PFAS concerns with water (e.g., taste, odor, chemical)? ☐ no ☒ yes, describe: Sulfury odor
- [x] Is anyone tracking water usage? ☒ no ☐ yes, estimate monthly water usage (gallons):
- [x] Preferred POET system location ☐ indoor ☐ outdoor (indoors if possible)
- [ ] Questions/concerns:

WATER USE

- [x] No. of occupants: 56 seats in restaurant | Square footage: | No. of bathrooms: 2 | No. of bedrooms: —
- Washer/Dryer (Y/N): N | Dishwasher (Y/N): N | No. of sinks: 2 bath 2 kitchen | Year built:
- [x] High-use items (circle if apply): outdoor irrigation, fire-suppression system, radiant heat, etc.
- [x] Is well use seasonal? High in summer (open April → October) Stove on yr. round

WATER QUALITY

- [x] Water softener present? ☐ no ☒ yes, make/model: HAHN FILTRATION serial number: HF-600 age: ?
- [x] Existing totalizer flowmeter reading, if present (gal): n/a time of reading
- [x] Treatment equipment in place (e.g., iron filter, RO, ion exchange, alumina)? type: 1 sediment / 1 carbon (see photos)
- make/model: serial number:
- [x] Is there staining on fixtures that would indicate iron or manganese? ☐ no ☒ yes, photo document (pg 2)

SKETCH EXISTING SYSTEM

- [x] Sketch existing system (e.g., P&ID) on pg. 2 (bladder tank, valves, treatment, pipe sizes, existing equipment to remain)
- [x] Bladder tank make/model: HT20 serial number: 14912024 volume: age: 7/20/2004 pressure: 100
- [x] Water pressure at closest tap to well when water is not being used: 42 psi
- [ ] Distribution system flowrate at closest tap to well when water is not being used elsewhere: gallons per minute.
- Empty bucket into drain ☐
- [x] Check the overall distribution system piping. Any damage, leaks stains? ☒ no ☐ yes, document on sketch/photos (pg. 2)
- [x] Material of construction of distribution piping at influent (e.g., copper, PEX, CPVC, etc.): copper ?

PUMP

- [x] Pump type: Flint + Walling Submersible? ☒ no ☐ yes Serial Number: 139966
- Housepower/size: 172 (?) label worn Depth (if known): — Year installed: —
- [ ] Well production (gallons/minute): Well log? ☒ no ☐ yes

POWER

- [x] Note and photo document available space on circuit board Service amperage: 225 Amp max
- [x] Is there a 120 V, 20 A circuit available? ☐ no ☒ yes 1 space? Space could be made
- [ ] Is there clear access from the panel to the preferred location of the POET? ☐ yes ☒ no, describe Shelving/cabinet

INSTALLATIONS — INTERIOR

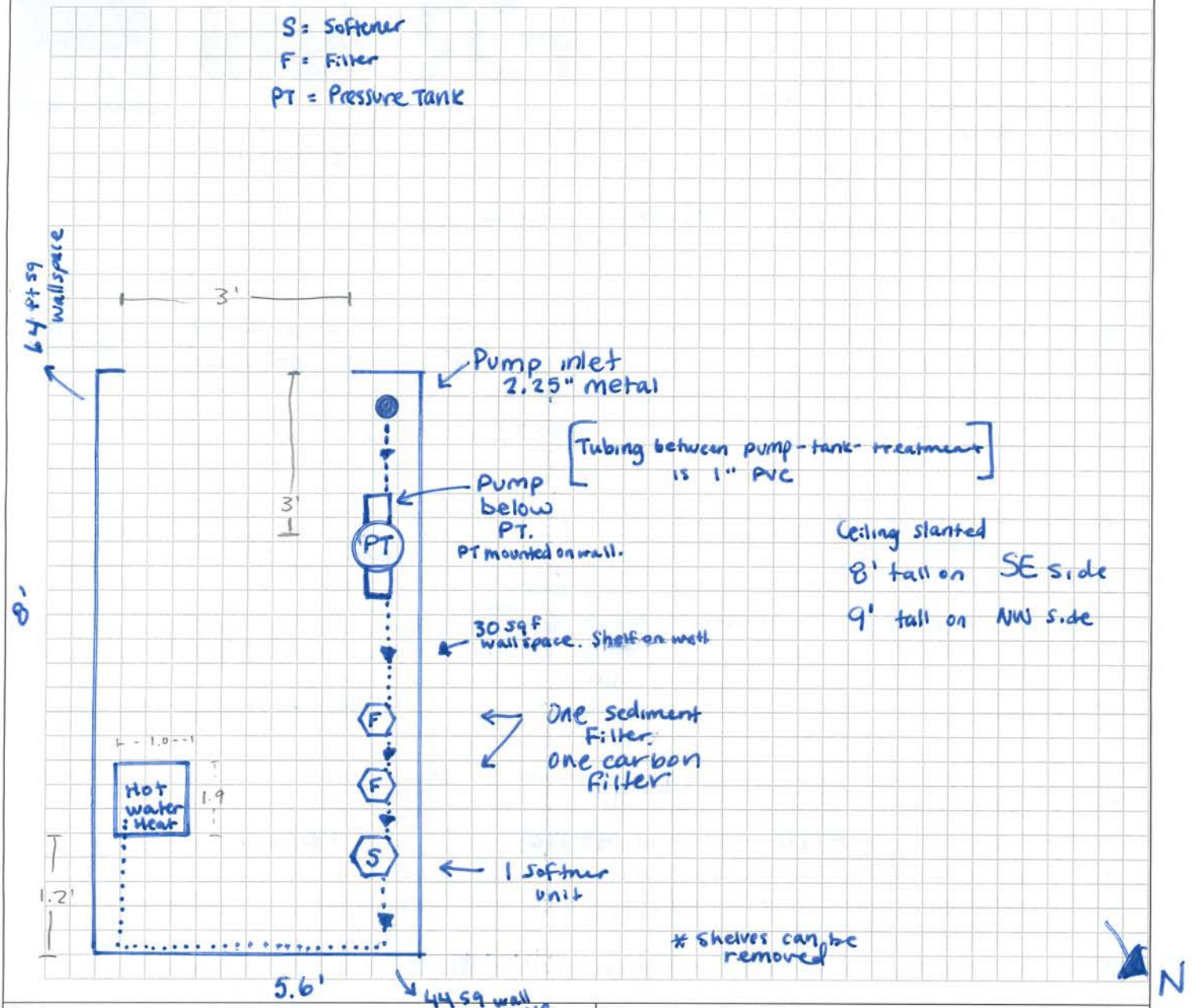
- [x] Floor area available in home or existing out building for water treatment equipment (square feet): 8'x5.6' = 44.8'
- [x] Wall space available for attachment of treatment units, instrumentation, and piping (square feet): see diagram
- [x] Is the area heated sufficiently to prevent freezing? ☐ no ☒ yes Can move shelving
- [x] Is there access for maintenance and filter change out? ☐ no ☐ yes, describe delivery path: ?

INSTALLATIONS — EXTERIOR

- [ ] Available space near well (square feet): Location of septic system: unknown
- [ ] Septic dimensions: Septic capacity (if known): Year installed:
- [ ] Access to service line, describe:

Consumption water imported from in town drinking water

Sketches Indoor



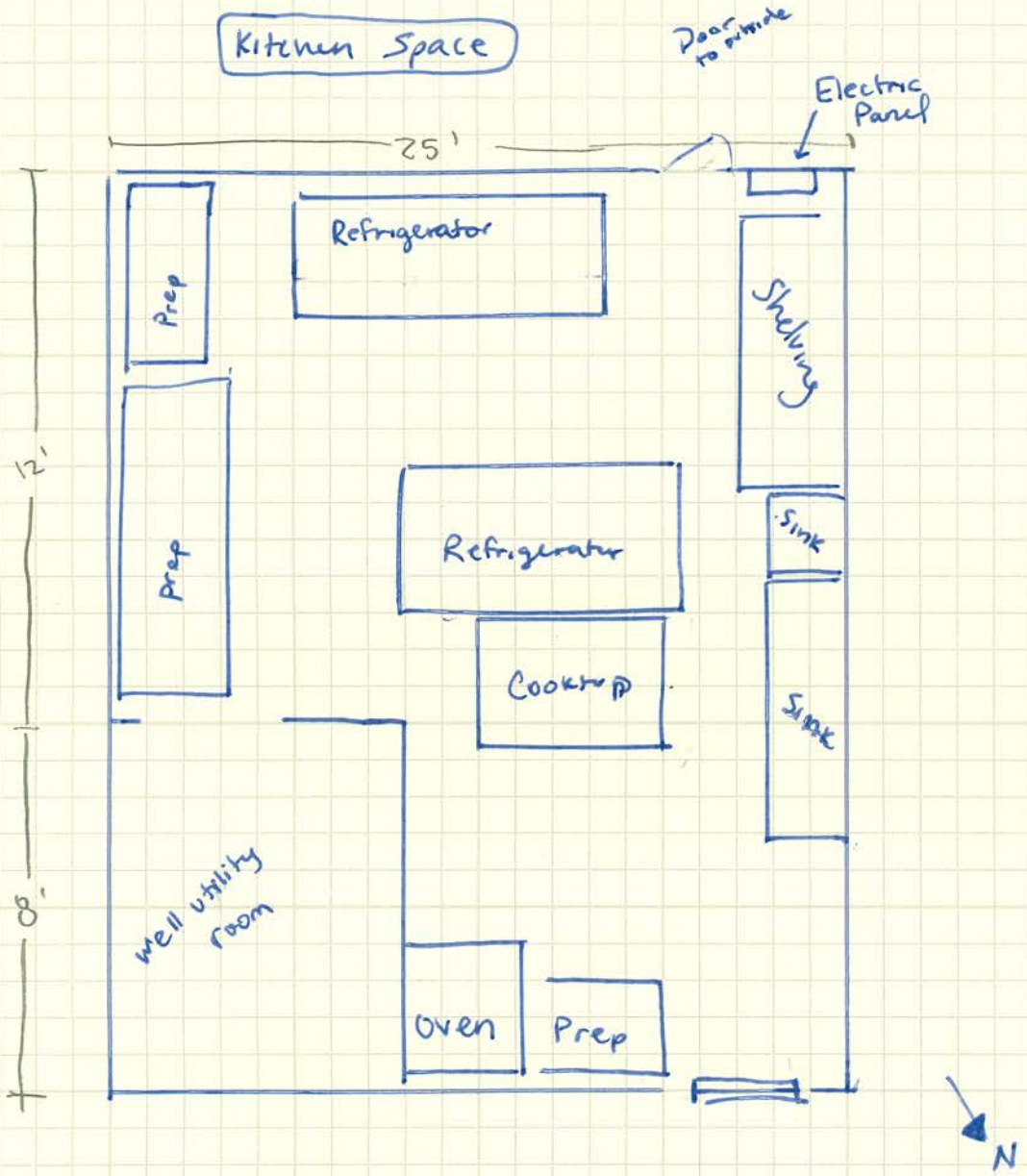
Photos

Time taken	Direction facing	Description of photo

Other Information / Notes

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

JOB NAME _____ JOB NO. _____
SUBJECT 33066 Yakutat Lodge Restaurant DATE 3/13/20
BY RLW CHK'D _____ SHEET 1 of _____



APPENDIX B: BARR - POET FEASIBILITY REPORT AND SUPPORTING INFORMATION

SGS LAB REPORT 1204244-REV1 AND LDRC

Laboratory Report of Analysis

To: Shannon & Wilson-Fairbanks
2355 Hill Road
Fairbanks, AK 99709
(907)458-3118

Report Number: **1204244**

Client Project: **102896-005 Yakutat ALT. Water**

Dear Ashley Jaramillo,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Jennifer at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

Stephen C. Ede 2020.10.07 15:10:56 -08'00'

Jennifer Dawkins Date
Project Manager
Jennifer.Dawkins@sgs.com

SGS North America Inc. 200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Case Narrative

SGS Client: Shannon & Wilson-Fairbanks

SGS Project: 1204244

Project Name/Site: 102896-005 Yakutat ALT. Water

Refer to sample receipt form for information on sample condition. Corrected Report: Missing analytes reported for 1204244002.

33066 **1204244001 PS**
Arsenic Speciation was analyzed by Brooks Applied of Bothell, WA.
EPA 537M PFAS list 24 were analyzed by SGS of Orlando, FL.

Trip Blank **1204244003 TB**
AK101 - Sample pH is greater than 2.

XXX/43681 **1575487 LCS**
AK102/103 - Surrogate recoveries in the LCS for 5a androstane and n triacontane do not meet QC criteria; however, the surrogate recoveries in the samples are within criteria.

* QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to the associated field samples.

Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. The results apply to the samples as received. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indenmification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & 17-021 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020B, 7470A, 7471B, 8015C, 8021B, 8082A, 8260D, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). SGS is only certified for the analytes listed on our Drinking Water Certification (DW methods: 200.8, 2130B, 2320B, 2510B, 300.0, 4500-CN-C,E, 4500-H-B, 4500-NO3-F, 4500-P-E and 524.2) and only those analytes will be reported to the State of Alaska for compliance. Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
DF	Analytical Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LLQC/LLIQC	Low Level Quantitation Check
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
RPD	Relative Percent Difference
TNTC	Too Numerous To Count
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.

SGS North America Inc. 200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
33066	1204244001	08/13/2020	08/14/2020	Water (Surface, Eff., Ground)
33063	1204244002	08/13/2020	08/14/2020	Water (Surface, Eff., Ground)
Trip Blank	1204244003	08/13/2020	08/14/2020	Water (Surface, Eff., Ground)

Method	Method Description
AK101	AK101/8021 Combo.
SW8021B	AK101/8021 Combo.
SM21 2510B	Conductivity SM2510B
AK102	DRO/RRO Low Volume Water
AK103	DRO/RRO Low Volume Water
SM21 2340B	Hardness as CaCO3 by ICP-MS
EPA 300.0	Ion Chromatographic Analysis (W)
EP200.8	Metals in Water by 200.8 ICP-MS
SM21 4500NO3-F	Nitrate/Nitrite Flow injection Pres.
EPA 1664B	Oil & Grease HEM by EPA 1664
SM21 4500-H B	pH Analysis
SM23 4500S D	Sulfide by Colorimetric
SM23 4500-N D	TKN by Phenate (W)
SM21 2540C	Total Dissolved Solids SM18 2540C
SM 5310B	Total Organic Carbon
SM21 2540D	Total Suspended Solids SM20 2540D

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Detectable Results Summary

Client Sample ID: **33066**
Lab Sample ID: 1204244001

	Parameter	Result	Units
Metals by ICP/MS	Calcium	63700	ug/L
	Hardness as CaCO3	178000	ug/L
	Iron	721	ug/L
	Magnesium	4550	ug/L
	Manganese	144	ug/L
	Potassium	3260	ug/L
	Sodium	4060	ug/L
Semivolatile Organic Fuels	Diesel Range Organics	0.206J	mg/L
	Residual Range Organics	0.300J	mg/L
Volatile Fuels	Benzene	0.800	ug/L
	Gasoline Range Organics	0.0331J	mg/L
Waters Department	Chloride	4370	ug/L
	Conductivity	349	umhos/cm
	Fluoride	55.0J	ug/L
	pH	7.7	pH units
	Sulfate	15500	ug/L
	Total Dissolved Solids	204000	ug/L
	Total Organic Carbon	1540	ug/L
	Total Suspended Solids	1520	ug/L

Client Sample ID: **33063**
Lab Sample ID: 1204244002

	Parameter	Result	Units
Metals by ICP/MS	Calcium	51100	ug/L
	Hardness as CaCO3	142000	ug/L
	Magnesium	3530	ug/L
	Manganese	105	ug/L
	Potassium	4460J	ug/L
	Sodium	6380	ug/L
Semivolatile Organic Fuels	Diesel Range Organics	0.206J	mg/L
	Residual Range Organics	0.175J	mg/L
Volatile Fuels	Benzene	0.150J	ug/L
	Gasoline Range Organics	0.0394J	mg/L
Waters Department	Chloride	5220	ug/L
	Conductivity	306	umhos/cm
	Fluoride	58.0J	ug/L
	pH	7.8	pH units
	Sulfate	11900	ug/L
	Total Dissolved Solids	181000	ug/L
	Total Organic Carbon	1200	ug/L

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Results of **33066**

Client Sample ID: **33066**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244001
Lab Project ID: 1204244

Collection Date: 08/13/20 17:21
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Metals by ICP/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Calcium	63700		500	150	ug/L	1		08/27/20 19:00
Chromium	1.00 U		2.00	0.800	ug/L	1		08/27/20 19:00
Iron	721		250	78.0	ug/L	1		08/27/20 19:00
Magnesium	4550		50.0	15.0	ug/L	1		08/27/20 19:00
Manganese	144		1.00	0.350	ug/L	1		08/27/20 19:00
Potassium	3260		500	150	ug/L	1		08/27/20 19:00
Sodium	4060		500	150	ug/L	1		08/27/20 19:00

Batch Information

Analytical Batch: MMS10864
Analytical Method: EP200.8
Analyst: DMM
Analytical Date/Time: 08/27/20 19:00
Container ID: 1204244001-G

Prep Batch: MXX33569
Prep Method: E200.2
Prep Date/Time: 08/24/20 17:36
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Hardness as CaCO3	178000		5000	5000	ug/L	1		08/27/20 19:00

Batch Information

Analytical Batch: MMS10864
Analytical Method: SM21 2340B
Analyst: DMM
Analytical Date/Time: 08/27/20 19:00
Container ID: 1204244001-G

Prep Batch: MXX33569
Prep Method: E200.2
Prep Date/Time: 08/24/20 17:36
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Print Date: 10/07/2020 2:35:55PM

J flagging is activated

Results of **33066**

Client Sample ID: **33066**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244001
Lab Project ID: 1204244

Collection Date: 08/13/20 17:21
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	0.206	J	0.577	0.173	mg/L	1		08/30/20 22:03
Surrogates								
5a Androstane (surr)	102		50-150		%	1		08/30/20 22:03

Batch Information

Analytical Batch: XFC15711
Analytical Method: AK102
Analyst: CDM
Analytical Date/Time: 08/30/20 22:03
Container ID: 1204244001-I

Prep Batch: XXX43681
Prep Method: SW3520C
Prep Date/Time: 08/18/20 19:25
Prep Initial Wt./Vol.: 260 mL
Prep Extract Vol: 1 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	0.300	J	0.481	0.144	mg/L	1		08/30/20 22:03
Surrogates								
n-Triacontane-d62 (surr)	114		50-150		%	1		08/30/20 22:03

Batch Information

Analytical Batch: XFC15711
Analytical Method: AK103
Analyst: CDM
Analytical Date/Time: 08/30/20 22:03
Container ID: 1204244001-I

Prep Batch: XXX43681
Prep Method: SW3520C
Prep Date/Time: 08/18/20 19:25
Prep Initial Wt./Vol.: 260 mL
Prep Extract Vol: 1 mL

Results of **33066**

Client Sample ID: **33066**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244001
Lab Project ID: 1204244

Collection Date: 08/13/20 17:21
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.0331	J	0.100	0.0310	mg/L	1		08/19/20 02:26
Surrogates								
4-Bromofluorobenzene (surr)	94.5		50-150		%	1		08/19/20 02:26

Batch Information

Analytical Batch: VFC15292
Analytical Method: AK101
Analyst: ALJ
Analytical Date/Time: 08/19/20 02:26
Container ID: 1204244001-N

Prep Batch: VXX36158
Prep Method: SW5030B
Prep Date/Time: 08/18/20 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.800		0.500	0.150	ug/L	1		08/19/20 02:26
Ethylbenzene	0.500	U	1.00	0.310	ug/L	1		08/19/20 02:26
o-Xylene	0.500	U	1.00	0.310	ug/L	1		08/19/20 02:26
P & M -Xylene	1.00	U	2.00	0.620	ug/L	1		08/19/20 02:26
Toluene	0.500	U	1.00	0.310	ug/L	1		08/19/20 02:26
Xylenes (total)	1.50	U	3.00	0.930	ug/L	1		08/19/20 02:26
Surrogates								
1,4-Difluorobenzene (surr)	102		77-115		%	1		08/19/20 02:26

Batch Information

Analytical Batch: VFC15292
Analytical Method: SW8021B
Analyst: ALJ
Analytical Date/Time: 08/19/20 02:26
Container ID: 1204244001-N

Prep Batch: VXX36158
Prep Method: SW5030B
Prep Date/Time: 08/18/20 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **33066**

Client Sample ID: **33066**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244001
Lab Project ID: 1204244

Collection Date: 08/13/20 17:21
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Oil & Grease HEM	2040	U	4080	1020	ug/L	1		08/27/20 09:11

Batch Information

Analytical Batch: THOG1363
Analytical Method: EPA 1664B
Analyst: EWW
Analytical Date/Time: 08/27/20 09:11
Container ID: 1204244001-O

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Chloride	4370		200	50.0	ug/L	1		08/24/20 19:50
Fluoride	55.0	J	200	50.0	ug/L	1		08/24/20 19:50
Sulfate	15500		200	50.0	ug/L	1		08/24/20 19:50

Batch Information

Analytical Batch: WIC6080
Analytical Method: EPA 300.0
Analyst: DMM
Analytical Date/Time: 08/24/20 19:50
Container ID: 1204244001-F

Prep Batch: WXX13413
Prep Method: METHOD
Prep Date/Time: 08/24/20 12:45
Prep Initial Wt./Vol.: 10 mL
Prep Extract Vol: 10 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Organic Carbon	1540		1000	400	ug/L	1		08/18/20 22:16

Batch Information

Analytical Batch: WTC3028
Analytical Method: SM 5310B
Analyst: EWW
Analytical Date/Time: 08/18/20 22:16
Container ID: 1204244001-E

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Conductivity	349		5.00	1.50	umhos/cm	1		08/17/20 16:16

Print Date: 10/07/2020 2:35:55PM

J flagging is activated

Results of **33066**

Client Sample ID: **33066**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244001
Lab Project ID: 1204244

Collection Date: 08/13/20 17:21
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Batch Information

Analytical Batch: WTI5463
Analytical Method: SM21 2510B
Analyst: EWW
Analytical Date/Time: 08/17/20 16:16
Container ID: 1204244001-F

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Dissolved Solids	204000		10000	3100	ug/L	1		08/19/20 17:06

Batch Information

Analytical Batch: STS6774
Analytical Method: SM21 2540C
Analyst: S.S
Analytical Date/Time: 08/19/20 17:06
Container ID: 1204244001-F

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Suspended Solids	1520		952	295	ug/L	1		08/17/20 17:10

Batch Information

Analytical Batch: STS6772
Analytical Method: SM21 2540D
Analyst: S.S
Analytical Date/Time: 08/17/20 17:10
Container ID: 1204244001-H

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
pH	7.7		0.100	0.100	pH units	1		08/17/20 16:16

Batch Information

Analytical Batch: WTI5462
Analytical Method: SM21 4500-H B
Analyst: EWW
Analytical Date/Time: 08/17/20 16:16
Container ID: 1204244001-F

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed

Print Date: 10/07/2020 2:35:55PM

J flagging is activated

Results of **33066**

Client Sample ID: **33066**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244001
Lab Project ID: 1204244

Collection Date: 08/13/20 17:21
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Nitrate/Nitrite-N	100 U		200	50.0	ug/L	2		08/17/20 19:51

Batch Information

Analytical Batch: WFI2885
Analytical Method: SM21 4500NO3-F
Analyst: EWW
Analytical Date/Time: 08/17/20 19:51
Container ID: 1204244001-K

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Kjeldahl Nitrogen	500 U		1000	310	ug/L	1		08/26/20 16:04

Batch Information

Analytical Batch: WDA4841
Analytical Method: SM23 4500-N D
Analyst: EWW
Analytical Date/Time: 08/26/20 16:04
Container ID: 1204244001-K

Prep Batch: WXX13415
Prep Method: METHOD
Prep Date/Time: 08/26/20 10:13
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Sulfide	50.0 U		100	31.0	ug/L	1		08/19/20 17:02

Batch Information

Analytical Batch: WAT11576
Analytical Method: SM23 4500S D
Analyst: EWW
Analytical Date/Time: 08/19/20 17:02
Container ID: 1204244001-Q

Results of **33063**

Client Sample ID: **33063**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244002
Lab Project ID: 1204244

Collection Date: 08/13/20 19:25
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Metals by ICP/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Calcium	51100		5000	1500	ug/L	10		08/27/20 19:30
Chromium	10.0	U	20.0	8.00	ug/L	10		08/27/20 19:30
Iron	1250	U	2500	780	ug/L	10		08/27/20 19:30
Magnesium	3530		500	150	ug/L	10		08/27/20 19:30
Manganese	105		10.0	3.50	ug/L	10		08/27/20 19:30
Potassium	4460	J	5000	1500	ug/L	10		08/27/20 19:30
Sodium	6380		5000	1500	ug/L	10		08/27/20 19:30

Batch Information

Analytical Batch: MMS10864
Analytical Method: EP200.8
Analyst: DMM
Analytical Date/Time: 08/27/20 19:30
Container ID: 1204244002-G

Prep Batch: MXX33569
Prep Method: E200.2
Prep Date/Time: 08/24/20 17:36
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Hardness as CaCO3	142000		50000	50000	ug/L	10		08/27/20 19:30

Batch Information

Analytical Batch: MMS10864
Analytical Method: SM21 2340B
Analyst: DMM
Analytical Date/Time: 08/27/20 19:30
Container ID: 1204244002-G

Prep Batch: MXX33569
Prep Method: E200.2
Prep Date/Time: 08/24/20 17:36
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Print Date: 10/07/2020 2:35:55PM

J flagging is activated

Results of **33063**

Client Sample ID: **33063**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244002
Lab Project ID: 1204244

Collection Date: 08/13/20 19:25
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	0.206	J	0.556	0.167	mg/L	1		08/30/20 22:12
Surrogates								
5a Androstane (surr)	105		50-150		%	1		08/30/20 22:12

Batch Information

Analytical Batch: XFC15711
Analytical Method: AK102
Analyst: CDM
Analytical Date/Time: 08/30/20 22:12
Container ID: 1204244002-I

Prep Batch: XXX43681
Prep Method: SW3520C
Prep Date/Time: 08/18/20 19:25
Prep Initial Wt./Vol.: 270 mL
Prep Extract Vol: 1 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	0.175	J	0.463	0.139	mg/L	1		08/30/20 22:12
Surrogates								
n-Triacontane-d62 (surr)	112		50-150		%	1		08/30/20 22:12

Batch Information

Analytical Batch: XFC15711
Analytical Method: AK103
Analyst: CDM
Analytical Date/Time: 08/30/20 22:12
Container ID: 1204244002-I

Prep Batch: XXX43681
Prep Method: SW3520C
Prep Date/Time: 08/18/20 19:25
Prep Initial Wt./Vol.: 270 mL
Prep Extract Vol: 1 mL

Print Date: 10/07/2020 2:35:55PM

J flagging is activated

Results of **33063**

Client Sample ID: **33063**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244002
Lab Project ID: 1204244

Collection Date: 08/13/20 19:25
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.0394	J	0.100	0.0310	mg/L	1		08/19/20 02:44
Surrogates								
4-Bromofluorobenzene (surr)	95.3		50-150		%	1		08/19/20 02:44

Batch Information

Analytical Batch: VFC15292
Analytical Method: AK101
Analyst: ALJ
Analytical Date/Time: 08/19/20 02:44
Container ID: 1204244002-L

Prep Batch: VXX36158
Prep Method: SW5030B
Prep Date/Time: 08/18/20 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.150	J	0.500	0.150	ug/L	1		08/19/20 02:44
Ethylbenzene	0.500	U	1.00	0.310	ug/L	1		08/19/20 02:44
o-Xylene	0.500	U	1.00	0.310	ug/L	1		08/19/20 02:44
P & M -Xylene	1.00	U	2.00	0.620	ug/L	1		08/19/20 02:44
Toluene	0.500	U	1.00	0.310	ug/L	1		08/19/20 02:44
Xylenes (total)	1.50	U	3.00	0.930	ug/L	1		08/19/20 02:44
Surrogates								
1,4-Difluorobenzene (surr)	102		77-115		%	1		08/19/20 02:44

Batch Information

Analytical Batch: VFC15292
Analytical Method: SW8021B
Analyst: ALJ
Analytical Date/Time: 08/19/20 02:44
Container ID: 1204244002-L

Prep Batch: VXX36158
Prep Method: SW5030B
Prep Date/Time: 08/18/20 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Results of **33063**

Client Sample ID: **33063**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244002
Lab Project ID: 1204244

Collection Date: 08/13/20 19:25
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Oil & Grease HEM	2020	U	4040	1010	ug/L	1		08/27/20 09:11

Batch Information

Analytical Batch: THOG1363
Analytical Method: EPA 1664B
Analyst: EWW
Analytical Date/Time: 08/27/20 09:11
Container ID: 1204244002-O

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Chloride	5220		200	50.0	ug/L	1		08/24/20 20:29
Fluoride	58.0	J	200	50.0	ug/L	1		08/24/20 20:29
Sulfate	11900		200	50.0	ug/L	1		08/24/20 20:29

Batch Information

Analytical Batch: WIC6080
Analytical Method: EPA 300.0
Analyst: DMM
Analytical Date/Time: 08/24/20 20:29
Container ID: 1204244002-F

Prep Batch: WXX13413
Prep Method: METHOD
Prep Date/Time: 08/24/20 12:45
Prep Initial Wt./Vol.: 10 mL
Prep Extract Vol: 10 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Organic Carbon	1200		1000	400	ug/L	1		08/18/20 22:30

Batch Information

Analytical Batch: WTC3028
Analytical Method: SM 5310B
Analyst: EWW
Analytical Date/Time: 08/18/20 22:30
Container ID: 1204244002-E

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Conductivity	306		5.00	1.50	umhos/cm	1		08/17/20 16:25

Print Date: 10/07/2020 2:35:55PM

J flagging is activated

Results of **33063**

Client Sample ID: **33063**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244002
Lab Project ID: 1204244

Collection Date: 08/13/20 19:25
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Batch Information

Analytical Batch: WTI5463
Analytical Method: SM21 2510B
Analyst: EWW
Analytical Date/Time: 08/17/20 16:25
Container ID: 1204244002-F

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Dissolved Solids	181000		10000	3100	ug/L	1		08/19/20 17:06

Batch Information

Analytical Batch: STS6774
Analytical Method: SM21 2540C
Analyst: S.S
Analytical Date/Time: 08/19/20 17:06
Container ID: 1204244002-F

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Suspended Solids	500 U		1000	310	ug/L	1		08/17/20 17:10

Batch Information

Analytical Batch: STS6772
Analytical Method: SM21 2540D
Analyst: S.S
Analytical Date/Time: 08/17/20 17:10
Container ID: 1204244002-H

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
pH	7.8		0.100	0.100	pH units	1		08/17/20 16:25

Batch Information

Analytical Batch: WTI5462
Analytical Method: SM21 4500-H B
Analyst: EWW
Analytical Date/Time: 08/17/20 16:25
Container ID: 1204244002-F

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed

Print Date: 10/07/2020 2:35:55PM

J flagging is activated

Results of **33063**

Client Sample ID: **33063**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244002
Lab Project ID: 1204244

Collection Date: 08/13/20 19:25
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Nitrate/Nitrite-N	100	U	200	50.0	ug/L	2		08/17/20 19:52

Batch Information

Analytical Batch: WFI2885
Analytical Method: SM21 4500NO3-F
Analyst: EWW
Analytical Date/Time: 08/17/20 19:52
Container ID: 1204244002-K

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Kjeldahl Nitrogen	500	U	1000	310	ug/L	1		08/26/20 16:05

Batch Information

Analytical Batch: WDA4841
Analytical Method: SM23 4500-N D
Analyst: EWW
Analytical Date/Time: 08/26/20 16:05
Container ID: 1204244002-K

Prep Batch: WXX13415
Prep Method: METHOD
Prep Date/Time: 08/26/20 10:13
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Sulfide	50.0	U	100	31.0	ug/L	1		08/19/20 17:02

Batch Information

Analytical Batch: WAT11576
Analytical Method: SM23 4500S D
Analyst: EWW
Analytical Date/Time: 08/19/20 17:02
Container ID: 1204244002-Q

Print Date: 10/07/2020 2:35:55PM

J flagging is activated

Results of **Trip Blank**

Client Sample ID: **Trip Blank**
Client Project ID: **102896-005 Yakutat ALT. Water**
Lab Sample ID: 1204244003
Lab Project ID: 1204244

Collection Date: 08/13/20 17:21
Received Date: 08/14/20 16:46
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.0500	U	0.100	0.0310	mg/L	1		08/18/20 22:19
Surrogates								
4-Bromofluorobenzene (surr)	99		50-150		%	1		08/18/20 22:19

Batch Information

Analytical Batch: VFC15292
Analytical Method: AK101
Analyst: ALJ
Analytical Date/Time: 08/18/20 22:19
Container ID: 1204244003-A

Prep Batch: VXX36158
Prep Method: SW5030B
Prep Date/Time: 08/18/20 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.250	U	0.500	0.150	ug/L	1		08/18/20 22:19
Ethylbenzene	0.500	U	1.00	0.310	ug/L	1		08/18/20 22:19
o-Xylene	0.500	U	1.00	0.310	ug/L	1		08/18/20 22:19
P & M -Xylene	1.00	U	2.00	0.620	ug/L	1		08/18/20 22:19
Toluene	0.500	U	1.00	0.310	ug/L	1		08/18/20 22:19
Xylenes (total)	1.50	U	3.00	0.930	ug/L	1		08/18/20 22:19
Surrogates								
1,4-Difluorobenzene (surr)	101		77-115		%	1		08/18/20 22:19

Batch Information

Analytical Batch: VFC15292
Analytical Method: SW8021B
Analyst: ALJ
Analytical Date/Time: 08/18/20 22:19
Container ID: 1204244003-A

Prep Batch: VXX36158
Prep Method: SW5030B
Prep Date/Time: 08/18/20 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Method Blank

Blank ID: MB for HBN 1810779 [MXX/33569]
Blank Lab ID: 1576892

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **EP200.8**

Parameter	Results	LOQ/CL	DL	Units
Calcium	250U	500	150	ug/L
Chromium	1.00U	2.00	0.800	ug/L
Iron	125U	250	78.0	ug/L
Magnesium	25.0U	50.0	15.0	ug/L
Manganese	0.500U	1.00	0.350	ug/L
Potassium	250U	500	150	ug/L
Sodium	250U	500	150	ug/L

Batch Information

Analytical Batch: MMS10864
Analytical Method: EP200.8
Instrument: Perkin Elmer Nexlon P5
Analyst: DMM
Analytical Date/Time: 8/27/2020 6:51:24PM

Prep Batch: MXX33569
Prep Method: E200.2
Prep Date/Time: 8/24/2020 5:36:54PM
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [MXX33569]
Blank Spike Lab ID: 1576893
Date Analyzed: 08/27/2020 18:54

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **EP200.8**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Calcium	10000	10700	107	(85-115)
Chromium	400	439	110	(85-115)
Iron	5000	5570	111	(85-115)
Magnesium	10000	10800	108	(85-115)
Manganese	500	521	104	(85-115)
Potassium	10000	10700	107	(85-115)
Sodium	10000	10800	108	(85-115)

Batch Information

Analytical Batch: **MMS10864**
Analytical Method: **EP200.8**
Instrument: **Perkin Elmer Nexlon P5**
Analyst: **DMM**

Prep Batch: **MXX33569**
Prep Method: **E200.2**
Prep Date/Time: **08/24/2020 17:36**
Spike Init Wt./Vol.: 10000 ug/L Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Matrix Spike Summary

Original Sample ID: 1576895
MS Sample ID: 1576896 MS
MSD Sample ID:

Analysis Date: 08/27/2020 19:00
Analysis Date: 08/27/2020 19:03
Analysis Date:
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **EP200.8**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Calcium	63700	10000	71600	79				70-130		
Chromium	1.00U	400	415	104				70-130		
Iron	721	5000	6000	106				70-130		
Magnesium	4550	10000	14500	99				70-130		
Manganese	144	500	632	98				70-130		
Potassium	3260	10000	14100	108				70-130		
Sodium	4060	10000	14300	103				70-130		

Batch Information

Analytical Batch: MMS10864
Analytical Method: EP200.8
Instrument: Perkin Elmer Nexlon P5
Analyst: DMM
Analytical Date/Time: 8/27/2020 7:03:21PM

Prep Batch: MXX33569
Prep Method: DW Digest for Metals on ICP-MS
Prep Date/Time: 8/24/2020 5:36:54PM
Prep Initial Wt./Vol.: 20.00mL
Prep Extract Vol: 50.00mL

Print Date: 10/07/2020 2:36:02PM

Matrix Spike Summary

Original Sample ID: 1576897
MS Sample ID: 1576898 MS
MSD Sample ID:

QC for Samples: 1204244002

Analysis Date: 08/27/2020 19:06
Analysis Date: 08/27/2020 19:09
Analysis Date:
Matrix: Water (Surface, Eff., Ground)

Results by **EP200.8**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Calcium	100000	10000	112000	121				70-130		
Chromium	5.48	400	476	118				70-130		
Iron	538	5000	6170	113				70-130		
Magnesium	282000	10000	293000	111				70-130		
Manganese	104	500	692	118				70-130		
Potassium	85300	10000	96100	108				70-130		
Sodium	250U	10000	306000	3060 *				70-130		

Batch Information

Analytical Batch: MMS10864
Analytical Method: EP200.8
Instrument: Perkin Elmer Nexlon P5
Analyst: DMM
Analytical Date/Time: 8/27/2020 7:09:19PM

Prep Batch: MXX33569
Prep Method: DW Digest for Metals on ICP-MS
Prep Date/Time: 8/24/2020 5:36:54PM
Prep Initial Wt./Vol.: 20.00mL
Prep Extract Vol: 50.00mL

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Method Blank

Blank ID: MB for HBN 1810398 [STS/6772]
Blank Lab ID: 1575146

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **SM21 2540D**

Parameter	Results	LOQ/CL	DL	Units
Total Suspended Solids	500U	1000	310	ug/L

Batch Information

Analytical Batch: STS6772
Analytical Method: SM21 2540D
Instrument:
Analyst: S.S
Analytical Date/Time: 8/17/2020 5:10:20PM

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Duplicate Sample Summary

Original Sample ID: 1204120011
Duplicate Sample ID: 1575149
QC for Samples:

Analysis Date: 08/17/2020 17:10
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2540D**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Suspended Solids	108000	123077	ug/L	13.30*	(< 5)

Batch Information

Analytical Batch: STS6772
Analytical Method: SM21 2540D
Instrument:
Analyst: S.S

Print Date: 10/07/2020 2:36:08PM

Duplicate Sample Summary

Original Sample ID: 1204237001
Duplicate Sample ID: 1575150
QC for Samples:
1204244001, 1204244002

Analysis Date: 08/17/2020 17:10
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2540D**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Suspended Solids	51000	60000	ug/L	16.20*	(< 5)

Batch Information

Analytical Batch: STS6772
Analytical Method: SM21 2540D
Instrument:
Analyst: S.S

Print Date: 10/07/2020 2:36:08PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [STS6772]
Blank Spike Lab ID: 1575147
Date Analyzed: 08/17/2020 17:10

Spike Duplicate ID: LCSD for HBN 1204244 [STS6772]
Spike Duplicate Lab ID: 1575148
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM21 2540D**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Suspended Solids	25000	24900	100	25000	25100	100	(75-125)	0.80	(< 5)

Batch Information

Analytical Batch: **STS6772**
Analytical Method: **SM21 2540D**
Instrument:
Analyst: **S.S**

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Method Blank

Blank ID: MB for HBN 1810390 [STS/6772]
Blank Lab ID: 1373718

5 4 for SaQCmp:
1e02e22001s1e02e2200e

Ma,rti : x a,mr VS(rfaumscffEs. ro(nGd

) mp(l,p bR SM21 2540C

OaraQmmr	) mp(l,p	LU5 /4 L	DL	y nt,p
To,al DtppolPmG SoltGp	3000y	10000	9100	(g/L

Batch Information

AnalRtual Ba,uh: STS6772
AnalRtual MmhoG SMe1 e3204
Inp,r(Qmn,:
AnalRp,: SES
AnalRtual Da,mTtQm 8/1v/e0e0 3:06:98OM

Ortn, Da,m 10/07/e0e0 e:96:1eOM

Duplicate Sample Summary

Original Sample ID: 1204302004
Duplicate Sample ID: 1575721
QC for Samples:
1204244001, 1204244002

Analysis Date: 08/19/2020 17:06
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2540C**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Dissolved Solids	378000	370000	ug/L	2.10	(< 5)

Batch Information

Analytical Batch: STS6774
Analytical Method: SM21 2540C
Instrument:
Analyst: S.S

Print Date: 10/07/2020 2:36:13PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [STS6774]
Blank Spike Lab ID: 157571t
DaAe y nalzde8: 0/ u1t u2020 17:06

Spike DcpliRaAe ID: LCSD for HBN 1204244 [STS6774]
Spike DcpliRaAe Lab ID: 1575720
x aAiW (aAer ,ScrfaReE. ffGE) rocn8P

- C for Sa%pleM 1204244001E1204244002

s eMtlAMbz **SM21 2540C**

	Blank Spike ,cQLLP			Spike DcpliRaAe ,cQLLP					
mara%eAer	Spike	s eMtlA	s eR,g P	Spike	s eMtlA	s eR,g P	CL	s mD ,g P	s mD CL
ToAal DiMvol<e8 Soli8M	999000	905000	t 2	999000	906000	t 2	, 75h125 P	0G99	,3 5 P

Batch Information

y nalzARal BaARv: **STS6774**
y nalzARal x eAvo8: **SM21 2540C**
InMkc%enA
y nalzMA **S.S**

Method Blank

Blank ID: MB for HBN 1810898 [THOG/1363]
Blank Lab ID: 1577474

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **EPA 1664B**

Parameter	Results	LOQ/CL	DL	Units
Oil & Grease HEM	2000U	4000	1000	ug/L

Batch Information

Analytical Batch: THOG1363
Analytical Method: EPA 1664B
Instrument:
Analyst: EWW
Analytical Date/Time: 8/27/2020 9:11:25AM

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [THOG1363]
Blank Spike Lab ID: 1577475
Date Analyzed: 08/27/2020 09:11

Spike Duplicate ID: LCSD for HBN 1204244 [THOG1363]
Spike Duplicate Lab ID: 1577476
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **EPA 1664B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Oil & Grease HEM	40000	37400	94	40000	36400	91	(78-114)	2.70	(< 18)

Batch Information

Analytical Batch: **THOG1363**
Analytical Method: **EPA 1664B**
Instrument:
Analyst: **EWW**

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Matrix Spike Summary

Original Sample ID: 1577477
MS Sample ID: 1577478 MS
MSD Sample ID:

Analysis Date: 08/27/2020 9:11
Analysis Date: 08/27/2020 9:11
Analysis Date:
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **EPA 1664B**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Oil & Grease HEM	14700	43000	48900	80				78-114		

Batch Information

Analytical Batch: THOG1363
Analytical Method: EPA 1664B
Instrument:
Analyst: EWW
Analytical Date/Time: 8/27/2020 9:11:25AM

Print Date: 10/07/2020 2:36:21PM

Method Blank

Blank ID: MB for HBN 1810541 [VXX/36158]
Blank Lab ID: 1575761

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002, 1204244003

Results by **AK101**

Parameter	Results	LOQ/CL	DL	Units
Gasoline Range Organics	0.0500U	0.100	0.0310	mg/L
Surrogates				
4-Bromofluorobenzene (surr)	96.8	50-150		%

Batch Information

Analytical Batch: VFC15292
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: ALJ
Analytical Date/Time: 8/18/2020 12:35:00PM

Prep Batch: VXX36158
Prep Method: SW5030B
Prep Date/Time: 8/18/2020 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [VXX36158]
Blank Spike Lab ID: 1575764
Date Analyzed: 08/18/2020 13:28

Spike Duplicate ID: LCSD for HBN 1204244 [VXX36158]
Spike Duplicate Lab ID: 1575765
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002, 1204244003

Results by **AK101**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Gasoline Range Organics	1.00	1.09	109	1.00	1.02	102	(60-120)	6.70	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	0.0500	109	109	0.0500	106	106	(50-150)	2.50	

Batch Information

Analytical Batch: **VFC15292**
Analytical Method: **AK101**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ALJ**

Prep Batch: **VXX36158**
Prep Method: **SW5030B**
Prep Date/Time: **08/18/2020 06:00**
Spike Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1810541 [VXX/36158]
Blank Lab ID: 1575761

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002, 1204244003

Results by **SW8021B**

Parameter	Results	LOQ/CL	DL	Units
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Xylenes (total)	1.50U	3.00	0.930	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	100	77-115		%

Batch Information

Analytical Batch: VFC15292
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: ALJ
Analytical Date/Time: 8/18/2020 12:35:00PM

Prep Batch: VXX36158
Prep Method: SW5030B
Prep Date/Time: 8/18/2020 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [VXX36158]
Blank Spike Lab ID: 1575762
Date Analyzed: 08/18/2020 13:10

Spike Duplicate ID: LCSD for HBN 1204244 [VXX36158]
Spike Duplicate Lab ID: 1575763
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002, 1204244003

Results by **SW8021B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Benzene	100	97.9	98	100	107	107	(80-120)	9.10	(< 20)
Ethylbenzene	100	97.5	98	100	103	103	(75-125)	5.20	(< 20)
o-Xylene	100	103	103	100	108	108	(80-120)	4.80	(< 20)
P & M -Xylene	200	200	100	200	210	105	(75-130)	4.70	(< 20)
Toluene	100	92.8	93	100	99.1	99	(75-120)	6.60	(< 20)
Xylenes (total)	300	303	101	300	318	106	(79-121)	4.80	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	50	108	108	50	108	108	(77-115)	0.00	

Batch Information

Analytical Batch: **VFC15292**
Analytical Method: **SW8021B**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ALJ**

Prep Batch: **VXX36158**
Prep Method: **SW5030B**
Prep Date/Time: **08/18/2020 06:00**
Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1810531 [WAT/11576]
Blank Lab ID: 1575722

Matrix: Drinking Water

QC for Samples:
1204244001, 1204244002

Results by **SM23 4500S D**

Parameter	Results	LOQ/CL	DL	Units
Sulfide	50.0U	100	31.0	ug/L

Batch Information

Analytical Batch: WAT11576
Analytical Method: SM23 4500S D
Instrument:
Analyst: EWW
Analytical Date/Time: 8/19/2020 5:02:10PM

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [WAT11576]
Blank Spike Lab ID: 1575723
Date Analyzed: 08/19/2020 17:02

Matrix: Drinking Water

QC for Samples: 1204244001, 1204244002

Results by **SM23 4500S D**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Sulfide	499	380	76	(75-125)

Batch Information

Analytical Batch: **WAT11576**
Analytical Method: **SM23 4500S D**
Instrument:
Analyst: **EWW**

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Matrix Spike Summary

Original Sample ID: 1204244001
MS Sample ID: 1575725 MS
MSD Sample ID: 1575726 MSD

Analysis Date: 08/19/2020 17:02
Analysis Date: 08/19/2020 17:02
Analysis Date: 08/19/2020 17:02
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM23 4500S D**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Sulfide	50.0U	499	390	78	499	380	76	75-125	2.60	(< 25)

Batch Information

Analytical Batch: WAT11576
Analytical Method: SM23 4500S D
Instrument:
Analyst: EWW
Analytical Date/Time: 8/19/2020 5:02:10PM

Print Date: 10/07/2020 2:36:35PM

Method Blank

Blank ID: MB for HBN 1810420 (WFI/2885)
Blank Lab ID: 1575285

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **SM21 4500NO3-F**

Parameter	Results	LOQ/CL	DL	Units
Nitrate-N	100U	200	50.0	ug/L
Nitrite-N	100U	200	50.0	ug/L
Total Nitrate/Nitrite-N	100U	200	50.0	ug/L

Batch Information

Analytical Batch: WFI2885
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 8/17/2020 7:10:54PM

Method Blank

Blank ID: MB for HBN 1810420 (WFI/2885)
Blank Lab ID: 1575287

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **SM21 4500NO3-F**

Parameter	Results	LOQ/CL	DL	Units
Nitrate-N	100U	200	50.0	ug/L
Nitrite-N	100U	200	50.0	ug/L
Total Nitrate/Nitrite-N	100U	200	50.0	ug/L

Batch Information

Analytical Batch: WFI2885
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 8/17/2020 7:56:23PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [WFI2885]
Blank Spike Lab ID: 1575284
Date Analyzed: 08/17/2020 19:09

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM21 4500NO3-F**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Nitrate-N	2500	2420	97	(70-130)
Nitrite-N	2500	2570	103	(90-110)
Total Nitrate/Nitrite-N	5000	4990	100	(90-110)

Batch Information

Analytical Batch: **WFI2885**
Analytical Method: **SM21 4500NO3-F**
Instrument: **Astoria segmented flow**
Analyst: **EWW**

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [WFI2885]
Blank Spike Lab ID: 1575286
Date Analyzed: 08/17/2020 19:54

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM21 4500NO3-F**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Nitrate-N	2500	2380	95	(70-130)
Nitrite-N	2500	2570	103	(90-110)
Total Nitrate/Nitrite-N	5000	4950	99	(90-110)

Batch Information

Analytical Batch: **WFI2885**
Analytical Method: **SM21 4500NO3-F**
Instrument: **Astoria segmented flow**
Analyst: **EWW**

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Matrix Spike Summary

Original Sample ID: 1204191001
MS Sample ID: 1575235 MS
MSD Sample ID: 1575236 MSD

Analysis Date: 08/17/2020 18:21
Analysis Date: 08/17/2020 18:23
Analysis Date: 08/17/2020 18:25
Matrix: Drinking Water

QC for Samples:

Results by **SM21 4500NO3-F**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Nitrate/Nitrite-N	200U	5000	5070	101	5000	5100	102	90-110	0.42	(< 25)

Batch Information

Analytical Batch: WFI2885
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 8/17/2020 6:23:39PM

Print Date: 10/07/2020 2:36:40PM

Matrix Spike Summary

Original Sample ID: 1204270001
MS Sample ID: 1575237 MS
MSD Sample ID: 1575238 MSD

Analysis Date: 08/17/2020 20:05
Analysis Date: 08/17/2020 20:06
Analysis Date: 08/17/2020 20:08
Matrix: Drinking Water

QC for Samples: 1204244001, 1204244002

Results by **SM21 4500NO3-F**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Nitrate/Nitrite-N	200U	5000	5290	106	5000	5440	109	90-110	2.70	(< 25)

Batch Information

Analytical Batch: WFI2885
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 8/17/2020 8:06:54PM

Print Date: 10/07/2020 2:36:40PM

Matrix Spike Summary

Original Sample ID: 1209562009
MS Sample ID: 1575239 MS
MSD Sample ID: 1575240 MSD

Analysis Date: 08/17/2020 19:14
Analysis Date: 08/17/2020 19:16
Analysis Date: 08/17/2020 19:17
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM21 4500NO3-F**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Nitrate/Nitrite-N	693	5000	5770	102	5000	5930	105	90-110	2.60	(< 25)

Batch Information

Analytical Batch: WFI2885
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 8/17/2020 7:16:09PM

Print Date: 10/07/2020 2:36:40PM

Method Blank

Blank ID: MB for HBN 1810548 [WTC/3028]
Blank Lab ID: 1575789

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **SM 5310B**

Parameter	Results	LOQ/CL	DL	Units
Total Organic Carbon	500U	1000	400	ug/L

Batch Information

Analytical Batch: WTC3028
Analytical Method: SM 5310B
Instrument: TOC Analyzer 2
Analyst: EWW
Analytical Date/Time: 8/18/2020 8:20:48PM

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [WTC3028]
Blank Spike Lab ID: 1575787
Date Analyzed: 08/18/2020 20:06

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM 5310B**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Total Organic Carbon	75000	73600	98	(80-120)

Batch Information

Analytical Batch: **WTC3028**
Analytical Method: **SM 5310B**
Instrument: **TOC Analyzer 2**
Analyst: **EWW**

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Matrix Spike Summary

Original Sample ID: 1204110001
MS Sample ID: 1575790 MS
MSD Sample ID: 1575791 MSD

Analysis Date: 08/18/2020 20:36
Analysis Date: 08/18/2020 20:51
Analysis Date: 08/18/2020 21:05
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM 5310B**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Organic Carbon	4170	10000	13700	96	10000	14200	100	75-125	3.40	(< 25)

Batch Information

Analytical Batch: WTC3028
Analytical Method: SM 5310B
Instrument: TOC Analyzer 2
Analyst: EWW
Analytical Date/Time: 8/18/2020 8:51:17PM

Print Date: 10/07/2020 2:36:45PM

Duplicate Sample Summary

Original Sample ID: 1204076001
Duplicate Sample ID: 1575209
QC for Samples:
1204244001, 1204244002

Analysis Date: 08/17/2020 13:28
Matrix: Drinking Water

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	8.0	8.00	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI5462
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: EWW

Print Date: 10/07/2020 2:36:47PM

Duplicate Sample Summary

Original Sample ID: 1204118001
Duplicate Sample ID: 1575210
QC for Samples:
1204244001, 1204244002

Analysis Date: 08/17/2020 13:46
Matrix: Drinking Water

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	7.2	7.20	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI5462
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: EWW

Print Date: 10/07/2020 2:36:47PM

Duplicate Sample Summary

Original Sample ID: 1204247001
Duplicate Sample ID: 1575211
QC for Samples:
1204244001, 1204244002

Analysis Date: 08/17/2020 15:34
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	8.1	8.10	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI5462
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: EWW

Print Date: 10/07/2020 2:36:47PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [WTI5462]
Blank Spike Lab ID: 1575206
Date Analyzed: 08/17/2020 10:20

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM21 4500-H B**

Blank Spike (pH units)

Parameter	Spike	Result	Rec (%)	CL
pH	6.99	7.00	100	(99-101)

Batch Information

Analytical Batch: **WTI5462**
Analytical Method: **SM21 4500-H B**
Instrument: **Titration**
Analyst: **EWW**

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Method Blank

Blank ID: MB for HBN 1810418 [WTI/5463]
Blank Lab ID: 1575212

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **SM21 2510B**

Parameter	Results	LOQ/CL	DL	Units
Conductivity	2.00J	5.00	1.50	umhos/cm

Batch Information

Analytical Batch: WTI5463
Analytical Method: SM21 2510B
Instrument: Titration
Analyst: EWW
Analytical Date/Time: 8/17/2020 10:49:12AM

Duplicate Sample Summary

Original Sample ID: 1204118001
Duplicate Sample ID: 1575216
QC for Samples:
1204244001, 1204244002

Analysis Date: 08/17/2020 13:46
Matrix: Drinking Water

Results by **SM21 2510B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Conductivity	94.6	94.5	umhos/cm	0.11	(< 20)

Batch Information

Analytical Batch: WTI5463
Analytical Method: SM21 2510B
Instrument: Titration
Analyst: EWW

Print Date: 10/07/2020 2:36:52PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [WTI546] b
Blank Spike La7 ID: 15t 521]
DaAe y nalzde8: 0/ R1t R2020 0s:42

(aAic: WaAer ,SxrfaEe. Gff). Proxn8m

h C for SaQpleM 1204244001. 1204244002

u eMxlAM7z **SM21 2510B**

Blank Spike ,xQ- oMREQm

%araQeAer	Spike	u eMxlA	u eE,9 m	CL
Con8xEA3iAz	s)24	10)1	10s	, s0v110 m

Batch Information

y nalzAEal BaAE- : **WTI5463**
y nalzAEal (eA o8: **SM21 2510B**
InMAxQenA **Titration**
y nalzMA **EWW**

%rinADaAe: 10R3t R2020 2:] 6:5] %(

Method Blank

Blank ID: MB for HBN 1810795 [WXX/13413]
Blank Lab ID: 1577010

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **EPA 300.0**

Parameter	Results	LOQ/CL	DL	Units
Chloride	100U	200	50.0	ug/L
Fluoride	100U	200	50.0	ug/L
Sulfate	58.0J	200	50.0	ug/L

Batch Information

Analytical Batch: WIC6080
Analytical Method: EPA 300.0
Instrument: 930 Metrohm compact IC flex
Analyst: DMM
Analytical Date/Time: 8/24/2020 2:07:57PM

Prep Batch: WXX13413
Prep Method: METHOD
Prep Date/Time: 8/24/2020 12:45:00PM
Prep Initial Wt./Vol.: 10 mL
Prep Extract Vol: 10 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [WXX13413]
Blank Spike Lab ID: 1577011
Date Analyzed: 08/24/2020 14:27

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **EPA 300.0**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Chloride	5000	5040	101	(90-110)
Fluoride	5000	5120	102	(90-110)
Sulfate	5000	5410	108	(90-110)

Batch Information

Analytical Batch: **WIC6080**
Analytical Method: **EPA 300.0**
Instrument: **930 Metrohm compact IC flex**
Analyst: **DMM**

Prep Batch: **WXX13413**
Prep Method: **METHOD**
Prep Date/Time: **08/24/2020 12:45**
Spike Init Wt./Vol.: 5000 ug/L Extract Vol: 10 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 10/07/2020 2:36:57PM

Matrix Spike Summary

Original Sample ID: 1577013
MS Sample ID: 1577014 MS
MSD Sample ID:

Analysis Date: 08/24/2020 15:05
Analysis Date: 08/24/2020 15:24
Analysis Date:
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **EPA 300.0**

		Matrix Spike (ug/L)				Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)		Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Chloride	1630	5000	6690	101					90-110		
Fluoride	120J	5000	4890	95					90-110		
Sulfate	15300	5000	19500	84	*				90-110		

Batch Information

Analytical Batch: WIC6080
Analytical Method: EPA 300.0
Instrument: 930 Metrohm compact IC flex
Analyst: DMM
Analytical Date/Time: 8/24/2020 3:24:15PM

Prep Batch: WXX13413
Prep Method: EPA 300.0 Extraction Waters/Liquids
Prep Date/Time: 8/24/2020 12:45:00PM
Prep Initial Wt./Vol.: 10.00mL
Prep Extract Vol: 10.00mL

Print Date: 10/07/2020 2:36:59PM

Matrix Spike Summary

Original Sample ID: 1577015
MS Sample ID: 1577017 MS
MSD Sample ID:

Analysis Date: 08/24/2020 18:53
Analysis Date: 08/25/2020 9:25
Analysis Date:
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **EPA 300.0**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Chloride	1720	5000	6830	102				90-110		
Fluoride	98.0J	5000	4760	93				90-110		
Sulfate	1280	5000	6340	101				90-110		

Batch Information

Analytical Batch: WIC6080
Analytical Method: EPA 300.0
Instrument: 930 Metrohm compact IC flex
Analyst: DMM
Analytical Date/Time: 8/25/2020 9:25:32AM

Prep Batch: WXX13413
Prep Method: EPA 300.0 Extraction Waters/Liquids
Prep Date/Time: 8/24/2020 12:45:00PM
Prep Initial Wt./Vol.: 10.00mL
Prep Extract Vol: 10.00mL

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Method Blank

Blank ID: MB for HBN 1810870 [WXX/13415]
Blank Lab ID: 1577329

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **SM23 4500-N D**

Parameter	Results	LOQ/CL	DL	Units
Total Kjeldahl Nitrogen	500U	1000	310	ug/L

Batch Information

Analytical Batch: WDA4841
Analytical Method: SM23 4500-N D
Instrument: Discrete Analyzer 2
Analyst: EWW
Analytical Date/Time: 8/26/2020 4:00:40PM

Prep Batch: WXX13415
Prep Method: METHOD
Prep Date/Time: 8/26/2020 10:13:00AM
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [WXX13415]
Blank Spike Lab ID: 1577330
Date Analyzed: 08/26/2020 16:01

Spike Duplicate ID: LCSD for HBN 1204244 [WXX13415]
Spike Duplicate Lab ID: 1577331
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM23 4500-N D**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Kjeldahl Nitrogen	4000	3870	97	4000	3520	88	(75-125)	9.50	(< 25)

Batch Information

Analytical Batch: **WDA4841**
Analytical Method: **SM23 4500-N D**
Instrument: **Discrete Analyzer 2**
Analyst: **EWW**

Prep Batch: **WXX13415**
Prep Method: **METHOD**
Prep Date/Time: **08/26/2020 10:13**
Spike Init Wt./Vol.: 4000 ug/L Extract Vol: 25 mL
Dupe Init Wt./Vol.: 4000 ug/L Extract Vol: 25 mL

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Matrix Spike Summary

Original Sample ID: 1204302004
MS Sample ID: 1577332 MS
MSD Sample ID: 1577333 MSD

Analysis Date: 08/26/2020 16:07
Analysis Date: 08/26/2020 16:08
Analysis Date: 08/26/2020 16:09
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **SM23 4500-N D**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Kjeldahl Nitrogen	500U	4000	3830	96	4000	3820	95	75-125	0.42	(< 25)

Batch Information

Analytical Batch: WDA4841
Analytical Method: SM23 4500-N D
Instrument: Discrete Analyzer 2
Analyst: EWW
Analytical Date/Time: 8/26/2020 4:08:30PM

Prep Batch: WXX13415
Prep Method: Distillation TKN by Phenate (W)
Prep Date/Time: 8/26/2020 10:13:00AM
Prep Initial Wt./Vol.: 25.00mL
Prep Extract Vol: 25.00mL

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Method Blank

Blank ID: MB for HBN 1810470 [XXX/43681]
Blank Lab ID: 1575486

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **AK102**

Parameter	Results	LOQ/CL	DL	Units
Diesel Range Organics	0.279J	0.600	0.180	mg/L
Surrogates				
5a Androstane (surr)	104	60-120		%

Batch Information

Analytical Batch: XFC15711
Analytical Method: AK102
Instrument: Agilent 7890B R
Analyst: CDM
Analytical Date/Time: 8/30/2020 7:02:00PM

Prep Batch: XXX43681
Prep Method: SW3520C
Prep Date/Time: 8/18/2020 7:25:52PM
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [XXX43681]
Blank Spike Lab ID: 1575487
Date Analyzed: 08/30/2020 19:12

Spike Duplicate ID: LCSD for HBN 1204244 [XXX43681]
Spike Duplicate Lab ID: 1575488
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **AK102**

	Blank Spike (mg/L)				Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)		Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Diesel Range Organics	20	24.1	121		20	21.0	105	(75-125)	13.70	(< 20)
Surrogates										
5a Androstane (surr)	0.4	137	137	*	0.4	120	120	(60-120)	12.80	

Batch Information

Analytical Batch: **XFC15711**
Analytical Method: **AK102**
Instrument: **Agilent 7890B R**
Analyst: **CDM**

Prep Batch: **XXX43681**
Prep Method: **SW3520C**
Prep Date/Time: **08/18/2020 19:25**
Spike Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL
Dupe Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL

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Method Blank

Blank ID: MB for HBN 1810470 [XXX/43681]
Blank Lab ID: 1575486

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1204244001, 1204244002

Results by **AK103**

Parameter	Results	LOQ/CL	DL	Units
Residual Range Organics	0.250U	0.500	0.150	mg/L
Surrogates				
n-Triacontane-d62 (surr)	113	60-120		%

Batch Information

Analytical Batch: XFC15711
Analytical Method: AK103
Instrument: Agilent 7890B R
Analyst: CDM
Analytical Date/Time: 8/30/2020 7:02:00PM

Prep Batch: XXX43681
Prep Method: SW3520C
Prep Date/Time: 8/18/2020 7:25:52PM
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Blank Spike Summary

Blank Spike ID: LCS for HBN 1204244 [XXX43681]
Blank Spike Lab ID: 1575487
Date Analyzed: 08/30/2020 19:12

Spike Duplicate ID: LCSD for HBN 1204244 [XXX43681]
Spike Duplicate Lab ID: 1575488
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1204244001, 1204244002

Results by **AK102**

	Blank Spike (mg/L)				Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)		Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Residual Range Organics	20	23.9	119		20	20.6	103	(60-120)	14.70	(< 20)
Surrogates										
n-* riacontane-d62 (surr)	0.4	132	132	h	0.4	117	117	(60-120)	11.90	

Batch Information

Analytical BatcT: **XFC15711**
Analytical MetTod: **AK102**
Instrument: **Agilent 7890B R**
Analyst: **CDM**

Prep BatcT: **XXX42381**
Prep MetTod: **S6 25W0C**
Prep Date/* ime: **08/18/W0W0 19:W5**
Spike Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL
Dupe Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL

Print Date: 10/07/2020 2:37:13PM

Dawkins, Jennifer A (Fairbanks)

From: Dawkins, Jennifer A (Fairbanks)
Sent: Wednesday, August 19, 2020 9:59 AM
To: Dawkins, Jennifer A (Fairbanks)
Subject: 1204244 Change Order

J-flags are needed for 1204244, per client.

Jennifer A-B Dawkins
Environment, Health & Safety
Fairbanks Client Services
Project Manager - Alaska
SGS
3180 Peger Rd. Ste. 190
Fairbanks, AK 99709
907-474-8656
907-322-8444
jennifer.dawkins@sgs.com

1204244

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
2355 Hill Road
Fairbanks, AK 99709
(907) 479-0600
www.shannonwilson.com

CUSTODY RECORD

Page 1 of 1

Laboratory SGS

Attn:

Turn Around Time: [X] Normal [ ] Rush — Please Specify

Quote No:

J-Flags: [ ] Yes [X] No

Analytical Methods (include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Speciated Arsenic (EDTA)	PFAS	TOC (HCl)	Cl, F, SO4, pH, TDS, Cond	200.8 + Hardness (HNO3)	TSS	DRO, RRO (HCl)	TKN + NO3+NO2	BTEX/GRO (HCl)	Oil + Grease (HCl)	Sulfide (NaOH+ZnAc)	Total Number of Containers	Remarks/Matrix Composition/Grab? Sample Containers
33066	1AQ	1721	8/13/20	X	X	X	X	X	X	X	X	X	X	X	17	GROUNDWATER
33063	2AQ	1925	8/13/20	X	X	X	X	X	X	X	X	X	X	X	17	" "

Project Information

Number: 102B96-005
Name: YAKUTAT ALT. WATER
Contact: AMJ
Ongoing Project? Yes [X] No [ ]
Sampler: RLW

Sample Receipt

Total No. of Containers: 34
COC Seals/Intact? Y/N/NA:
Received Good Cond./Cold:
Temp:
Delivery Method:

Notes:

Speciated Arsenic also denoted on separate coc form.
P# 3645032AD

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Time: 0900	Signature: Time:	Signature: Time:
Printed Name: Rachel Willis Date: 8/14/20	Printed Name: Date:	Printed Name: Date:
Company: Shannon + Wilson, Inc	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: Time:	Signature: Time:	Signature: Time: 1646
Printed Name: Date:	Printed Name: Date:	Printed Name: Michelle Albaugh Date: 8/14/20
Company:	Company:	Company: SG IE, IB

1) 1.2 DSR
2) 5.7 DSR

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

No. 36242

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CHAIN-OF-CUSTODY RECORD

Laboratory BAL VIA SGS

Attn:

Analytical Method (Include preservative if used)

Turn Around Time:	Quote No:	J-Flags:
[X] Normal [ ] Rush		[ ] Yes [X] No
Please Specify		

Sample Identity	Lab No.	Time	Date Sampled	Speciated Arsenic (EDTA)	Total Number of Containers	Remarks/Matrix Composition/Grab? Sample Containers
33066	1AB	8/13/12	1721	X	2	GROUNDWATER
33063	2AB	1	1925	X	2	"

Project Information		Sample Receipt	
Number:	102896-005	Total No. of Containers:	4
Name:	AMJ	COC Seals/Intact? Y/N/NA	
Contact:	AMJ@shanwil.com	Received Good Cond./Cold	
Ongoing Project?	Yes [X] No [ ]	Temp:	
Sampler:	RLW	Delivery Method:	

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: [signature] Time: 0900	Signature: Time:	Signature: Time:
Printed Name: Rachel Willis Date: 8/14/12	Printed Name: Date:	Printed Name: Date:
Company: Shannon + Wilson, Inc	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: Time:	Signature: Time:	Signature: [signature] Time: 1446
Printed Name: Date:	Printed Name: Date:	Printed Name: PR Date: 8/14/12
Company:	Company:	Company: SGS 2F Cooler temp 4.6°C DS8

Notes:

P# 364503
AD

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

No. 36236

Chain-of-Custody Form

BROOKS APPLIED LABS

Ship samples to:
18804 North Creek Parkway, Suite 100
Bothell, WA 98011

For BAL use only
Received by: _____ *Date:* _____
Work Order ID: _____ *Time:* _____
Project ID: _____

Client: Shannon + Wilson, Inc / SGS PO Number: 102896-005 Mailing Address: 2355 HILL RD
Contact: Jen Dawkins (SGS) / AMJ (Shannon + Wilson) Phone: 907-479-0600 (Shannon+Wilson) FAIRBANKS, AK 99709
Client Project ID: 102896-005 Email: amj@shanwil.com Email Receipt Confirmation? (Yes/No)
Samples Collected By: RLW BAL PM: _____

Requested TAT (business days)
- ☐ 20 (standard)
- ☐ 15*
- ☐ 10*
- ☐ 5*
- ☐ Other ____

*Surcharges may apply to expedited TATs

	Sample ID	Collection: Date	Collection: Time	Client Sample Info: Matrix Type	Client Sample Info: Number of Containers	Client Sample Info: Field Filtered? (Yes/No)	Client Sample Info: Preservation Type HCl / HNO_3 / Other	BAL Analyses Required: Total Hg, EPA 1631	Methyl Hg, EPA 1630	ICP-MS Metals (specify)	As Species (specify) InOrg, III, V, MMA, DMA	Se Species (specify) Se(IV), Se(VI), SeCN, Uknown	Filtration	Other (specify)	Other (specify)	Comments: Specify Here
1	33066	8/13/20	1721	Groundwater	2	Yes	EDTA				X					
2	33063	8/13/20	1925	Groundwater	2	Yes	EDTA				X					
3																
4																
5																
6																
7																
8																
9																
10																
	Trip Blank															

Relinquished By: RLW	Date: 8/14/20	Time: 0900	Relinquished By:	Date:	Time:
Received By: [signature]	Date: 8/14/20	Time: 1646	Total Number of Packages:		

Page 1 of 1 List Hazardous Contaminants: _____

Cooler temp 6.6° D58 2F

samples@brooksapplied.com | brooksapplied.com

BROOKS APPLIED LABS
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Field Sampling Protocol Suggestions

The following protocol is derived from EPA Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (July, 1996). This brief summary is meant to be used as an overview and a reference. For more comprehensive instructions and a complete description of the proper methods for sampling ambient water for trace levels of metals, please refer to EPA Method 1669.

Gloves - Sampling personnel are required to wear clean, non-powdered gloves (made of polyethylene, latex, or PVC) at all times when handling sampling equipment and sample containers. Gloves should be tested to show low levels of trace metals, especially mercury and zinc. Remember to change gloves in-between each sample collected.

Dirty Hands/Clean Hands - Upon arrival at the sampling site, one member of the sampling team is designated as "dirty hands" and the second member is designated as "clean hands".

"Dirty Hands" is responsible for all activities that do not involve direct contact with the sample. Examples of activities performed by "dirty hands" include:

- Removal of the double-bagged sample containers from the cooler
- Holding and opening of the outer ziplock bag
- If only two samplers are available, then "dirty hands" should also be responsible for performing all necessary documentation.
- Operation of any sampling apparatus involved in collection (peristaltic pump, grab sampling device)

"Clean Hands" only performs operations involving direct contact with the sample. These activities include:

- Opening and closing the inner ziplock bag
- All direct handling of the sample container, including or attachment/detachment of sample container to collection device
- Transfer of the sample from the sample collection device to the sample container.

Sampling - Whenever possible, samples are collected facing upstream and upwind of the sampling team. "Clean hands" should remove the sample container from the inner bag and reseal the inner bag in order to minimize potential contamination.

Surface samples are collected using a grab sampling technique. This technique involves rapid submersion of the sample container, filling and capping the container while still submersed to minimize exposure to airborne contamination. Prior to its final filling, the sample container should be partially filled and rinsed 3 times.

Note that some methods, such as EPA Method 1632 for arsenic speciation, require that samples be preserved in the field. For these methods, Brooks Applied Labs can include the proper amount of the appropriate preservative in each sample container. Sample containers with preservative **must not** be submersed or rinsed prior to sample collection. Instead, tip the top lip of the container gently below the water surface so that the preservative remains in the container while filling. Alternatively, you may use a second container (tripled rinsed with the native sample) without preservative to serve as a sample collection container. After collection, pour the sample from the non-preserved container into the container with preservative.

Any sampling equipment (tubing and in-line filter units) must be purged in the field prior to use for collecting samples. Brooks Applied Labs (BAL) has determined that purging the in-line filter units for 3 minutes (using 2-3 L of sample or ultra-pure reagent water) is sufficient to remove any metals contamination to levels below BAL's MRLs. EPA 1669 suggests that sampling tubing be purged for 5-10 minutes prior to collecting samples.

All sample containers should be completely filled to minimize contact with the atmosphere, and should immediately be tightly capped. Again, prior to its final filling, the sample container should be partially filled and rinsed 3 times.

Sample containers should be filled to minimize contact with the atmosphere and tightly capped immediately. While "dirty hands" holds open the outer ziplock bag, "clean hands" opens the inner bag, returns the filled sample container to the inner bag, and reseals the inner bag. "Dirty hands" then reseals the outer bag and places the sample in the cooler.

BAL Sample Acceptance Policy

All samples received by Brooks Applied Labs must meet the following requirements. Results for samples that do not meet the requirements will be appropriately qualified and fully narrated to make it clear that the samples did not conform to the policy.

Proper, Full, and Complete Documentation of the Sample: Documentation sent with the sample must include sample identification, the location, date and time of collection, the collector's name, preservation type, sample type and any special remarks concerning the sample.

Sample Labeling: The sample must be received with a durable, water resistant label written with indelible ink. The sample must be uniquely identified so that it cannot be confused with any other sample in the shipment. This unique identifier must match the identifier for the sample included in the COC.

Containers: The sample must be sampled and received within a container appropriate to the analysis being requested.

Adherence to Holding Times: The sample must be received in adherence to the specific holding time for the analysis being requested. Sample holding time requirements will vary dependent upon whether the sample was preserved in the field or in the lab.

Adequate Sample Volume: Sufficient sample volume must be available to perform the necessary analyses.

Damage: The sample must be received without any evidence of damaged. Signs of damage may include dented cooler, broken sample container, etc.

Contamination: Samples must be received without any evidence of possible contamination. Signs of potential contamination may include loose container caps, unzipped or ripped baggies holding the sample container, broken custody seals, leakage from or into the sample container, particulate material in a sample indicated as being a dissolved fraction, etc.

Preservation: Samples must be received adequately preserved to meet the requirements of the analysis being requested.

Circumstances Under Which Samples Will Not Be Received: Chemically or biologically hazardous samples that BAL personnel are not trained to handle safely or BAL does not have the proper facilities to store, prepare, or analyze safely and/or legally will not be accepted for delivery.

Some issues can be resolved through discussion with the client. For example, missing documentation for the date and time of sample collection may be provided by the client after receipt of the samples. If the non-conformance is such that it can be corrected prior to reporting sample results, then those results will no longer require qualification.

Thank you for your cooperation. Please feel free to contact your Brooks Applied Labs Project Manager at 206-632-6206 if you have any further questions. Alternatively, you may contact Brooks Applied Labs at samples@brooksapplied.com.

BROOKS APPLIED LABS

18804 North Creek Parkway
Suite 100
Bothell, WA 98011
www.brooksapplied.com

Phone: 206-632-6206
Fax: 206-632-6017
Email: info@brooksapplied.com

Sample Container Order Form and Packing Slip

Date to ship by: **7/31/2020**
Date to Arrive: **8/3/2020**

Shipper: **FedEx**
Service to Use: **FedEx - 2-Day**

Service Changed? ☐ Yes, for_____

Paired with tubing order? no

Project ID: **SGS-AN1803**
Ship To (Company): **SGS- North America**
Contact Name: **Jennifer Dawkins**
Shipping Address: **3180 Peger Rd.**
Suite 190
Fairbanks, AK 99709

Date: **7/30/2020**
Phone: 907-562-2343
Fax:
Cell:
Email:
BAL PM: **Amanda Royal**

Bill to: Customer (FedEx), Shipping Account Number: 1135-6764-3

Ship Using: ☑ Cooler ☐ Cardboard Box

Comments: Send Extra 0.45 um syringe filters

Quantity Needed	Pre-preserved?	Description	Cleaning Lot Number
2	no	**As Speciation (HPLC): 2 x 10mL Vacutainer** *DO NOT USE ACID-CLEANED BOTTLES! - For BAL use* *SC: For vacutainers (6mL Lavendar lid), also need to include per container:* *15mL syringes* ☑ *0.45 µm syringe filters* ☑ *25 gauge needles* ☑ 1 *HDPE Sharps Container(s)* ☑ *(Need enough containers to include all syringes/sampling sites)* ***Please check boxes above once items have been packed*** ***Vacutainer Expiration date:*** 10-31-2020 ***(Should be no less than 2 months from today's date)*** *Notes:*	20-0075 20-0083 17-0148

Submitted By: **DM** Assembled By: DSR 7/31/20 Shipped By: DSR

A COPY OF THIS FORM SHOULD BE INCLUDED WITH THE SHIPMENT AS A PACKING SLIP

027 YAK 2754 9745

COOLER

027-2754 9745

Shipper's Name and Address
Shannon and Wilson Inc
2355 Hill Rd
Fairbanks, AK 99712
USA
Tel: 907-479-0600

Shipper's Account Number
27400200733

Customer's ID Number
10926

Not Negotiable
Air Waybill
Issued By

Alaska. AIR CARGO
P.O. BOX 68900 SEATTLE, WA 98168
800-225-2752 ALASKACARGO.COM

Consignee's Name and Address
SGS CT and ENVIRONM
200 W Potter Drive
Anchorage, AK 99518
USA
Tel: 907-562-2343

Consignee's Account Number
27400215947

Also notify
Tel:

Issuing Carrier's Agent and City

Agent's IATA Code

Account No.

Airport of Departure (Addr. of First Carrier) and Requested Routing
Yakutat

Accounting Information
10926
Shannon and Wilson Inc
2355 Hill Rd
Fairbanks, AK 99712
USA

SRN/102896-006
GoldStreak

To	By First Carrier	To / By		To / By		Currency		WT/VAL		Other		Declared Value For Carriage	Declared Value For Customs
ANC	Alaska Airlines					USD	PX	X		X		NVD	NCV

Airport of Destination	Flight/Date	Flight/Date	Amount of Insurance
Anchorage	AS 061/14		XXX

Handling Information
STORE IN COOLER WHEN POSSIBLE
NOA 907-474-8656

SCI

No of Pieces	Gross Weight	kg lb	Commodity Item No.	Chargeable Weight	Rate / Charge	Total	Nature and Quantity of Goods (Incl. Dimensions or Volume)
3	69.0	L	Q	69.0		AS AGREED	ENVIRONMENTAL SAMPLE Dims: 24 x 13 x14 x 1 13 x 9 x11 x 1 10 x 7 x7 x 1 GSX COL
3	69.0					AS AGREED	Volume: 3.556

Prepaid	Weight Charge	Collect
	AS AGREED	

Valuation Charge

Tax

Other Charges
XBC 10.00

Total Other Charges Due Agent

Total Other Charges Due Carrier

Shipper certifies that the particulars on the face hereof are correct and that **insofar as any part of the consignment contains dangerous goods, such part is properly described by name and is in proper condition for carriage by air according to the applicable Dangerous Goods Regulations. I consent to the inspection of this cargo.**

For: Shannon and Wilson Inc

Signature of Shipper or his Agent

[RWJ] THIS SHIPMENT DOES NOT CONTAIN DANGEROUS GOODS

[ ] THIS SHIPMENT DOES CONTAIN DANGEROUS GOODS

Total Prepaid	Total Collect
AS AGREED	

14 Aug 2020 09:49 — Executed On (Date)

Yakutat — at (Place)

Alaska Airlines — Signature of Issuing Carrier or its Agent

027-2754 9745

Alert Expeditors Inc.

#404288

Citywide Delivery • 440-3351
8421 Flamingo Drive • Anchorage, Alaska 99502

Date 8/19/2020

From S+W

To SGS

Collect ❐	Prepay ❐	Advance Charges ❐
Job # YAK	PO# AS 2754 9745	

5 coolers

Shipped Signature

Total Charge

Received By:

e-Sample Receipt Form

SGS Workorder #: **1204244**

1 2 0 4 2 4 4

Review Criteria	Condition (Yes, No, N/A)	Exceptions Noted below
Chain of Custody / Temperature Requirements		N/A — Exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	Yes	1F, 1B
COC accompanied samples?	Yes	
DOD: Were samples received in COC corresponding coolers?	N/A	
N/A — **Exemption permitted if chilled & collected <8 hours ago, or for samples where chilling is not required		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	Yes	Cooler ID: 1 @ 1.2 °C Therm. ID: D58
	Yes	Cooler ID: 2 @ 5.7 °C Therm. ID: D50
If samples received without a temperature blank, the "cooler temperature" will be documented instead & "COOLER TEMP" will be noted to the right. "ambient" or "chilled" will be noted if neither is available.	No	Cooler ID: 3 @ 6.6 °C Therm. ID: D58
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
*If >6°C, were samples collected <8 hours ago?	N/A	
If <0°C, were sample containers ice free?	N/A	
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		
Holding Time / Documentation / Sample Condition Requirements		Note: Refer to form F-083 "Sample Guide" for specific holding times.
Were samples received within holding time?	Yes	
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	Yes	
**Note: If times differ <1hr, record details & login per COC.		
***Note: If sample information on containers differs from COC, SGS will default to COC information		
Were analytical requests clear? (i.e., method is specified for analyses with multiple option for analysis (Ex: BTEX, Metals)	Yes	
		N/A — ***Exemption permitted for metals (e.g,200.8/6020A).
Were proper containers (type/mass/volume/preservative***)used?	Yes	
Volatile / LL-Hg Requirements		
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	Yes	
Were all water VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	Yes	
Were all soil VOAs field extracted with MeOH+BFB?	N/A	

Note to Client: Any "No", answer above indicates non-compliance with standard procedures and may impact data quality.

Additional notes (if applicable):

Cooler #3 only had arsenic samples in it.

F192b_SRFrm_20190325

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1204244001-A	No Preservative Required	OK			
1204244001-B	No Preservative Required	OK			
1204244001-C	No Preservative Required	OK			
1204244001-D	No Preservative Required	OK			
1204244001-E	HCL to pH < 2	OK			
1204244001-F	No Preservative Required	OK			
1204244001-G	HNO3 to pH < 2	OK			
1204244001-H	No Preservative Required	OK			
1204244001-I	HCL to pH < 2	OK			
1204244001-J	HCL to pH < 2	OK			
1204244001-K	H2SO4 to pH < 2	OK			
1204244001-L	HCL to pH < 2	OK			
1204244001-M	HCL to pH < 2	OK			
1204244001-N	HCL to pH < 2	OK			
1204244001-O	HCL to pH < 2	OK			
1204244001-P	HCL to pH < 2	OK			
1204244001-Q	Zn Acetate,NaOH to pH > 9	OK			
1204244002-A	No Preservative Required	OK			
1204244002-B	No Preservative Required	OK			
1204244002-C	No Preservative Required	OK			
1204244002-D	No Preservative Required	OK			
1204244002-E	HCL to pH < 2	OK			
1204244002-F	No Preservative Required	OK			
1204244002-G	HNO3 to pH < 2	OK			
1204244002-H	No Preservative Required	OK			
1204244002-I	HCL to pH < 2	OK			
1204244002-J	HCL to pH < 2	OK			
1204244002-K	H2SO4 to pH < 2	OK			
1204244002-L	HCL to pH < 2	OK			
1204244002-M	HCL to pH < 2	OK			
1204244002-N	HCL to pH < 2	OK			
1204244002-O	HCL to pH < 2	OK			
1204244002-P	HCL to pH < 2	OK			
1204244002-Q	Zn Acetate,NaOH to pH > 9	OK			
1204244003-A	HCL to pH < 2	OK			
1204244003-B	HCL to pH < 2	OK			
1204244003-C	HCL to pH < 2	OK			

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.
BU - The container was received with headspace greater than 6mm.
DM - The container was received damaged.
FR - The container was received frozen and not usable for Bacteria or BOD analyses.
IC - The container provided for microbiology analysis was not a laboratory-supplied, pre-sterilized container and therefore was not suitable for analysis.
NC- The container provided was not preserved or was under-preserved. The method does not allow for additional preservative added after collection.
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
QN - Insufficient sample quantity provided.

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

September 2, 2020

SGS Environmental
ATTN: Julie Shumway
200 West Potter Drive
Anchorage AK 99518
julie.shumway@sgs.com

RE: Project SGS-AN1803 Client Project ID: 1204244

Dear Julie Shumway,

On August 20, 2020, Brooks Applied Labs (BAL) received two (2) water samples in a sealed cooler. The samples were logged-in for dissolved arsenite [*(As(III)*], arsenate [*As(V)*], monomethylarsonic acid [*MMAs*], and dimethylarsinic acid [*DMAs*]. The sample was filtered in the field by the client. The sample was received, prepared, analyzed, and stored according to BAL SOPs and EPA methodology.

Arsenic speciation was preformed using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Arsenic species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS)

If the native sample result and/or the DUP result is not detected (ND) above the MDL, then the associated RPD is not calculated (N/C).

All data was reported without qualification (aside from concentration qualifiers) and all associated quality control sample results met the acceptance criteria. BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited meet all NELAP requirements. For more information please see the *Report Information* page in your report.

Sincerely,

Lydia Greaves

Lydia Greaves
Client Services Manager
lydia@brooksapplied.com

Don Moran

Don Moran
Project Coordinator
don@brooksapplied.com

Project ID: SGS-AN1803
PM: Amanda Royal

Client PM: Julie Shumway
Client Project: 1204244

Report Information

Laboratory Accreditation

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksapplied.com/resources/certificates-permits/> or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

AR	as received
BAL	Brooks Applied Labs
BLK	method blank
BS	blank spike
CAL	calibration standard
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain of custody record
D	dissolved fraction
DUP	duplicate
IBL	instrument blank
ICV	initial calibration verification
MDL	method detection limit
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
NR	non-reportable
N/C	not calculated
PS	post preparation spike
REC	percent recovery
RPD	relative percent difference
SCV	secondary calibration verification
SOP	standard operating procedure
SRM	reference material
T	total fraction
TR	total recoverable fraction

Definition of Data Qualifiers

(Effective 3/23/2020)

E	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H	Holding time and/or preservation requirements not met. Please see narrative for explanation.
J	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
J-1	Estimated value. A full explanation is presented in the narrative.
M	Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
N	Spike recovery was not within acceptance criteria. Please see narrative for explanation.
R	Rejected, unusable value. A full explanation is presented in the narrative.
U	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
Z	Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010. These supersede all previous qualifiers ever employed by BAL.

Accreditation Information

Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard)
Issued on: July 27, 2020; Valid to: June 30, 2021
Certificate Number: E87982-35

Method	Matrix	TNI Accredited Analyte(s)
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
EPA 6020	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
BAL-5000	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness
	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn
EPA 1640	Non-Potable Waters	Ag, As, Cd, Cu, Pb, Ni, Zn
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury
EPA 1630	Non-Potable Waters	Methyl Mercury
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs
BAL-4200	Non-Potable Waters	Se(IV), Se(VI)
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)
SM2340B	Non-Potable Waters	Hardness

Accreditation Information

Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2), and DoD/DOE (3)

Issued by: ANAB

Issued on: January 10, 2020; Valid to: March 30, 2022

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)	DoD/DOE Accredited Analytes
EPA 1638 Mod EPA 200.8 Mod EPA 6020 Mod BAL-5000	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn	Ag, Al, As, Ba, Ca, Cd, Cr, Cu, Fe, Pb, Mg, Mn, Ni, Sb, Se, V, Zn
	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn	Ag, As, Cd, Cr, Cu, Pb, Ni, Se, Zn
EPA 1640 Mod	Non-Potable Waters	Ag, As, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Tl, V, Zn	Not Accredited
EPA 1631E Mod BAL-3100 (waters) BAL-3101 (solids)	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury	Total Mercury
EPA 1630 Mod BAL-3200	Non-Potable Waters, Solids/Chemicals Biological	Methyl Mercury	Methyl Mercury (excluding Solids/Chemicals)
EPA 1632A Mod BAL-3300	Non-Potable Waters Solids/Chemicals	Inorganic Arsenic, As(III)	Inorganic Arsenic. As(III) for waters only.
	Biological/Food	Inorganic Arsenic	Inorganic Arsenic (excluding Food)
AOAC 2015.01 Mod BAL-5000 by BAL-5040	Food	As, Cd, Hg, Pb	Not Accredited
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs	Not Accredited
	Biological by BAL-4115	Inorganic Arsenic, DMAs, MMAs	Not Accredited
BAL-4101	Food by BAL-4116	Inorganic Arsenic, DMAs, MMAs	Not Accredited
BAL-4200	Non-Potable Waters	Se(IV), Se(VI), SeCN	Not Accredited
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet	Not Accredited
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)	Cr(VI)
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II)	Not Accredited
SM2340B	Non-Potable Waters	Hardness	Hardness
SM 2540G EPA 160.3 BAL-0501	Solids/Chemicals & Biological	% Dry Weight	% Dry Weight

(1) ISO/IEC 17025:2017 – Certificate Number ADE-1447.2
(2) Non-Governmental NELAC Institute 2016 Standard – Certificate Number ADE-1447.1
(3) Department of Defense/Energy Consolidated Quality Systems Manual v. 5.3 – Certificate Numbers ADE-1447 for DoD, ADE-1447.3 for DOE.

Project ID: SGS-AN1803
PM: Amanda Royal

Client PM: Julie Shumway
Client Project: 1204244

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
33066	2034051-01	Water	Sample	08/13/2020	08/20/2020
33063	2034051-02	Water	Sample	08/13/2020	08/20/2020

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
As(III)	Water	SOP BAL-4100	08/25/2020	08/28/2020	B202313	2001070
As(V)	Water	SOP BAL-4100	08/25/2020	08/28/2020	B202313	2001070
DMAs	Water	SOP BAL-4100	08/25/2020	08/28/2020	B202313	2001070
MMAs	Water	SOP BAL-4100	08/25/2020	08/28/2020	B202313	2001070

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
33066										
2034051-01	As(III)	Water	D	5.98		0.040	0.210	µg/L	B202313	2001070
2034051-01	As(V)	Water	D	0.665		0.040	0.210	µg/L	B202313	2001070
2034051-01	DMAs	Water	D	≤ 0.050	U	0.050	0.210	µg/L	B202313	2001070
2034051-01	MMAs	Water	D	≤ 0.040	U	0.040	0.210	µg/L	B202313	2001070
33063										
2034051-02	As(III)	Water	D	4.05		0.040	0.210	µg/L	B202313	2001070
2034051-02	As(V)	Water	D	0.246		0.040	0.210	µg/L	B202313	2001070
2034051-02	DMAs	Water	D	≤ 0.050	U	0.050	0.210	µg/L	B202313	2001070
2034051-02	MMAs	Water	D	≤ 0.040	U	0.040	0.210	µg/L	B202313	2001070

Project ID: SGS-AN1803
PM: Amanda Royal

Client PM: Julie Shumway
Client Project: 1204244

Accuracy & Precision Summary

Batch: B202313
Lab Matrix: Water
Method: SOP BAL-4100

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B202313-BS1	**Blank Spike, (2020004)**						
	As(III)		5.000	4.471	µg/L	89% 75-125	
	As(V)		5.000	4.484	µg/L	90% 75-125	
	DMAs		5.210	4.948	µg/L	95% 75-125	
B202313-BS2	**Blank Spike, (2006012)**						
	MMAs		5.000	4.938	µg/L	99% 75-125	
B202313-DUP2	**Duplicate, (2034051-02)**						
	As(III)	4.053		4.214	µg/L		4% 25
	As(V)	0.246		0.247	µg/L		0.4% 25
	DMAs	ND		ND	µg/L		N/C 25
	MMAs	ND		ND	µg/L		N/C 25
B202313-MS2	**Matrix Spike, (2034051-02)**						
	As(III)	4.053	10.45	14.74	µg/L	102% 75-125	
	As(V)	0.246	9.710	10.24	µg/L	103% 75-125	
	DMAs	ND	10.00	10.14	µg/L	101% 75-125	
	MMAs	ND	9.740	9.853	µg/L	101% 75-125	
B202313-MSD2	**Matrix Spike Duplicate, (2034051-02)**						
	As(III)	4.053	10.45	14.63	µg/L	101% 75-125	0.8% 25
	As(V)	0.246	9.710	10.29	µg/L	103% 75-125	0.5% 25
	DMAs	ND	10.00	10.10	µg/L	101% 75-125	0.4% 25
	MMAs	ND	9.740	9.798	µg/L	101% 75-125	0.6% 25

Project ID: SGS-AN1803
PM: Amanda Royal

Client PM: Julie Shumway
Client Project: 1204244

Method Blanks & Reporting Limits

Batch: B202313
Matrix: Water
Method: SOP BAL-4100
Analyte: As(III)

Sample	Result	Units
B202313-BLK1	0.00	µg/L
B202313-BLK2	0.00	µg/L
B202313-BLK3	0.00	µg/L
B202313-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.021

MDL: 0.004
MRL: 0.021

Analyte: As(V)

Sample	Result	Units
B202313-BLK1	0.0009	µg/L
B202313-BLK2	0.002	µg/L
B202313-BLK3	0.002	µg/L
B202313-BLK4	0.001	µg/L

Average: 0.001
Limit: 0.021

MDL: 0.004
MRL: 0.021

Analyte: DMAs

Sample	Result	Units
B202313-BLK1	0.00	µg/L
B202313-BLK2	0.00	µg/L
B202313-BLK3	0.00	µg/L
B202313-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.021

MDL: 0.005
MRL: 0.021

Project ID: SGS-AN1803
PM: Amanda Royal

Client PM: Julie Shumway
Client Project: 1204244

Method Blanks & Reporting Limits

Analyte: MMAs

Sample	Result	Units
B202313-BLK1	0.00	µg/L
B202313-BLK2	0.00	µg/L
B202313-BLK3	0.00	µg/L
B202313-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.021

MDL: 0.004
MRL: 0.021

Project ID: SGS-AN1803
PM: Amanda Royal

Client PM: Julie Shumway
Client Project: 1204244

Sample Containers

Lab ID: 2034051-01
Sample: 33066
Report Matrix: Water
Sample Type: Sample
Collected: 08/13/2020
Received: 08/20/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Vacutainer	10 mL	20-0075	EDTA (Vial)	n/a	n/a	Styrofoam Cooler - 2034051
B	EXTRA_VOL	10 mL	20-0075	EDTA (Vial)	n/a	n/a	Styrofoam Cooler - 2034051

Lab ID: 2034051-02
Sample: 33063
Report Matrix: Water
Sample Type: Sample
Collected: 08/13/2020
Received: 08/20/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Vacutainer	10 mL	20-0075	EDTA (Vial)	n/a	n/a	Styrofoam Cooler - 2034051
B	EXTRA_VOL	10 mL	20-0075	EDTA (Vial)	n/a	n/a	Styrofoam Cooler - 2034051

Shipping Containers

Styrofoam Cooler - 2034051

Received: August 20, 2020 15:14
Tracking No: 1483 4800 8722 via FedEx
Coolant Type: Blue Ice
Temperature: 3.6 °C

Description: Styrofoam Cooler
Damaged in transit? No
Returned to client? No
Comments: IR #21

Custody seals present? Yes
Custody seals intact? Yes
COC present? Yes

Sample Receipt Chain of Custody

Instructions: Initial and date for each step performed. Write N/A if not applicable.

Workorder: 2034051	**Project Manager:**
Labeled: ADN 8/20/20	
pH checked: N/A	
Preserved: N/A **Time:**	
Syringe filtered: N/A **Time:**	
Poured off/split: N/A	
Stored: ADN 8/20/20	
Other (specify: _____): N/A	
Non-conformance notes: N/A	
Initial/date: ADN 8/20/20	

SGS North America Inc.
CHAIN OF CUSTODY RECORD

Locations Nationwide
Alaska Florida
New Jersey Colorado
Texas North Carolina
Virginia Louisiana
www.us.sgs.com

BAL Report 2034051

CLIENT:	SGS North America Inc. - Alaska Division	SGS Reference:	**Brooks Applied Science**
CONTACT:	Julie Shumway	PHONE NO:	(907) 562-2343
PROJECT NAME:	1204244	PWSID#:	
		NPDL#:	
REPORTS TO: Julie Shumway		E-MAIL:	Julie.Shumway@sgs.com; Env.Alaska.RefLabTeam@sgs.com
INVOICE TO:	SGS - Alaska	QUOTE #:	
		P.O. #:	1204244

Additional Comments: All soils report out in dry weight unless

Page 1 of 1

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HHMM	MATRIX/ MATRIX CODE	# CONTAINERS	Preservative Used: NONE	TYPE C = COMP G = GRAB MI = Multi Incremental Soils	Arsenic Speciation			MS	MSD	SGS lab #	Location ID
	33066	08/13/2020	17:21:00	Water	1			X					1204244001	
	33063	08/13/2020	19:25:00	Water	1			X					1204244002	

Relinquished By: (1)	Date	Time	Received By:	DOD Project? YES	Data Deliverable Requirements:
J Shumway	8/19/20	1006	AP 8/20/20 0751	Report to DL (J Flags)? YES If J- Report as DL/LOD/LOQ.	Level 2 + XML DV
Relinquished By: (2)	Date	Time	Received By:	Cooler ID:	
Relinquished By: (3)	Date	Time	Received By:	Requested Turnaround Time and-or Special Instructions:	
Relinquished By: (4)	Date	Time	Received For Laboratory By:	Temp Blank °C: _____ or Ambient [ ]	Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

[X 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

ORIGIN ID:ANCA (907) 562-2343
JULIE SHUMWAY
SGS ENVIRONMENTAL SERVICES INC
200 W POTTER DR

ANCHORAGE, AK 995181605
UNITED STATES US

SHIP DATE: 19AUG20
ACTWGT: 6.00 LB MAN
CAD: 0824383/CAFE3313
DIMS: 16x10x10 IN

BILL SENDER

TO **SAMPLE RECEIVING**
BROOKS APPLIED LABS
18804 N CREEK PKWY
STE 100
BOTHELL WA 98011
(206) 632-6206 REF:
INV:
PO: DEPT:

56SC2/7709/05A2

FedEx
Express

J191219082001uv

THU – 20 AUG 3:00P
STANDARD OVERNIGHT

TRK# 0201 **1483 4800 8722**

XH PAEA

98011
WA-US **SEA**

Sample Receipt Checklist:

Container Type:

- ☐ Cooler
- ☐ Cardboard box
- ☒ Styrofoam cooler
- ☐ Other (Specify):

☒ Custody Seal Present?

Custody Seal Intact? (Y) N

☒ Chain of Custody Present?

Coolant and Temperature

Coolant Type IR#: 21

- ☐ None
- ☒ Blue Ice: 3.6 °C
- ☐ Ice: °C
- ☐ Dry Ice: °C
- ☒ Temp Blank: 3.6 °C

Corrected Temp: °C

Coolant Note:

Bottle Type:

- ☐ Client Provided
- ☒ Other :
  - Size / Type: 2x10mL Vacutainer
  - Lot: 20-0075
  - Preservation: N/A
  - Preservative Lot: N/A
- ☐ Other :
  - Size / Type:
  - Lot:
  - Preservation:
  - Preservative Lot:
- ☐ Other :
  - Size / Type:
  - Lot:
  - Preservation:
  - Preservative Lot:

All information accurate

Initial/date: AP 8/20/20

The results set forth herein are provided by SGS North America Inc.

e-Hardcopy 2.0
Automated Report

Technical Report for

SGS North America, Inc

1204244

SGS Job Number: FA78009

Sampling Date: 08/13/20

Report to:

SGS North America, Inc
200 W Potter Dr
Anchorage, AK 99518
julie.shumway@sgs.com

ATTN: Julie Shumway

Total number of pages in report: 28

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Norm Farmer
Technical Director

Client Service contact: Andrea Colby 407-425-6700

Certifications: FL(E83510), LA(03051), KS(E-10327), IL(200063), NC(573), NJ(FL002), NY(12022), SC(96038001) DoD ELAP(ANAB L2229), AZ(AZ0806), CA(2937), TX(T104704404), PA(68-03573), VA(460177), AK, AR, IA, KY, MA, MS, ND, NH, NV, OK, OR, UT, WA, WV

Test results relate only to samples analyzed.

Sections:

1 2 3 4 5 6

Table of Contents

Sample Summary

SGS North America, Inc

1204244

Job No: FA78009

Sample Number	Collected Date	Time	By	Received	Matrix Code	Matrix Type	Client Sample ID
FA78009-1	08/13/20	17:21		08/20/20	AQ	Water	33066
FA78009-2	08/13/20	19:25		08/20/20	AQ	Water	33063

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client: SGS North America, Inc **Job No:** FA78009

Site: 1204244 **Report Date** 9/2/2020 3:22:26 PM

2 Sample(s), 0 Trip Blank(s) and 0 Field Blank(s) were collected on 08/13/2020 and were received at SGS North America Inc - Orlando on 08/20/2020 properly preserved, at 4.4 Deg. C and intact. These Samples received an SGS Orlando job number of FA78009. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section. Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

MS Semi-volatiles By Method EPA 537M QSM5.3 B-15

Matrix: AQ **Batch ID:** OP81709

All samples were extracted within the recommended method holding time.

All samples were analyzed within the recommended method holding time.

Sample(s) FA78002-6MS, FA78002-6MSD were used as the QC samples indicated.

All method blanks for this batch meet method specific criteria.

Sample(s) FA78009-1 have surrogates outside control limits.

FA78009-1: Dilution required due to matrix interference (ID recovery standard failure).

FA78009-1 for 13C2-PFTeDA: Outside control limits.

SGS Orlando certifies that this report meets the project requirements for analytical data produced for the samples as received at SGS Orlando and as stated on the COC. SGS Orlando certifies that the data meets the Data Quality Objectives for precision, accuracy and completeness as specified in the SGS Orlando Quality Manual except as noted above. This report is to be used in its entirety. SGS Orlando is not responsible for any assumptions of data quality if partial data packages are used.

Narrative prepared by:

_____

Ariel Hartney, Client Services *(Signature on File)*

Summary of Hits

Job Number: FA78009
Account: SGS North America, Inc
Project: 1204244
Collected: 08/13/20

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	LOQ	LOD	Units	Method
FA78009-1	**33066**					
Perfluorobutanoic acid		0.0053 J	0.017	0.0083	ug/l	EPA 537M QSM5.3 B-15
Perfluoropentanoic acid		0.0089	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorohexanoic acid		0.0071 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluoroheptanoic acid		0.0029 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorooctanoic acid		0.0058 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorobutanesulfonic acid		0.0023 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluoropentanesulfonic acid		0.0065 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorohexanesulfonic acid		0.0421	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorooctanesulfonic acid		0.0886	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
FA78009-2	**33063**					
Perfluorobutanoic acid		0.0044 J	0.017	0.0083	ug/l	EPA 537M QSM5.3 B-15
Perfluoropentanoic acid		0.0092	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorohexanoic acid		0.0065 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluoroheptanoic acid		0.0027 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorooctanoic acid		0.0047 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorobutanesulfonic acid		0.0026 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluoropentanesulfonic acid		0.0043 J	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorohexanesulfonic acid		0.0235	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15
Perfluorooctanesulfonic acid		0.0393	0.0083	0.0042	ug/l	EPA 537M QSM5.3 B-15

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	33066		
Lab Sample ID:	FA78009-1	**Date Sampled:**	08/13/20
Matrix:	AQ - Water	**Date Received:**	08/20/20
Method:	EPA 537M QSM5.3 B-15 EPA 537 MOD	**Percent Solids:**	n/a
Project:	1204244		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q26009.D	1	08/27/20 20:48	NG	08/24/20 13:00	OP81709	S3Q393
Run #2 [a]	2Q53278.D	5	08/28/20 13:31	NG	08/24/20 13:00	OP81709	S2Q792

	Initial Volume	Final Volume
Run #1	120 ml	1.0 ml
Run #2	120 ml	1.0 ml

CAS No.	Compound	Result	LOQ	LOD	DL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS							
375-22-4	Perfluorobutanoic acid	0.0053	0.017	0.0083	0.0042	ug/l	J
2706-90-3	Perfluoropentanoic acid	0.0089	0.0083	0.0042	0.0031	ug/l	
307-24-4	Perfluorohexanoic acid	0.0071	0.0083	0.0042	0.0021	ug/l	J
375-85-9	Perfluoroheptanoic acid	0.0029	0.0083	0.0042	0.0021	ug/l	J
335-67-1	Perfluorooctanoic acid	0.0058	0.0083	0.0042	0.0021	ug/l	J
375-95-1	Perfluorononanoic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
335-76-2	Perfluorodecanoic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
2058-94-8	Perfluoroundecanoic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
307-55-1	Perfluorododecanoic acid	0.0042 U	0.0083	0.0042	0.0031	ug/l	
72629-94-8	Perfluorotridecanoic acid	0.021 U [b]	0.042	0.021	0.010	ug/l	
376-06-7	Perfluorotetradecanoic acid	0.021 U [b]	0.042	0.021	0.010	ug/l	
PERFLUOROALKYLSULFONATES							
375-73-5	Perfluorobutanesulfonic acid	0.0023	0.0083	0.0042	0.0021	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	0.0065	0.0083	0.0042	0.0021	ug/l	J
355-46-4	Perfluorohexanesulfonic acid	0.0421	0.0083	0.0042	0.0021	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0886	0.0083	0.0042	0.0031	ug/l	
68259-12-1	Perfluorononanesulfonic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
335-77-3	Perfluorodecanesulfonic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
PERFLUOROOCTANESULFONAMIDES							
754-91-6	PFOSA	0.0042 U	0.0083	0.0042	0.0021	ug/l	
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS							
2355-31-9	MeFOSAA	0.017 U	0.042	0.017	0.0083	ug/l	
2991-50-6	EtFOSAA	0.017 U	0.042	0.017	0.0083	ug/l	
FLUOROTELOMER SULFONATES							
757124-72-4	4:2 Fluorotelomer sulfonate	0.0083 U	0.017	0.0083	0.0042	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	0.0083 U	0.017	0.0083	0.0042	ug/l	

U = Not detected LOD = Limit of Detection J = Indicates an estimated value
LOQ = Limit of Quantitation DL = Detection Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	33066		
Lab Sample ID:	FA78009-1	**Date Sampled:**	08/13/20
Matrix:	AQ - Water	**Date Received:**	08/20/20
Method:	EPA 537M QSM5.3 B-15 EPA 537 MOD	**Percent Solids:**	n/a
Project:	1204244		

CAS No.	Compound	Result	LOQ	LOD	DL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	0.0083 U	0.017	0.0083	0.0042	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	85%	88%	50-150%
	13C5-PFPeA	85%	85%	50-150%
	13C5-PFHxA	85%	85%	50-150%
	13C4-PFHpA	85%	85%	50-150%
	13C8-PFOA	86%	86%	50-150%
	13C9-PFNA	83%	83%	50-150%
	13C6-PFDA	77%	86%	50-150%
	13C7-PFUnDA	67%	84%	50-150%
	13C2-PFDoDA	57%	84%	50-150%
	13C2-PFTeDA	42% [c]	63%	50-150%
	13C3-PFBS	85%	87%	50-150%
	13C3-PFHxS	86%	86%	50-150%
	13C8-PFOS	80%	88%	50-150%
	13C8-FOSA	75%	91%	50-150%
	d3-MeFOSAA	60%	86%	50-150%
	13C2-4:2FTS	80%	81%	50-150%
	13C2-6:2FTS	80%	82%	50-150%
	13C2-8:2FTS	71%	84%	50-150%

(a) Dilution required due to matrix interference (ID recovery standard failure).
(b) Result is from Run# 2
(c) Outside control limits.

U = Not detected LOD = Limit of Detection J = Indicates an estimated value
LOQ = Limit of Quantitation DL = Detection Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	33063		
Lab Sample ID:	FA78009-2	**Date Sampled:**	08/13/20
Matrix:	AQ - Water	**Date Received:**	08/20/20
Method:	EPA 537M QSM5.3 B-15 EPA 537 MOD	**Percent Solids:**	n/a
Project:	1204244		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q25957.D	1	08/27/20 07:15	NG	08/24/20 13:00	OP81709	S3Q392
Run #2							

	Initial Volume	Final Volume
Run #1	120 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	LOQ	LOD	DL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS							
375-22-4	Perfluorobutanoic acid	0.0044	0.017	0.0083	0.0042	ug/l	J
2706-90-3	Perfluoropentanoic acid	0.0092	0.0083	0.0042	0.0031	ug/l	
307-24-4	Perfluorohexanoic acid	0.0065	0.0083	0.0042	0.0021	ug/l	J
375-85-9	Perfluoroheptanoic acid	0.0027	0.0083	0.0042	0.0021	ug/l	J
335-67-1	Perfluorooctanoic acid	0.0047	0.0083	0.0042	0.0021	ug/l	J
375-95-1	Perfluorononanoic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
335-76-2	Perfluorodecanoic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
2058-94-8	Perfluoroundecanoic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
307-55-1	Perfluorododecanoic acid	0.0042 U	0.0083	0.0042	0.0031	ug/l	
72629-94-8	Perfluorotridecanoic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
376-06-7	Perfluorotetradecanoic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
PERFLUOROALKYLSULFONATES							
375-73-5	Perfluorobutanesulfonic acid	0.0026	0.0083	0.0042	0.0021	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	0.0043	0.0083	0.0042	0.0021	ug/l	J
355-46-4	Perfluorohexanesulfonic acid	0.0235	0.0083	0.0042	0.0021	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0393	0.0083	0.0042	0.0031	ug/l	
68259-12-1	Perfluorononanesulfonic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
335-77-3	Perfluorodecanesulfonic acid	0.0042 U	0.0083	0.0042	0.0021	ug/l	
PERFLUOROOCTANESULFONAMIDES							
754-91-6	PFOSA	0.0042 U	0.0083	0.0042	0.0021	ug/l	
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS							
2355-31-9	MeFOSAA	0.017 U	0.042	0.017	0.0083	ug/l	
2991-50-6	EtFOSAA	0.017 U	0.042	0.017	0.0083	ug/l	
FLUOROTELOMER SULFONATES							
757124-72-4	4:2 Fluorotelomer sulfonate	0.0083 U	0.017	0.0083	0.0042	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	0.0083 U	0.017	0.0083	0.0042	ug/l	

U = Not detected LOD = Limit of Detection J = Indicates an estimated value
LOQ = Limit of Quantitation DL = Detection Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 33063
Lab Sample ID: FA78009-2
Matrix: AQ - Water
Method: EPA 537M QSM5.3 B-15 EPA 537 MOD
Project: 1204244

Date Sampled: 08/13/20
Date Received: 08/20/20
Percent Solids: n/a

CAS No.	Compound	Result	LOQ	LOD	DL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	0.0083 U	0.017	0.0083	0.0042	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	111%		50-150%
	13C5-PFPeA	111%		50-150%
	13C5-PFHxA	113%		50-150%
	13C4-PFHpA	114%		50-150%
	13C8-PFOA	114%		50-150%
	13C9-PFNA	115%		50-150%
	13C6-PFDA	114%		50-150%
	13C7-PFUnDA	107%		50-150%
	13C2-PFDoDA	96%		50-150%
	13C2-PFTeDA	80%		50-150%
	13C3-PFBS	111%		50-150%
	13C3-PFHxS	113%		50-150%
	13C8-PFOS	113%		50-150%
	13C8-FOSA	115%		50-150%
	d3-MeFOSAA	104%		50-150%
	13C2-4:2FTS	104%		50-150%
	13C2-6:2FTS	106%		50-150%
	13C2-8:2FTS	102%		50-150%

U = Not detected LOD = Limit of Detection
LOQ = Limit of Quantitation DL = Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- QC Evaluation: DOD QSM5.x Limits

FA78009

SGS North America Inc.
CHAIN OF CUSTODY RECORD

Locations Nationwide
Alaska Florida
New Jersey Colorado
Texas North Carolina
Virginia Louisiana
www.us.sgs.com

CLIENT:	SGS North America Inc. - Alaska Division	SGS Reference:	SGS Orlando, FL
CONTACT:	Julie Shumway	PHONE NO: (907) 562-2343	Additional Comments: All soils report out in dry weight unless
PROJECT NAME:	1204244	PWSID#: / NPDL#:	
REPORTS TO: Julie Shumway		E-MAIL: Julie.Shumway@sgs.com; Env.Alaska.RefLabTeam@sgs.com	
INVOICE TO: SGS - Alaska		QUOTE #: / P.O. #: 1204244	

Page 1 of 1

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HHMM	MATRIX/ MATRIX CODE	# CONTAINERS	Preservative Used:	NONE	EPA 537M PFAS list 24			MS	MSD	SGS lab #	Location ID
1	33066	08/13/2020	17:21:00	Water	1			X					1204244001	
2	33063	08/13/2020	19:25:00	Water	1			X					1204244002	

TYPE C = COMP G = GRAB MI = Multi Incremental Soils

INITIAL ASSESSMENT
RE-VERIFICATION

Relinquished By: (1)	Date	Time	Received By:	DOD Project? YES	Data Deliverable Requirements:
[signature]	8/19/20	1006	FX	Report to DL (J Flags)? YES (If J- Report as DL/LOD/LOQ.)	Level 2 + S&W XML DV
Relinquished By: (2) FX	Date	Time	Received By: [signature] 08/20/20 9:45	Cooler ID:	
Relinquished By: (3)	Date	Time	Received By:	Requested Turnaround Time and-or Special Instructions:	
Relinquished By: (4)	Date	Time	Received For Laboratory By:	Temp Blank °C: 4.4 or Ambient [ ]	Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

[X 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

http://www.sgs.com/terms_and_conditions.htm

F088_COC_REF_LAB_20190411

FA78009: Chain of Custody
Page 1 of 2

SGS Sample Receipt Summary

Job Number: FA78009 **Client:** SGSAKA **Project:** 1204244

Date / Time Received: 8/20/2020 9:45:00 AM **Delivery Method:** FEDEX **Airbill #'s:** 148348008733

Therm ID: IR 1; **Therm CF:** -0.2; **# of Coolers:** 1

Cooler Temps (Raw Measured) °C: Cooler 1: (4.6);

Cooler Temps (Corrected) °C: Cooler 1: (4.4);

Cooler Information	Y	or	N
1. Custody Seals Present	☑		☐
2. Custody Seals Intact	☑		☐
3. Temp criteria achieved	☑		☐
4. Cooler temp verification	IR Gun		
5. Cooler media	Ice (Bag)		

Trip Blank Information	Y	or	N	N/A
1. Trip Blank present / cooler	☐		☐	☑
2. Trip Blank listed on COC	☐		☐	☑

	W	or	S	N/A
3. Type Of TB Received	☐		☐	☑

Sample Information	Y	or	N	N/A
1. Sample labels present on bottles	☑		☐	
2. Samples preserved properly	☑		☐	
3. Sufficient volume/containers recvd for analysis:	☑		☐	
4. Condition of sample	Intact			
5. Sample recvd within HT	☑		☐	
6. Dates/Times/IDs on COC match Sample Label	☑		☐	
7. VOCs have headspace	☐		☐	☑
8. Bottles received for unspecified tests	☐		☑	
9. Compositing instructions clear	☐		☐	☑
10. Voa Soil Kits/Jars received past 48hrs?	☐		☐	☑
11. % Solids Jar received?	☐		☐	☑
12. Residual Chlorine Present?	☐		☐	☑

Misc. Information

Number of Encores: 25-Gram _____ 5-Gram _____ Number of 5035 Field Kits: _____ Number of Lab Filtered Metals: _____

Test Strip Lot #s: pH 0-3 230315 pH 10-12 219813A Other: (Specify) _____ _____

Residual Chlorine Test Strip Lot #: _____

Comments

SM001
Rev. Date 05/24/17

Technician: JENNAK Date: 8/20/2020 9:45:00 AM Reviewer: _____ Date: _____

5.1 5

FA78009: Chain of Custody
Page 2 of 2

QC Evaluation: DOD QSM5.x Limits

Job Number: FA78009
Account: SGS North America, Inc
Project: 1204244
Collected: 08/13/20

QC Sample ID	CAS#	Analyte	Sample Type	Result Type	Result	Units	Limits
OP81709	EPA 537M QSM5.3 B-15						
OP81709-BS	375-22-4	Perfluorobutanoic acid	BSP	REC	94	%	73-129
OP81709-BS	2706-90-3	Perfluoropentanoic acid	BSP	REC	94	%	72-129
OP81709-BS	307-24-4	Perfluorohexanoic acid	BSP	REC	94	%	72-129
OP81709-BS	375-85-9	Perfluoroheptanoic acid	BSP	REC	96	%	72-130
OP81709-BS	335-67-1	Perfluorooctanoic acid	BSP	REC	94	%	71-133
OP81709-BS	375-95-1	Perfluorononanoic acid	BSP	REC	95	%	69-130
OP81709-BS	335-76-2	Perfluorodecanoic acid	BSP	REC	94	%	71-129
OP81709-BS	2058-94-8	Perfluoroundecanoic acid	BSP	REC	94	%	69-133
OP81709-BS	307-55-1	Perfluorododecanoic acid	BSP	REC	97	%	72-134
OP81709-BS	72629-94-8	Perfluorotridecanoic acid	BSP	REC	91	%	65-144
OP81709-BS	376-06-7	Perfluorotetradecanoic acid	BSP	REC	93	%	71-132
OP81709-BS	375-73-5	Perfluorobutanesulfonic acid	BSP	REC	95	%	73-130
OP81709-BS	2706-91-4	Perfluoropentanesulfonic acid	BSP	REC	96	%	71-127
OP81709-BS	355-46-4	Perfluorohexanesulfonic acid	BSP	REC	94	%	68-131
OP81709-BS	375-92-8	Perfluoroheptanesulfonic acid	BSP	REC	99	%	69-134
OP81709-BS	1763-23-1	Perfluorooctanesulfonic acid	BSP	REC	94	%	65-140
OP81709-BS	68259-12-1	Perfluorononanesulfonic acid	BSP	REC	96	%	69-127
OP81709-BS	335-77-3	Perfluorodecanesulfonic acid	BSP	REC	93	%	53-142
OP81709-BS	754-91-6	PFOSA	BSP	REC	96	%	67-137
OP81709-BS	2355-31-9	MeFOSAA	BSP	REC	98	%	65-136
OP81709-BS	2991-50-6	EtFOSAA	BSP	REC	96	%	61-135
OP81709-BS	757124-72-4	4:2 Fluorotelomer sulfonate	BSP	REC	101	%	63-143
OP81709-BS	27619-97-2	6:2 Fluorotelomer sulfonate	BSP	REC	101	%	64-140
OP81709-BS	39108-34-4	8:2 Fluorotelomer sulfonate	BSP	REC	99	%	67-138
OP81709-MS*	375-22-4	Perfluorobutanoic acid	MS	REC	93	%	73-129
OP81709-MS*	2706-90-3	Perfluoropentanoic acid	MS	REC	94	%	72-129
OP81709-MS*	307-24-4	Perfluorohexanoic acid	MS	REC	94	%	72-129
OP81709-MS*	375-85-9	Perfluoroheptanoic acid	MS	REC	93	%	72-130
OP81709-MS*	335-67-1	Perfluorooctanoic acid	MS	REC	92	%	71-133
OP81709-MS*	375-95-1	Perfluorononanoic acid	MS	REC	93	%	69-130
OP81709-MS*	335-76-2	Perfluorodecanoic acid	MS	REC	92	%	71-129
OP81709-MS*	2058-94-8	Perfluoroundecanoic acid	MS	REC	92	%	69-133
OP81709-MS*	307-55-1	Perfluorododecanoic acid	MS	REC	94	%	72-134
OP81709-MS*	72629-94-8	Perfluorotridecanoic acid	MS	REC	98	%	65-144
OP81709-MS*	376-06-7	Perfluorotetradecanoic acid	MS	REC	91	%	71-132
OP81709-MS*	375-73-5	Perfluorobutanesulfonic acid	MS	REC	94	%	73-130
OP81709-MS*	2706-91-4	Perfluoropentanesulfonic acid	MS	REC	95	%	71-127
OP81709-MS*	355-46-4	Perfluorohexanesulfonic acid	MS	REC	92	%	68-131
OP81709-MS*	375-92-8	Perfluoroheptanesulfonic acid	MS	REC	95	%	69-134
OP81709-MS*	1763-23-1	Perfluorooctanesulfonic acid	MS	REC	92	%	65-140
OP81709-MS*	68259-12-1	Perfluorononanesulfonic acid	MS	REC	92	%	69-127
OP81709-MS*	335-77-3	Perfluorodecanesulfonic acid	MS	REC	92	%	53-142

* Sample used for QC is not from job FA78009

QC Evaluation: DOD QSM5.x Limits

Job Number: FA78009
Account: SGS North America, Inc
Project: 1204244
Collected: 08/13/20

QC Sample ID	CAS#	Analyte	Sample Type	Result Type	Result	Units	Limits
OP81709-MS*	754-91-6	PFOSA	MS	REC	97	%	67-137
OP81709-MS*	2355-31-9	MeFOSAA	MS	REC	94	%	65-136
OP81709-MS*	2991-50-6	EtFOSAA	MS	REC	94	%	61-135
OP81709-MS*	757124-72-4	4:2 Fluorotelomer sulfonate	MS	REC	98	%	63-143
OP81709-MS*	27619-97-2	6:2 Fluorotelomer sulfonate	MS	REC	100	%	64-140
OP81709-MS*	39108-34-4	8:2 Fluorotelomer sulfonate	MS	REC	97	%	67-138
OP81709-MSD*	375-22-4	Perfluorobutanoic acid	MSD	REC	95	%	73-129
OP81709-MSD*	375-22-4	Perfluorobutanoic acid	MSD	RPD	3	%	30
OP81709-MSD*	2706-90-3	Perfluoropentanoic acid	MSD	REC	96	%	72-129
OP81709-MSD*	2706-90-3	Perfluoropentanoic acid	MSD	RPD	3	%	30
OP81709-MSD*	307-24-4	Perfluorohexanoic acid	MSD	REC	94	%	72-129
OP81709-MSD*	307-24-4	Perfluorohexanoic acid	MSD	RPD	1	%	30
OP81709-MSD*	375-85-9	Perfluoroheptanoic acid	MSD	REC	97	%	72-130
OP81709-MSD*	375-85-9	Perfluoroheptanoic acid	MSD	RPD	4	%	30
OP81709-MSD*	335-67-1	Perfluorooctanoic acid	MSD	REC	95	%	71-133
OP81709-MSD*	335-67-1	Perfluorooctanoic acid	MSD	RPD	3	%	30
OP81709-MSD*	375-95-1	Perfluorononanoic acid	MSD	REC	95	%	69-130
OP81709-MSD*	375-95-1	Perfluorononanoic acid	MSD	RPD	3	%	30
OP81709-MSD*	335-76-2	Perfluorodecanoic acid	MSD	REC	96	%	71-129
OP81709-MSD*	335-76-2	Perfluorodecanoic acid	MSD	RPD	4	%	30
OP81709-MSD*	2058-94-8	Perfluoroundecanoic acid	MSD	REC	95	%	69-133
OP81709-MSD*	2058-94-8	Perfluoroundecanoic acid	MSD	RPD	3	%	30
OP81709-MSD*	307-55-1	Perfluorododecanoic acid	MSD	REC	98	%	72-134
OP81709-MSD*	307-55-1	Perfluorododecanoic acid	MSD	RPD	4	%	30
OP81709-MSD*	72629-94-8	Perfluorotridecanoic acid	MSD	REC	100	%	65-144
OP81709-MSD*	72629-94-8	Perfluorotridecanoic acid	MSD	RPD	2	%	30
OP81709-MSD*	376-06-7	Perfluorotetradecanoic acid	MSD	REC	94	%	71-132
OP81709-MSD*	376-06-7	Perfluorotetradecanoic acid	MSD	RPD	4	%	30
OP81709-MSD*	375-73-5	Perfluorobutanesulfonic acid	MSD	REC	97	%	73-130
OP81709-MSD*	375-73-5	Perfluorobutanesulfonic acid	MSD	RPD	3	%	30
OP81709-MSD*	2706-91-4	Perfluoropentanesulfonic acid	MSD	REC	97	%	71-127
OP81709-MSD*	2706-91-4	Perfluoropentanesulfonic acid	MSD	RPD	2	%	30
OP81709-MSD*	355-46-4	Perfluorohexanesulfonic acid	MSD	REC	96	%	68-131
OP81709-MSD*	355-46-4	Perfluorohexanesulfonic acid	MSD	RPD	4	%	30
OP81709-MSD*	375-92-8	Perfluoroheptanesulfonic acid	MSD	REC	100	%	69-134
OP81709-MSD*	375-92-8	Perfluoroheptanesulfonic acid	MSD	RPD	5	%	30
OP81709-MSD*	1763-23-1	Perfluorooctanesulfonic acid	MSD	REC	94	%	65-140
OP81709-MSD*	1763-23-1	Perfluorooctanesulfonic acid	MSD	RPD	2	%	30
OP81709-MSD*	68259-12-1	Perfluorononanesulfonic acid	MSD	REC	90	%	69-127
OP81709-MSD*	68259-12-1	Perfluorononanesulfonic acid	MSD	RPD	3	%	30
OP81709-MSD*	335-77-3	Perfluorodecanesulfonic acid	MSD	REC	89	%	53-142
OP81709-MSD*	335-77-3	Perfluorodecanesulfonic acid	MSD	RPD	3	%	30
OP81709-MSD*	754-91-6	PFOSA	MSD	REC	97	%	67-137
OP81709-MSD*	754-91-6	PFOSA	MSD	RPD	1	%	30
OP81709-MSD*	2355-31-9	MeFOSAA	MSD	REC	98	%	65-136

* Sample used for QC is not from job FA78009

QC Evaluation: DOD QSM5.x Limits

Job Number: FA78009
Account: SGS North America, Inc
Project: 1204244
Collected: 08/13/20

QC Sample ID	CAS#	Analyte	Sample Type	Result Type	Result	Units	Limits
OP81709-MSD*	2355-31-9	MeFOSAA	MSD	RPD	4	%	30
OP81709-MSD*	2991-50-6	EtFOSAA	MSD	REC	95	%	61-135
OP81709-MSD*	2991-50-6	EtFOSAA	MSD	RPD	2	%	30
OP81709-MSD*	757124-72-4	4:2 Fluorotelomer sulfonate	MSD	REC	102	%	63-143
OP81709-MSD*	757124-72-4	4:2 Fluorotelomer sulfonate	MSD	RPD	4	%	30
OP81709-MSD*	27619-97-2	6:2 Fluorotelomer sulfonate	MSD	REC	103	%	64-140
OP81709-MSD*	27619-97-2	6:2 Fluorotelomer sulfonate	MSD	RPD	4	%	30
OP81709-MSD*	39108-34-4	8:2 Fluorotelomer sulfonate	MSD	REC	104	%	67-138
OP81709-MSD*	39108-34-4	8:2 Fluorotelomer sulfonate	MSD	RPD	7	%	30

* Sample used for QC is not from job FA78009

MS Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

Instrument Blank

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q392-IBLK	3Q25889.D	1	08/26/20	NG	n/a	n/a	S3Q392

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-2

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries		Limits
	13C4-PFBA	113%	50-150%
	13C5-PFPeA	111%	50-150%
	13C5-PFHxA	112%	50-150%
	13C4-PFHpA	113%	50-150%
	13C8-PFOA	115%	50-150%
	13C9-PFNA	115%	50-150%
	13C6-PFDA	118%	50-150%
	13C7-PFUnDA	115%	50-150%

Instrument Blank

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q392-IBLK	3Q25889.D	1	08/26/20	NG	n/a	n/a	S3Q392

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-2

CAS No.	ID Standard Recoveries		Limits
	13C2-PFDoDA	115%	50-150%
	13C2-PFTeDA	123%	50-150%
	13C3-PFBS	111%	50-150%
	13C3-PFHxS	115%	50-150%
	13C8-PFOS	117%	50-150%
	13C8-FOSA	123%	50-150%
	d3-MeFOSAA	118%	50-150%
	13C2-4:2FTS	107%	50-150%
	13C2-6:2FTS	106%	50-150%
	13C2-8:2FTS	108%	50-150%
	13C3-HFPO-DA	118%	50-150%

Instrument Blank

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q393-IBLK	3Q25977.D	1	08/27/20	NG	n/a	n/a	S3Q393

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-1

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries		Limits
	13C4-PFBA	90%	50-150%
	13C5-PFPeA	90%	50-150%
	13C5-PFHxA	90%	50-150%
	13C4-PFHpA	90%	50-150%
	13C8-PFOA	91%	50-150%
	13C9-PFNA	91%	50-150%
	13C6-PFDA	92%	50-150%
	13C7-PFUnDA	91%	50-150%
	13C2-PFDoDA	93%	50-150%
	13C2-PFTeDA	91%	50-150%

Instrument Blank

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q393-IBLK	3Q25977.D	1	08/27/20	NG	n/a	n/a	S3Q393

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-1

CAS No.	ID Standard Recoveries		Limits
	13C3-PFBS	91%	50-150%
	13C3-PFHxS	87%	50-150%
	13C8-PFOS	91%	50-150%
	13C8-FOSA	97%	50-150%
	d3-MeFOSAA	89%	50-150%
	13C2-4:2FTS	85%	50-150%
	13C2-6:2FTS	85%	50-150%
	13C2-8:2FTS	88%	50-150%
	13C3-HFPO-DA	89%	50-150%

Instrument Blank

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q792-IBLK	2Q53272.D	1	08/28/20	NG	n/a	n/a	S2Q792

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-1

CAS No.	Compound	Result	RL	MDL	Units	Q
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

CAS No.	ID Standard Recoveries		Limits
	13C4-PFBA	102%	50-150%
	13C5-PFPeA	97%	50-150%
	13C5-PFHxA	98%	50-150%
	13C4-PFHpA	98%	50-150%
	13C8-PFOA	99%	50-150%
	13C9-PFNA	96%	50-150%
	13C6-PFDA	100%	50-150%
	13C7-PFUnDA	97%	50-150%
	13C2-PFDoDA	97%	50-150%
	13C2-PFTeDA	92%	50-150%
	13C3-PFBS	96%	50-150%
	13C3-PFHxS	96%	50-150%
	13C8-PFOS	96%	50-150%
	13C8-FOSA	103%	50-150%
	d3-MeFOSAA	100%	50-150%
	13C2-4:2FTS	94%	50-150%
	13C2-6:2FTS	92%	50-150%
	13C2-8:2FTS	92%	50-150%

Method Blank Summary

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP81709-MB	3Q25932.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-1, FA78009-2

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.016	0.0040	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0080	0.0030	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0080	0.0020	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0080	0.0020	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0080	0.0020	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0080	0.0020	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0080	0.0020	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0080	0.0020	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0080	0.0030	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0080	0.0020	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0080	0.0020	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0080	0.0020	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0080	0.0020	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0080	0.0020	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0080	0.0020	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0080	0.0030	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0080	0.0020	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0080	0.0020	ug/l	
754-91-6	PFOSA	ND	0.0080	0.0020	ug/l	
2355-31-9	MeFOSAA	ND	0.040	0.0080	ug/l	
2991-50-6	EtFOSAA	ND	0.040	0.0080	ug/l	
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	

CAS No.	ID Standard Recoveries		Limits
	13C4-PFBA	102%	50-150%
	13C5-PFPeA	101%	50-150%
	13C5-PFHxA	104%	50-150%
	13C4-PFHpA	104%	50-150%
	13C8-PFOA	105%	50-150%
	13C9-PFNA	106%	50-150%
	13C6-PFDA	105%	50-150%
	13C7-PFUnDA	103%	50-150%

Method Blank Summary

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP81709-MB	3Q25932.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-1, FA78009-2

CAS No.	ID Standard Recoveries		Limits
	13C2-PFDoDA	96%	50-150%
	13C2-PFTeDA	88%	50-150%
	13C3-PFBS	102%	50-150%
	13C3-PFHxS	105%	50-150%
	13C8-PFOS	101%	50-150%
	13C8-FOSA	106%	50-150%
	d3-MeFOSAA	102%	50-150%
	13C2-4:2FTS	96%	50-150%
	13C2-6:2FTS	96%	50-150%
	13C2-8:2FTS	95%	50-150%

Blank Spike Summary

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP81709-BS	3Q25931.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-1, FA78009-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
375-22-4	Perfluorobutanoic acid	0.16	0.151	94	73-129
2706-90-3	Perfluoropentanoic acid	0.16	0.151	94	72-129
307-24-4	Perfluorohexanoic acid	0.16	0.150	94	72-129
375-85-9	Perfluoroheptanoic acid	0.16	0.154	96	72-130
335-67-1	Perfluorooctanoic acid	0.16	0.150	94	71-133
375-95-1	Perfluorononanoic acid	0.16	0.152	95	69-130
335-76-2	Perfluorodecanoic acid	0.16	0.151	94	71-129
2058-94-8	Perfluoroundecanoic acid	0.16	0.150	94	69-133
307-55-1	Perfluorododecanoic acid	0.16	0.155	97	72-134
72629-94-8	Perfluorotridecanoic acid	0.16	0.145	91	65-144
376-06-7	Perfluorotetradecanoic acid	0.16	0.149	93	71-132
375-73-5	Perfluorobutanesulfonic acid	0.16	0.152	95	73-130
2706-91-4	Perfluoropentanesulfonic acid	0.16	0.154	96	71-127
355-46-4	Perfluorohexanesulfonic acid	0.16	0.150	94	68-131
375-92-8	Perfluoroheptanesulfonic acid	0.16	0.158	99	69-134
1763-23-1	Perfluorooctanesulfonic acid	0.16	0.150	94	65-140
68259-12-1	Perfluorononanesulfonic acid	0.16	0.153	96	69-127
335-77-3	Perfluorodecanesulfonic acid	0.16	0.148	93	53-142
754-91-6	PFOSA	0.16	0.153	96	67-137
2355-31-9	MeFOSAA	0.16	0.156	98	65-136
2991-50-6	EtFOSAA	0.16	0.154	96	61-135
757124-72-4	4:2 Fluorotelomer sulfonate	0.16	0.162	101	63-143
27619-97-2	6:2 Fluorotelomer sulfonate	0.16	0.161	101	64-140
39108-34-4	8:2 Fluorotelomer sulfonate	0.16	0.158	99	67-138

CAS No.	ID Standard Recoveries	BSP	Limits
	13C4-PFBA	108%	50-150%
	13C5-PFPeA	108%	50-150%
	13C5-PFHxA	110%	50-150%
	13C4-PFHpA	109%	50-150%
	13C8-PFOA	109%	50-150%
	13C9-PFNA	109%	50-150%
	13C6-PFDA	107%	50-150%
	13C7-PFUnDA	104%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP81709-BS	3Q25931.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-1, FA78009-2

CAS No.	ID Standard Recoveries	BSP	Limits
	13C2-PFDoDA	100%	50-150%
	13C2-PFTeDA	107%	50-150%
	13C3-PFBS	108%	50-150%
	13C3-PFHxS	109%	50-150%
	13C8-PFOS	108%	50-150%
	13C8-FOSA	109%	50-150%
	d3-MeFOSAA	109%	50-150%
	13C2-4:2FTS	106%	50-150%
	13C2-6:2FTS	105%	50-150%
	13C2-8:2FTS	104%	50-150%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP81709-MS	3Q25934.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392
OP81709-MSD	3Q25935.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392
FA78002-6	3Q25933.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-1, FA78009-2

CAS No.	Compound	FA78002-6 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
375-22-4	Perfluorobutanoic acid	0.017	U	0.167	0.155	93	0.167	0.159	95	3	73-129/30
2706-90-3	Perfluoropentanoic acid	0.0083	U	0.167	0.156	94	0.167	0.160	96	3	72-129/30
307-24-4	Perfluorohexanoic acid	0.0083	U	0.167	0.156	94	0.167	0.157	94	1	72-129/30
375-85-9	Perfluoroheptanoic acid	0.0083	U	0.167	0.155	93	0.167	0.162	97	4	72-130/30
335-67-1	Perfluorooctanoic acid	0.0083	U	0.167	0.154	92	0.167	0.159	95	3	71-133/30
375-95-1	Perfluorononanoic acid	0.0083	U	0.167	0.155	93	0.167	0.159	95	3	69-130/30
335-76-2	Perfluorodecanoic acid	0.0083	U	0.167	0.153	92	0.167	0.160	96	4	71-129/30
2058-94-8	Perfluoroundecanoic acid	0.0083	U	0.167	0.154	92	0.167	0.158	95	3	69-133/30
307-55-1	Perfluorododecanoic acid	0.0083	U	0.167	0.157	94	0.167	0.163	98	4	72-134/30
72629-94-8	Perfluorotridecanoic acid	0.0083	U	0.167	0.163	98	0.167	0.167	100	2	65-144/30
376-06-7	Perfluorotetradecanoic acid	0.0083	U	0.167	0.151	91	0.167	0.157	94	4	71-132/30
375-73-5	Perfluorobutanesulfonic acid	0.0083	U	0.167	0.156	94	0.167	0.161	97	3	73-130/30
2706-91-4	Perfluoropentanesulfonic acid	0.0083	U	0.167	0.159	95	0.167	0.162	97	2	71-127/30
355-46-4	Perfluorohexanesulfonic acid	0.0083	U	0.167	0.154	92	0.167	0.160	96	4	68-131/30
375-92-8	Perfluoroheptanesulfonic acid	0.0083	U	0.167	0.158	95	0.167	0.166	100	5	69-134/30
1763-23-1	Perfluorooctanesulfonic acid	0.0083	U	0.167	0.153	92	0.167	0.156	94	2	65-140/30
68259-12-1	Perfluorononanesulfonic acid	0.0083	U	0.167	0.154	92	0.167	0.150	90	3	69-127/30
335-77-3	Perfluorodecanesulfonic acid	0.0083	U	0.167	0.153	92	0.167	0.149	89	3	53-142/30
754-91-6	PFOSA	0.0083	U	0.167	0.161	97	0.167	0.162	97	1	67-137/30
2355-31-9	MeFOSAA	0.042	U	0.167	0.157	94	0.167	0.164	98	4	65-136/30
2991-50-6	EtFOSAA	0.042	U	0.167	0.156	94	0.167	0.159	95	2	61-135/30
757124-72-4	4:2 Fluorotelomer sulfonate	0.017	U	0.167	0.164	98	0.167	0.170	102	4	63-143/30
27619-97-2	6:2 Fluorotelomer sulfonate	0.017	U	0.167	0.166	100	0.167	0.172	103	4	64-140/30
39108-34-4	8:2 Fluorotelomer sulfonate	0.017	U	0.167	0.162	97	0.167	0.173	104	7	67-138/30

CAS No.	ID Standard Recoveries	MS	MSD	FA78002-6	Limits
	13C4-PFBA	106%	109%		50-150%
	13C5-PFPeA	106%	109%		50-150%
	13C5-PFHxA	105%	111%	109%	50-150%
	13C4-PFHpA	108%	110%	111%	50-150%
	13C8-PFOA	107%	111%	113%	50-150%
	13C9-PFNA	106%	111%	113%	50-150%
	13C6-PFDA	103%	108%	111%	50-150%
	13C7-PFUnDA	99%	102%	109%	50-150%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: FA78009
Account: SGSAKA SGS North America, Inc
Project: 1204244

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP81709-MS	3Q25934.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392
OP81709-MSD	3Q25935.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392
FA78002-6	3Q25933.D	1	08/27/20	NG	08/24/20	OP81709	S3Q392

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.3 B-15

FA78009-1, FA78009-2

CAS No.	ID Standard Recoveries	MS	MSD	FA78002-6	Limits
	13C2-PFDoDA	95%	94%	106%	50-150%
	13C2-PFTeDA	86%	85%	107%	50-150%
	13C3-PFBS	105%	110%	109%	50-150%
	13C3-PFHxS	108%	110%	110%	50-150%
	13C8-PFOS	105%	111%	108%	50-150%
	13C8-FOSA	106%	104%		50-150%
	d3-MeFOSAA	101%	103%	110%	50-150%
	13C2-4:2FTS	105%	109%		50-150%
	13C2-6:2FTS	103%	106%	101%	50-150%
	13C2-8:2FTS	101%	103%	101%	50-150%

* = Outside of Control Limits.

Laboratory Data Review Checklist

Completed By:

Dana Fjare

Title:

Environmental Scientist

Date:

10/09/20

Consultant Firm:

Shannon & Wilson, Inc.

Laboratory Name:

SGS North America, Inc.

Laboratory Report Number:

1204244_Revision 1

Laboratory Report Date:

10/07/20

CS Site Name:

Yakutat DOT&PF PFAS

ADEC File Number:

1530.38.022

Hazard Identification Number:

27090

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Laboratory Report Date:

10/07/20

CS Site Name:

Yakutat DOT&PF PFAS

Note: Any N/A or No box checked must have an explanation in the comments box.

1. Laboratory

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

   Yes☒ No☐ N/A☐ Comments:

   Samples were analyzed by SGS North America, Inc. in Anchorage, Alaska.

   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☒ N/A☐ Comments:

   Samples for PFAS analysis were sub-contracted to SGS in Orlando, Florida, an ADEC CS-approved laboratory. Samples for arsenic speciation analysis were subcontracted to Brooks Applied Labs in Bothell, Washington. Brooks Applied Labs is not an ADEC CS-approved laboratory; however, this laboratory is NELAP-accredited.

2. Chain of Custody (CoC)

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

   Yes☒ No☐ N/A☐ Comments:

   b. Correct analyses requested?

   Yes☒ No☐ N/A☐ Comments:

3. Laboratory Sample Receipt Documentation

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

   Yes☐ No☒ N/A☐ Comments:

   Sample cooler 3 was received by SGS in Anchorage at 6.6°C. This cooler contained the samples for arsenic speciation to be analyzed by Brooks Applied Labs. The samples were received by SGS within 24 hours from collection and would not have been out of temperature for very long. In addition, the samples were preserved with EDTA to stabilize the arsenic species. After discussing the temperature cooler exceedance with Brooks Applied Labs, it was determined that the slight temperature exceedance would result in negligible bias. The arsenic speciation results were not affected by the slight temperature exceedance.

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

The sample receipt form notes that the samples were received in good condition.

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☐ N/A☐ Comments:

Sample cooler 3 was received by SGS in Anchorage at 6.6°C. This cooler contained the samples for arsenic speciation to be analyzed by Brooks Applied Labs. There were no other discrepancies noted in this work order.

e. Data quality or usability affected?

Comments:

Data quality and usability were unaffected; see above.

4. Case Narrative

a. Present and understandable?

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

The report was corrected and revised to include missing requested analytes not included in the original report.

Arsenic speciation was analyzed by Brooks Applied of Bothell, WA and EPA 537M PFAS list 24 were analyzed by SGS of Orlando, FL.

The pH of the Trip Blank is greater than 2 in the vials for gasoline range organics (GRO) analysis.

Surrogate recoveries in the laboratory control sample (LCS) 1575487 for 5a-androstane and n-triacontane did not meet QC criteria; however, the surrogate recoveries in the associated project samples were within criteria.

Sample *33066* had IDA surrogate recovery for 13C2-PFTeDA outside of laboratory control limits. The sample required dilution due to matrix interference with the IDA surrogate.

c. Were all corrective actions documented?

Yes☐ No☐ N/A☒ Comments:

The laboratory did not specify corrective actions.

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

Comments:

The case narrative does not specify an effect on data quality/usability; see section 6.d for further assessment.

5. Samples Results

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

Yes☒ No☐ N/A☐ Comments:

b. All applicable holding times met?

Yes☒ No☐ N/A☐ Comments:

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c. All soils reported on a dry weight basis?

Yes☐ No☐ N/A☒ Comments:

The sample matrix is water.

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

Yes☐ No☐ N/A☒ Comments:

Project sample results are not compared with ADEC cleanup levels. The data is being used for water quality parameter assessment for point of entry treatment studies.

e. Data quality or usability affected?

The data quality/usability is not affected.

6. QC Samples

a. Method Blank

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

Yes☒ No☐ N/A☐ Comments:

ii. All method blank results less than limit of quantitation (LOQ) or project specified objectives?

Yes☒ No☐ N/A☐ Comments:

Method blank results were below the LOQ; however, DRO, sulfate, and conductivity were detected at estimated concentrations below the LOQ in several of the method blanks.

iii. If above LOQ or project specified objectives, what samples are affected?

Comments:

The method blanks are quality control (QC) samples for project samples *33066* and *33063*.

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

Yes☒ No☐ N/A☐ Comments:

The project sample conductivity and sulfate results are greater than 10 times the concentration detected in the method blanks, so the data are considered unaffected by the method blank detections.

DRO was detected at an estimated concentration below the LOQ in both project samples. These results are considered estimated non-detections and are flagged 'UB' in the analytical tables.

v. Data quality or usability affected?

Comments:

Data quality and/or usability are not affected; see above.

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☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☒ N/A☐ Comments:

The TSS laboratory duplicate samples 1575149 and 1575150 had RPD failures. The parent samples associated with the laboratory duplicate samples are not a part of the project sample set. Project samples are not affected by these RPD failures.

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

Comments:

Project samples are not affected; see above.

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

Yes☐ No☐ N/A☒ Comments:

No samples are affected; see above.

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

Comments:

The data quality/usability is not affected.

c. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Note: Leave blank if not required for project

i. Organics – One MS/MSD reported per matrix, analysis and 20 samples?

Yes☒ No☐ N/A☐ Comments:

An MS was reported for EPA 1664B analysis.

An MS/MSD was reported for Total Organic Carbon and PFAS analyses.

ii. Metals/Inorganics – one MS and one MSD reported per matrix, analysis and 20 samples?

Yes☒ No☐ N/A☐ Comments:

An MS was reported for EP200.8 (Metals) and EPA 300.0 (anions).

An MS/MSD was reported for Sulfide, Total Nitrate/Nitrite-N, Total Kjeldahl Nitrogen, analyses and arsenic speciation.

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

Yes☐ No☒ N/A☐ Comments:

The MS 1576898 sample had high recovery for sodium.

The MS 1577014 had low recovery for sulfate.

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

Yes☒ No☐ N/A☐ Comments:

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

Comments:

The parent samples for both MS 1576898 and MS 1577014 are not samples from this work order, so the project samples are considered unaffected by the MS recovery failures.

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

Yes☐ No☒ N/A☐ Comments:

Flags were not required because the MS parent samples were not samples from this work order; see above.

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

Comments:

The data quality and usability are not affected; see above.

d. Surrogates – Organics Only or Isotope Dilution Analytes (IDA) – Isotope Dilution Methods Only

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☒ N/A☐ Comments:

The DRO/RRO surrogate 5a-androstane and n-triacontane recoveries exceeded laboratory QC limits in LCS 1575487.

The IDA standard recovery for 13C2-PFTeDA was below laboratory QC limits in project sample *33066*.

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

Yes☐ No☒ N/A☐ Comments:

LCS recovery for DRO and RRO was within laboratory control limits so the surrogate recovery failures are not considered to affect the project sample results.

The laboratory ran the IDA standards a second time for project sample *33066*. The results from the second run were within laboratory QC limits. The laboratory reported the result for PFTeDA in project sample *33066* using the data from the second IDA run.

iv. Data quality or usability affected?

Comments:

The data quality and usability are not affected; see above.

e. Trip Blanks

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

Yes☒ No☐ N/A☐ Comments:

A trip blank was reported for GRO/BTEX analysis.

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☒ N/A☐ Comments:

The cooler containing the trip blank was not noted on the COC; however, the trip blank remained in the cooler with the project samples.

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Laboratory Report Date:

10/07/20

CS Site Name:

Yakutat DOT&PF PFAS

iii. All results less than LOQ and project specified objectives?

Yes☒ No☐ N/A☐ Comments:

iv. If above LOQ or project specified objectives, what samples are affected?

Comments:

N/A; project analytes were not detected in the trip blank.

v. Data quality or usability affected?

Comments:

The data quality/usability is not affected; see above.

f. Field Duplicate

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

Yes☐ No☐ N/A☒ Comments:

Field duplicate samples were not submitted with this work order.

ii. Submitted blind to lab?

Yes☐ No☐ N/A☒ Comments:

Field duplicate samples were not submitted with this work order.

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

RPD (%) = 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☐ N/A☒ Comments:

Field duplicate samples were not submitted with this work order.

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

Comments:

We cannot know the precision of the analyte results for the project sample matrix.

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Laboratory Report Date:

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Yakutat DOT&PF PFAS

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

Yes☐ No☐ N/A☒ Comments:

Samples for this project are not collected with reusable equipment, therefore a practical potential for equipment based cross-contamination does not exist.

i. All results less than LOQ and project specified objectives?

Yes☐ No☐ N/A☒ Comments:

See above.

ii. If above LOQ or project specified objectives, what samples are affected?

Comments:

No samples affected; see above.

iii. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected; see above.

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

a. Defined and appropriate?

Yes☐ No☐ N/A☒ Comments:

No other data flags or qualifiers

APPENDIX B: BARR - POET FEASIBILITY REPORT AND SUPPORTING INFORMATION

WATER SUPPLY WELL SAMPLING LOGS

SHANNON & WILSON, INC.

WATER SUPPLY WELL SAMPLING LOG

Address 989 AIRPORT WAY / 1034 Airport Access Rd
Owner/Occupant YAKUTAT LODGE RESTAURANT
Mailing address PO BOX 70
Telephone 907-952-4681 / 907-784-3232

Project Number 102896-005 / -006
Project Name YAKUTAT QUARTERLY
Date 8/13/20
Time 1645
Sampling Personnel RLW

Sample Location Purged in women's bathroom sink
Sampled from PT, pre-treatment

Sample Number 33066 (POET + PFAS)
Duplicate 93066 (PFAS only)

Time 1721
Time 1711

Analysis PFAS x 18 + Pre-POET samples

Lab TEST AMERICA
SGS for POET

Purge Volume 0.5 GPM

PARAMETERS [stabilization criteria]

Time	Temp. (°C) [± 0.5]	Conductivity (µS/cm) [± 3%]	pH (std. units) [± 0.1]	Water Clarity (visual)
1657	10.2	253.0	6.18	clear
1700	10.2	251.9	6.69	clear
1703	10.3	253.2	6.90	clear
1706	10.4	253.4	7.01	clear
1709	10.5	254.3	7.11	Clear
1712	10.4	253.3	7.18	clear
1715	10.4	253.6	7.20	clear
1718	10.4	253.7	7.24	clear
1721	SAMPLE			

Notes: Low water pressure. Toilet flush significantly ↓ pressure
* Removed filters post-pressure tank to collect sample.
Valve btwn PT + well head does not work!

SHANNON & WILSON, INC.

WATER SUPPLY WELL SAMPLING LOG

Address 1023/1033 AIRPORT ACCESS RD
Owner/Occupant YAK LODGE GUEST + EMPLOYEE HOUSING
Mailing address same as restaurant
Telephone

Project Number 102896-005
Project Name YAKUTAT ALT WATER
Date 8/13/20
Time 1900
Sampling Personnel RLW

Sample Location Pump house, outdoor spigot

Sample Number 33063
Duplicate —

Time 1925
Time —

Analysis POET SAMPLES

Lab SGS

Purge Volume 2 GPM

PARAMETERS [stabilization criteria]

Time	Temp. (°C) [± 0.5]	Conductivity (µS/cm) [± 3%]	pH (std. units) [± 0.1]	Water Clarity (visual)
1901	6.8	202.2	6.30	clear
1904	6.8	202.2	6.30	clear
1907	6.9	202.1	7.02	clear
1910	6.8	202.1	7.17	clear
1913	6.9	202.1	7.23	clear
1916	6.9	202.1	7.32	clear
1919	6.9	202.2	7.37	clear
1922	6.9	202.1	7.41	clear
1925	SAMPLE			

Notes: * Maintenance personnel (MS) said this well was on last winter + may remain on in the next

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 that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

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

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

IMPORTANT INFORMATION

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

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

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

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

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

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

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken

impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

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

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