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



BY:
Shannon & Wilson, Inc.
2355 Hill Rd
Fairbanks, Alaska 99709

(907) 479-0600
www.shannonwilson.com


FINAL

SUMMARY REPORT

# December 2018 to November 2019 Water Supply Sampling

GUSTAVUS, ALASKA


SHANNON & WILSON


August 2020
Shannon & Wilson No: 102599

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Submitted To: Alaska Department of Transportation & Public Facilities
2301 Peger Road
Fairbanks, Alaska 99709
Attn: Samantha Cummings

Subject: FINAL SUMMARY REPORT, DECEMBER 2018 TO NOVEMBER 2019 WATER SUPPLY SAMPLING, GUSTAVUS, ALASKA

Shannon & Wilson prepared this report as a summary of our water supply well sampling services from December 2018 to November 2019. The services were conducted on behalf of the Alaska Department of Transportation & Public Facilities (DOT&PF). Our scope of services was specified in our proposals dated February 1, 2019, May 23, 2019 and August 21, 2019 authorized on February 27, 2019, May 31, 2019 and September 17, 2019 respectively, by DOT&PF under our Professional Services Agreement Number 25-19-1-013 Per- and Polyfluoroalkyl Substance (PFAS) Related Environmental & Engineering Services.

We appreciate 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.

Craig Beebe
Geologist
Role: Primary Author

Kristen Freiburger, Associate
Senior Chemist
Role: Project Manager

Christopher Darrah, C.P.G., CPESC
Vice President
Role: Contract Manager

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# ACRONYMS

| | |
|---|---|
| AAC | Alaska Administrative Code |
| AFFF | aqueous film-forming foam |
| ARFF | aircraft rescue and firefighting |
| bgs | below ground surface |
| °C | degrees Celsius |
| COC | chain-of-custody |
| DEC | Alaska Department of Environmental Conservation |
| DOA | Department of Administration |
| DONA | 4,8-dioxa-3H-perfluorononanoic acid |
| DOT&PF | Alaska Department of Transportation & Public Facilities |
| DRM | Alaska Department of Administration Division of Risk Management |
| EPA | U.S. Environmental Protection Agency |
| GST | Gustavus Airport Terminal |
| HFPO-DA | hexafluoropropylene oxide dimer acid |
| LDRC | Laboratory Data Review Checklist |
| LHA | Lifetime Health Advisory |
| LCS/LCSD | laboratory control spike/laboratory control spike duplicate |
| LOD | limits of detection |
| LOQ | limit of quantification |
| MAROS | Monitoring and Remediation Optimization System |
| MS/MSD | matrix spike/matrix spike duplicate |
| µS/cm | microsiemens per centimeter |
| N-EtFOSAA | N-ethyl perfluorooctane sulfonamidoacetic acid |
| ng/L | nanograms per liter |
| N-MeFOSAA | N-methyl perfluorooctane sulfonamidoacetic acid |
| NPS | National Park Service |
| PFAS | per- and polyfluoroalkyl substances |
| PFBS | perfluorobutanesulfonic acid |
| PFDA | perfluorodecanoic acid |
| PFDoA | perfluorododecanoic acid |
| PFHpA | perfluoroheptanoic acid |
| PFHxA | perfluorohexanoic acid |
| PFHxS | perflurohexanesulfonic acid |
| PFNA | perfluorononanoic acid |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctanesulfonic acid |
| PFTeA | perfluorotetradecanoic acid |
| PFTrDA | perfluorotridecanoic acid |
| PFUnA | perfluororoundecanoic acid |
| POET | point of entry treatment |
| QA/QC | quality assurance/quality control |
| RPD | relative percent difference |

| | |
|---|---|
| SGS | SGS North America, Inc. |
| TestAmerica | TestAmerica Labs, Inc./Eurofins |
| TDS | total dissolved solids |
| TOC | total organic carbon |
| TSS | total suspended solids |
| UCMR | unregulated contaminant monitoring rule |
| WO | work order |
| YSI | multiprobe water quality meter |
| 6:2 FTS | 6:2 fluorotelomer-sulfonate |
| 11Cl-PF3OUdS | 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid |
| 9Cl-PF3ONS | 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid |

# 1 INTRODUCTION

Shannon & Wilson, Inc. has prepared this report to document our well-search and water supply well sampling efforts near the Gustavus Airport Terminal (GST) in Gustavus, Alaska. This report addresses activities conducting between December 2018 to January 2020 for the ongoing project. The GST is an active, Alaska Department of Environmental Conservation (DEC) listed contaminated site due to the presence of per- and polyfluoroalkyl substances (PFAS) in groundwater and surface water (File Number 1507.38.017, Hazard ID 26904).

This report was prepared for the Alaska Department of Transportation & Public Facilities (DOT&PF) in accordance with the terms and conditions of our contract, relevant DEC guidance documents, and 18 Alaska Administrative Code (AAC) 75.335.

## 1.1 Purpose and Objectives

The purpose of the services described in this report was to evaluate the potential for human exposure to PFAS-containing water in water supply wells. Our objectives were to collect quarterly or annual samples from previously sampled water supply wells that meet the monitoring criteria discussed in section 2.4; and to collect samples from previously unsampled wells in neighborhoods near the Gustavus Airport and within the well search areas. The well search areas are shown in Figure 1, Well Search Extent.

## 1.2 Background

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

The DOT&PF Crash and Fire Rescue program used aqueous film forming foam (AFFF) for training, systems testing, and emergency response at the GST for many years. Areas of potential use are shown as AFFF sites on Figure 1. The precise timeline and locations of AFFF use at the GST are unknown.

AFFF contains PFAS, a category of persistent organic compounds considered contaminants of emerging concern. Perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are two PFAS commonly found at sites where AFFFs were used. Due to their persistence, toxicity, and bioaccumulative potential, these compounds are of increasing concern to environmental and health agencies. The U.S. Environmental Protection Agency

(EPA) published a Lifetime Health Advisory (LHA) level for PFOS and PFOA in drinking water in May 2016 of 70 nanograms per liter (ng/L) for the sum of PFOS and PFOA. The DEC Contaminated Sites Program published groundwater-cleanup levels for PFOS and PFOA in November 2016 of 400 ng/L for each compound individually. Prior to the publication of these levels, there were no state-level cleanup levels established for PFAS.

On May 4, 2018 DEC informed DOT&PF the airport terminal well and National Park Service (NPS) Water System well serving the school were at risk for PFAS contamination. On June 27, 2018, DOT&PF sampled both drinking-water supply wells for the presence of PFAS. The analytical results were received on July 30, 2018. The airport terminal well contained levels of PFAS exceeding the EPA's LHA level. The NPS well had detections of several PFAS less than the EPA's LHA level. DOT&PF and the Alaska Department of Administration's (DOA's) Division of Risk Management (DRM) contacted Shannon & Wilson regarding the Gustavus results. Shannon & Wilson began water supply well search and sampling efforts in August 2018.

On August 20, 2018, the DEC published a Technical Memorandum outlining a new action level for the sum of five PFAS (PFOS, PFOS, perfluorohexane sulfonate [PFHxS], perfluoroheptanoate [PFHpA], and perfluorononanoate [PFNA]) in drinking water. The action levels proposed in the August 2018 Technical Memorandum were submitted as proposed regulation. PFAS projects for the State of Alaska adopted the proposed regulatory action level from August 2018 to March 2019, per DEC direction. The proposed regulation has not been formally adopted to date.

**Exhibit 1-1: Gustavus Airport AFFF training area.**

The initial response and water supply well sampling in Gustavus referenced the sum of five PFAS action level for the purposes of assessing drinking-water well contamination. Water supply wells used for drinking and/or cooking with concentrations for the sum of five PFAS exceeding 65 ng/L were provided with an alternative drinking-water source.

On April 9, 2019 DEC issued an update to the August 20, 2018 Technical Memorandum rescinding the previous action level to align with EPA’s LHA. The memo notes “In order to align state actions to the recently announced EPA plans, DEC will use the EPA LHA

(PFOS+PFOA above 0.07 µg/L) as the Action Level. Any new testing for PFAS will be for PFOS and PFOA only."

On October 2, 2019 DEC issued a second update to the August 20, 2018 Technical Memorandum stating, "Any new testing for PFAS will report the full suite of PFAS compounds analyzed by the appropriate EPA Method." EPA Method 537.1 includes the suite of 18 PFAS outlined in Section 1.4.

## 1.3 Geology and Hydrology

The GST sampling area lies in a glacial outwash plain. The plain is bounded by the Chilkat Mountain Range to the northeast, Glacier Bay to the northwest and Icy Strait to the south.

Our knowledge of subsurface geology and hydrology in the investigation area is based on observations Shannon & Wilson made during the 2019 site characterization drilling activities and information provided to us by a local well driller. Our investigation noted the sampling area is mostly comprised of fluvial and marine sediments. The soil profile generally consists of water-bearing, interbedded sand and silt underlain by a silty clay or clay confining layer. The confining layer was observed at varying depths ranging from approximately 13 to 45 feet below ground surface (bgs).

The depth to the water table ranged from 0.33 feet bgs to 8.75 feet bgs on the east side of the Salmon River. At the well cluster by City Hall, the water table ranged from 13.75 to 13.80 feet bgs.

## 1.4 Contaminants of Concern and Action Levels

Section 1.2 summarizes the progression of PFAS regulatory changes affecting the GST site. The contaminants of concern for the residential-well sampling described in this report are:

- PFOS
- PFOA
- PFHpA
- PFNA
- PFHxS
- perfluorobutanesulfonic acid (PFBS)
- perluorodecanoic acid (PFDA)
- perluorododecanoic acid (PFDoA)
- perfluorohexanoic acid (PFHxA)

- perfluorotetradecanoic acid (PFTeA)
- perfluorotridecanoic acid (PFTrDA)
- perfluoroundecanoic acid (PFUnA)
- hexafluoropropylene oxide dimer acid (HFPO-DA)
- N-ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA)
- N-methyl perfluorooctane sulfonamidoacetic acid (N-MeFOSAA)
- 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11CL-PF3OUdS)
- 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CL-PF3ONS)
- 4,8-dioxa-3H-perfluorononanoic acid (DONA)

Of these contaminants of concern, only PFOS and PFOA are regulated with numeric action levels or cleanup levels, as summarized in Exhibit 1-2.

**Exhibit 1-2: Applicable Regulatory Action Levels**

| Media | Compound | Level |
|---|---|---|
| Drinking water | PFOS + PFOA | 70 ng/L[a] |
| Groundwater | PFOS | 400 ng/L[b] |
| Groundwater | PFOA | 400 ng/L[b] |
| Soil | PFOS | 3.0 µg/kg[c] |
| Soil | PFOA | 1.7 µg/kg[c] |

Notes:
a Drinking-water action level reported in DEC October 2019 Technical Memorandum.
b DEC groundwater-cleanup level reported in 18 AAC 75.345, Table C.
c DEC migration-to-groundwater soil-cleanup levels reported in 18 AAC 75.341, Table B1.
ng/L = nanograms per liter, µg/kg = micrograms per liter

## 1.5 Scope of Services

Our scope of services summarized in this report includes water supply well searches, four water supply well monitoring events, and public-outreach support. Our purpose was to evaluate the potential for human exposure to PFAS-containing water in water supply wells near GST. The objective was to identify water supply wells in the sampling area and collect water samples from those wells. This project is ongoing; planned future work is summarized in Section 5.3.

Our well-search activities sought to identify water supply wells and document the well use and well construction details, where available. This report includes data from water supply well sampling events conducted in March, June and October 2019. This report also includes additional sampling conducted for Barr Engineering in June 2019 for the purposes of designing point of entry treatment (POET) systems. POET design is not discussed further in this report. Additionally, site characterization activities performed in October 2019 will not be discussed in this report; please reference our April 2020 report *Gustavus PFAS 2019 Site Characterization - Revision 1*.

This report was prepared for the exclusive use of the DOT&PF and its representatives. This work presents our professional judgment as to the conditions of the site. Information presented here is based on the sampling and analyses Shannon & Wilson performed. This report should not be used for other purposes without our approval or if any of the following occurs:

- Project details change, or new information becomes available, such as revised regulatory levels or the discovery of additional source areas.
- 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 the site ownership or land use has changed.
- Regulations, laws, or cleanup levels change.
- If the site's regulatory status has changed.

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

## 1.6 Summary of Previous Water Supply Well Sampling

Since August 2018, have collected samples from a total of 113 water supply wells for PFAS analytes over several visits to Gustavus. Shannon & Wilson also collected five surface-water samples during the August 2018 and September 2018 sampling events. In addition, Shannon & Wilson held several public-outreach meetings in conjunction with State of Alaska employees to inform residents about the project.

Water supply well sample concentrations for the sum of PFOS and PFOA ranged from not-detected to 6,110 ng/L for wells associated with the GST PFAS project. Water supply well sampling areas were expanded for subsequent sampling events until PFAS concentrations in wells along the edges of the sampling areas were found to be below the applicable DEC regulatory levels. Water supply well depths are generally between 15 to 25 feet bgs based on information provided by the residents and the former local driller who installed most of the wells. Shannon & Wilson was not able to obtain well-drilling or construction logs to confirm these depths.

# 2 FIELD ACTIVITIES

This section summarizes activities performed between December 2018 and November 2019.

## 2.1 Well Categories

For the purposes of this project, a water supply well is defined as a privately-owned water-supply well. Please note this definition of water supply well does not match the DEC Drinking Water Program regularity classification of a private water system, "a potable water system serving one single-family residence or duplex" (18 AAC 80, 2014).

Shannon & Wilson completed a Water Supply Well Inventory Survey Form for each newly identified water supply well. A copy of each completed Survey Form is included in Appendix A, Field Logs. Shannon & Wilson used this information to designate a well category based on use.

- Category 1: wells used for drinking or cooking, as reported by owners or occupants.
- Category 2: wells used for dish washing and other domestic purposes.
- Category 3: wells used for vegetable-garden irrigation and are not plumbed to indoor faucets or spigots. The well water is accessed by outdoor plumbing, but the well may be located underneath or inside the structure. These wells are considered non-drinking-water wells.
- Category 4: wells used for outdoor purposes only, such as irrigation of lawns or non-vegetable gardens or vehicle washing. These wells are considered non-drinking-water wells.
- Category 5: wells currently not in use. Wells that have been abandoned in place, are inoperable, disconnected, or intended for future use, are considered category 5 wells. These wells are considered non-drinking-water-wells.

## 2.2 Well Search

Shannon & Wilson made a reasonable attempt to contact each owner or occupant in the search areas to collect a well sample or verify a well is not present. During the 2019 water supply well sampling activities, efforts were made to follow up with properties where contact with an owner or occupant was unable to be made during previous events. If occupants were not present when Shannon & Wilson visited the property, a personalized door tag with contact information was provided. Shannon & Wilson collected first-time samples from 13 properties in the defined door-to-door well search areas during the 2019 sampling events, as described in Section 2.3 below.

## 2.3 Water Supply Well Sampling

Shannon & Wilson conducted three water supply well sampling events between March 7, 2019 and October 15, 2019. The following Shannon & Wilson personnel collected analytical water samples for this project. These individuals are State of Alaska Qualified Samplers as defined in 18 AAC 75.333[b] and 18 AAC 78.088[b].

- Amber Masters, Environmental Scientist
- Sheila Hinckley, Environmental Scientist
- Kristen Freiburger, Chemist
- Craig Beebe, Geologist
- Adam Wyborny, Environmental Engineer
- Cherissa Dukelow, Environmental Scientist

**Exhibit 2-1: Photographs of Water Supply Well Sample Locations in Gustavus, Alaska.**

Shannon & Wilson sampled 48 unique water supply wells during the reporting period; some wells were sampled multiples times over several sampling events. Shannon & Wilson collected water supply well samples from a location in the structure's plumbing upstream of water-treatment systems or water softeners, where possible. Samples collected downstream of water softeners or other in-home treatment systems are listed in Section 2.10, Deviations.

For the purposes of this project Shannon & Wilson does not consider small (i.e., less than 18 inches in height) particulate filters to be treatment systems.

Shannon & Wilson purged the water supply well systems prior to sampling by allowing the water to run until water parameters stabilized and the water appeared clear. Purging for approximately 20 minutes, parameters were collected using a multiprobe water quality meter (YSI). The parameters pH, temperature, and conductivity were recorded approximately once every three minutes until sample collection. The following values were used to indicate stability for a minimum of three consecutive readings: ±0.1 pH, ±0.5 degrees Celsius (°C) temperature, and ±3 percent conductivity (microsiemens per centimeter [μS/cm]).

Shannon & Wilson discharged purge water to an indoor sink or to the ground surface. At most residences within the GST search areas, indoor plumbing leads to a private septic system. Following parameter stabilization, Shannon & Wilson collected PFAS water samples using laboratory-supplied containers. Copies of the *Water Supply Well Sampling Logs* are included in Appendix A, Field Logs.

Shannon & Wilson are aware of the potential for cross-contamination of PFAS water samples from numerous everyday household items. Shannon & Wilson took appropriate precautions to prevent cross-contamination, including discontinuing the use of personal protective equipment and field supplies known to contain PFASs, using liner bags to contain samples before and after sample collection, hand washing, and donning a fresh pair of disposable nitrile gloves before sample collection.

## 2.4 Water Supply Well Monitoring

Through coordination with the DOT&PF and DEC, Shannon & Wilson established the well monitoring network criteria prior to the March 2019 sampling event. Wells were included in the March 2019 sampling event if they are active category 1 and 2 wells with:

- maximum combined PFOS, PFHpA, PFNA, PFHxS and PFOA concentration was greater than or equal to 35 ng/L during a previous sampling event; or
- within 500 lateral feet of wells with combined PFOS, PFHpA, PFNA, PFHxS and PFOA concentration was greater than or equal to 35 ng/L during a previous sampling event.

These samples were submitted for analysis of PFOS, PFOA, PFHxS, PFHpA, PFNA, and PFBS. Lateral distance was measured from the GIS points collected during the initial round of sampling.

Through coordination with DOT&PF and DEC, the well-monitoring network criteria were modified prior to the June 2019 sampling event. This is referred to as the annual sampling event. Wells were included in the June 2019 sampling event if they are active category 1 and 2 wells with:

- maximum combined PFOS and PFOA concentration greater than or equal to 17 ng/L during a previous sampling event; or
- within 500 lateral feet of wells with a combined PFOS and PFOA concentration greater than or equal to 17 ng/L during a previous sampling event.

These samples were submitted for analysis of PFOS and PFOA only.

Prior to the October 2019 sampling event, the well monitoring network criteria was modified to no longer include wells that exceeded the LHA. Wells were included in the October 2019 sampling event if they are active category 1 and 2 wells with:

- maximum combined PFOS and PFOA concentration greater than or equal to 35 ng/L but less than the LHA during a previous sampling event; or
- within 500 lateral feet of wells with a combined PFOS and PFOA concentration greater than or equal to 35 ng/L during a previous sampling event.

These samples were submitted for the analysis of 18 PFAS analytes per EPA 537.1 (Section 1.4).

Water supply well monitoring locations are shown in light and dark blue in Figure 2.

## 2.5 Surface Water Sampling

At the request of DOT&PF, Shannon & Wilson sampled two surface-water bodies to determine their suitability as water sources for filling the aircraft rescue and firefighting (ARFF) truck. Both locations were sampled during the March 2019 sampling event. The first sample was taken from the pond in the southeastern gravel pit along Wilson Road. The second sample was taken from the creek along the west side of Mountain View Road at the southern leg of Spruce Lane.

## 2.6 Sample Custody, Storage, and Transport

Immediately after collection, the sample bottles for each location were placed in Ziploc bags and stored in a designated sample cooler maintained between 0 °C and 6 °C with ice substitute separated from the sample bottles by a liner bag. Shannon & Wilson maintained custody of the samples until submitting them to the laboratory for analysis. For shipping Shannon & Wilson packaged analytical samples and chain-of-custody (COC) forms in a hard-plastic cooler with an adequate quantity of frozen-ice substitute and packing material to prevent bottle breakage. Shannon & Wilson applied custody seals to the cooler, which were observed to be intact upon receipt by the laboratory.

Shannon & Wilson shipped sample coolers to TestAmerica Laboratories, Inc./Eurofins (TestAmerica) in West Sacramento, California for analysis of PFAS using Alaska Air Cargo priority overnight service, also known as Goldstreak. Samples were generally shipped from Goldstreak in Juneau, Alaska. Water supply well samples were submitted promptly to the analytical laboratory after each well search and sampling effort. This allowed sufficient time for the laboratory to analyze the samples within holding-time requirements of the analytical method. An expedited, five-business-day turnaround time was requested for first work order only.

Shannon & Wilson also shipped sample coolers to SGS North America Inc. (SGS) in Anchorage, Alaska on June 10, 2019 to analyze samples collected for Barr Engineering POET system design; samples were shipped from Juneau, Alaska using Goldstreak.

Each laboratory report is included in Appendix B.

## 2.7 Notification of Results

Following a review of the analytical data, Shannon & Wilson prepared analytical-data tables for review by the rest of the project team. Shannon & Wilson then called property owners and occupants to notify them of the results of the PFAS water testing.

Shannon & Wilson also prepared letters for owners and occupants informing them of the results for the sample collected from their well. These letters were tailored to each property and analytical sample, and included the following information:

- sample name;
- analytical results for the three highest analyzed PFAS concentrations from the sampling event (March 2019 only) or concentrations of PFOS and PFOA (June and October 2019);
- comparison of analytical results to DEC's or EPA's current action levels;
- description of the project; and
- pages of the TestAmerica laboratory report that apply to the owner or occupant's water-well sample, including other PFAS results.

Where requested, Shannon & Wilson emailed results letters to owners and/or occupants.

## 2.8 Alternative Water Sources

The DOT&PF is exploring various options to provide affected residents with a permanent alternative water source. These may include but are not limited to POET systems, constructing a community well outside of the affected area, rain catchment systems and installing cisterns. Investigation of permanent water solutions for Gustavus is ongoing in 2020.

### 2.8.1 Bottled Water

On September 17, 2018, the DRM began offering and delivering bottled water to properties where the water supply well sample showed results above the proposed DEC action levels.

**Exhibit 2-2: Bottled water stored for deliveries.**

### 2.8.2 Point of Entry Treatment Systems

For the purposes of point of entry treatment system design, Shannon & Wilson collected eleven samples during our December 2018 and June 2019 sampling events. Sample testing methods are discussed in Section 3 below. For results from the December 2018 sampling event, reference our previous report titled *August 2018 to November 2018 Private Well Sampling*.

**Exhibit 2-3: Installed point of entry treatment system**

## 2.9 Public Information

The DOT&PF hosts a webpage describing the PFAS water-testing project. The webpage includes a project summary, list of contacts, simplified regional results map, and links to additional resources. The map is updated after each sampling event following the receipt of analytical data; Appendix C includes an example from July 2019.

## 2.10 Deviations

In general, Shannon & Wilson conducted these services in accordance with the sampling procedures noted above, and based on ongoing discussion with DRM, DEC and DOT&PF. The following are deviations from the procedures described in Section 2:

**Exhibit 2-4: Sampling the future site of the Gustavus Community Center (*PW-438*)**

- The following samples were collected from a location downstream of the property's water softener or other in-home treatment system during one or more sampling events: *PW-012, PW-038, PW*-040, and *PW-431*.
- Our sampling protocol includes stabilization of parameters; however, the following samples were collected from handpump wells and parameters were not measured and/or stabilized: *PW-205, PW-208, PW-209, PW-462* and *PW-464*.
- Our sampling protocol includes sampling directly from a spigot or port within the plumbing system. Sample *PW-415* was taken through a hose fused to the spigot.
- Samples *PW-205* and *PW-438* were taken with the use of a non-dedicated pump.

# 3 ANALYTICAL RESULTS

Shannon & Wilson submitted drinking-water samples collected in March and June 2019 to TestAmerica for determination PFAS concentrations using Method WS-LC-0025, the laboratory's in-house method. This method analyzes for the PFAS listed in the EPA Unregulated Contaminant Monitoring Rule (UCMR): PFOS, PFOA, PFHpA, PFNA, PFBS, and PFHxS. Samples collected in June 2019 were originally submitted for analysis of PFOS and PFOA only. The results are presented on Table 1 for PFOS and PFOA; the additional four analytes are presented on Table 2 for the June 2019 samples.

In October 2019, Shannon & Wilson submitted for the determination of 18 PFAS using modified Method 537.1. This method analyzes for PFOS, PFOA, PFHpA, PFNA, PFHxS, PFBS, PFDA, PFDoA, PFHxA, PFTeA, PFTrDA, PFUnA, HFPO-DA, N-EtFOSAA, N-MeFOSAA, 11CL-PF3OUdS, 9CL-PF3ONS and DONA. It is considered a modified method for groundwater samples, as the true EPA 537.1 method was developed for the analysis of municipal, chlorinated drinking-water samples.

Shannon & Wilson submitted the pre-POET design analytical water samples to SGS for determination of twenty-four PFAS and twenty-three other analytes. The analytical methods used were PFAS analysis by EPA 537M, diesel range organics by AK102, residual range organics by AK103, oil & grease total by EPA 1664B, chloride, fluoride, and sulfate by EPA 300.0, metals by EPA 200.8, total organic carbon by SM 5310B, total dissolved solids by SM21 2540C, total suspended solids by SM21 2540D, pH by SM21 4500-H B, alkalinity by SM21 2320B, hardness as calcium carbonate by SM21 2340B, conductivity by SM21 2510B, ammonia as nitrogen by SM21 4500-NH3 G, nitrate and nitrite by SM21 4500NO3-F, sulfide by SM23 4500S D and speciated arsenic by SOP BAL-4100.

The TestAmerica and SGS laboratory reports and associated DEC Laboratory Data Review Checklists (LDRCs) for each work order (WO) are listed in chronological order in Appendix B.

## 3.1 Water Supply Well Monitoring Samples

Table 1 summarizes the concentrations of PFOS and PFOA for initial samples collected from water supply wells sampled between June 2019 and October 2019. For the purposes of this report, Shannon & Wilson compared concentrations to the sum of PFOS and PFOA action level of 70 ng/L.

Table 2 summarizes the historical concentrations of PFAS in samples collected from previously sampled wells. With the exceptions of *PW-001, PW-002, PW-006, PW-022, PW-405, PW-406* and *PW-408* results are generally comparable to the initial sampling event. Table 2 also includes the additional analytes that were requested following the June 2019 sampling event. The laboratory was able to report additional data for PFHxS, PFHpA, PFNA, and PFBS for samples collected in June 2019 where PFOS and PFOA were originally requested.

Table 3 summarizes the concentrations of the pre-POET design samples collected in June 2019. For December 2018 concentrations of pre-POET design samples, please refer to our previously published report titled *August 2018 to December 2018 Private Well Sampling*.

## 3.2 Surface Water Samples

PFAS were not detected in the two surface-water locations sampled in March 2019. Results for these samples are presented on Table 4.

# 4 QUALITY ASSURANCE AND QUALITY CONTROL

Quality Assurance/Quality Control (QA/QC) procedures assist in producing data of acceptable quality and reliability. Shannon & Wilson reviewed the analytical results provided by TestAmerica and SGS for laboratory QC samples and conducted our own QA assessment for this project.

By working in accordance with our proposed scope of services, Shannon & Wilson considers the samples collected to be representative of site conditions at the locations and times they were obtained. The quality of the analytical data for this project does not appear to have been compromised, and those results affected by QC anomalies were qualified with appropriate flags. Additional details regarding our QA assessment are presented in Appendix D

# 5 DISCUSSION AND RECOMMENDATIONS

Shannon & Wilson presents here our discussion relevant to PFASs in groundwater at and near the GST property.

## 5.1 Comparison to Action Levels

Two newly identified category 1 and 2 wells (PW-415 and PW-463) with combined concentrations exceeding the action level of 70 ng/L for the sum of PFOS and PFOA were reported in 2019. The new exceedances are located in the impacted area along Wilson Road in Area 3 (Figure 1).

During the reporting period, the March 2019 sample collected from locations PW-013 and PW-022 exceeded the DEC groundwater-cleanup level of 400 ng/L for PFOS. Locations that exceeded the DEC groundwater-cleanup level for PFOS are depicted with dark red halos in Figure 3. During this reporting period, combined PFOS and PFOA concentrations at PW-022 increased by approximately 190 percent between August 2018 and March 2019, then decreased by 92 percent between March and June 2019. This well is located in the northern portion of Area 1 along a drainage ditch close to the DOT&PF Crash and Fire Rescue building. The seasonal spike at this well strongly suggests the impact of surface water to offsite contamination.

Samples exceeding the EPA LHA are highlighted in Tables 1 and 2. Further assessment of concentration trends using statistical analysis is discussed below in Section 5.2.

PFOS was most frequently the highest detected PFAS in water supply wells tested to date. The wells with the highest PFOS concentrations are geographically closer to the DOT&PF Crash and Fire Rescue building than to the existing burn pit or former fire training area.

## 5.2 Trend Analysis

Shannon & Wilson assessed temporal data for locations included in the well-monitoring network locations using a Mann-Kendall nonparametric trend analysis and Monitoring and Remediation Optimization System (MAROS) classification (Gilbert, 1987; Aziz, et. al., 2016). The MAROS evaluation was developed by the Air Force Center for Engineering and the Environment to assess concentration trends with confidence levels below 95 percent. MAROS further discriminates between “no trend” and “stable” contaminant concentrations by evaluating the Mann-Kendall trend statistic, confidence in trend, and coefficient of variation. These tests require data from a minimum of four sampling events to assess concentration trends.

Shannon & Wilson performed these statistical tests on PFOS, PFOA, and PFOS+PFOA combined results using the EPA’s Statistical Software ProUCL, version 5.1. Table 5, Water Supply Well Trends, compares the PFOS, PFOA, and LHA combined results for each monitoring location sampled greater than four times. Time series plots of water supply well trends are included in Appendix E, Time Series Plots.

Shannon & Wilson performed statistical analysis on wells with at least four samples. Of the 10 wells statistical tests were performed on, six could not be assessed due to PFOS and PFOA not being detected at those locations (PW-037, PW-038, PW-039, PW-040, PW-059, and PW-203). Samples collected from locations PW-401 showed no trend after five sampling events. Samples collected from locations PW-011, PW-012 and NPS Well showed stable trends for PFOS and LHA combined. Samples collected from location PW-012 showed a stable trend for PFOA. Samples collected from locations PW-011 and NPS Well showed decreasing trends for PFOA.

It is likely the region is heavily influenced by seasonal trends. To account for seasonal trends in a region heavily effected by seasonal variation a minimum of eight to twelve quarterly samples is recommended for further statistical analysis assessments. Given the monitoring criteria, it is likely this will be addressed using monitoring well data.

## 5.3 Planned Future Work

Shannon & Wilson anticipates continuing well search efforts to target properties within the existing search areas that have not yet been sampled. This work will be completed through our statewide contract with DOT&PF.

Quarterly sampling for 2020 was scheduled to take place in March 2020; however, the sampling event was postponed due to the world-wide concern regarding COVID-19. DEC, DOT&PF and Shannon & Wilson are monitoring the situation closely and will continue quarterly sampling when appropriate. Decisions regarding the monitoring criteria and frequency will be discussed with DEC prior to conducting sampling.

## 5.4 Recommendations

Based on our previous work, Shannon & Wilson recommends the DOT&PF continue to:

- attempt to identify wells at properties where well status is unknown;
- sample water supply wells in the well-monitoring network, as determined in coordination with DEC to determine future sampling frequency. With the addition of the monitoring-well network for assessing aquifer trends, it may be appropriate to collect water supply well samples on an annual basis for the purpose of assessing exposure;
- work with the DEC and the Alaska Department of Health and Social Services to continue educating the public regarding the potential health effects of exposure to PFAS-containing water, as new information becomes available; and
- refrain from discharging PFAS-containing AFFF to the ground, surface water bodies or groundwater from ARFF training, equipment testing, or emergency response.

Shannon & Wilson also recommends:

- expanding the residential buffer zone to account for the interpolated hydraulic gradients presented on Figure 2 (i.e., a 500 foot buffer may not be protective in different locations of the affected area). The proposed wells in this category are shown on Figure 2 as white circles ("proposed annual") and include PW-32, PW-47, PW-61, PW-74, PW-207, PW-230, PW-240, PW-241, PW-414 and PW-438; and
- expanding the monitoring-well network, specifically on airport property and near the DOT&PF building and airport terminal wells to monitor migration of contamination off site.

Our recommendations are based on:

- Groundwater conditions inferred through water supply well, monitoring-well, temporary-well-point and surface-water samples collected from August 27, 2018 to date.
- Soil conditions observed on, near and downgradient of the GST.
- The results of testing performed on soil and water samples Shannon & Wilson collected from the water supply wells, monitoring wells, temporary well points and surface water on, near, and downgradient from the GST.

- Publicly available literature and data Shannon & Wilson reviewed for this project, including United States Geological Survey, 2018.
- Our understanding of the project and information provided by the DOT&PF, DRM, and other members of the project team.
- The limitations of our approved scope described in our proposed Scope of Services dated August 23, 2019.

The information included in this report is based on limited sampling and should be considered representative of the times and locations at which the sampling occurred. Regulatory agencies may reach different conclusions than Shannon & Wilson. Shannon & Wilson have prepared and included in the *Important Information about your Environmental Report* Appendix to assist you and others in understanding the use and limitations of this report.

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## Table 1 - Summary of Initial Water Supply Well Analytical Results

| | | Analyte | Perfluoro-octanoic acid (PFOA) | Perfluoro-octane sulfonate (PFOS) | LHA Combined (PFOS + PFOA) |
|---|---|---|---|---|---|
| | | Action Level | 70 | | 70 |
| Sample Name | PW-ID | Sample Date | ng/L | ng/L | ng/L |
| *PW-071* | PW-071 | 6/8/2019 | 0.82 J | <2.0 | 0.82 J‡ |
| *PW-205* | PW-205 | 6/9/2019 | 0.93 J | 9.0 | 9.9 J |
| *PW-207* | PW-207 | 6/7/2019 | 1.0 J | <2.0 | 1.0 J‡ |
| *PW-208* | PW-208 | 6/7/2019 | 0.80 J I | 8.4 | 9.2 J I |
| *PW-414* | PW-414 | 6/8/2019 | <2.0 | 2.3 | 2.3 ‡ |
| *PW-415* | PW-415 | 6/7/2019 | 1.6 J | 67 | 69 J |
| *PW-419* | PW-419 | 6/8/2019 | <2.0 | 14 | 14 ‡ |
| *PW-433* | PW-433 | 6/9/2019 | <2.0 | <2.0 | N/A |
| *PW-438* | PW-438 | 6/9/2019 | <2.0 | 3.7 | 3.7 ‡ |
| *PW-441* | PW-441 | 6/7/2019 | <2.0 | 1.4 J | 1.4 J‡ |
| *PW-462* | PW-462 | 6/7/2019 | 1.8 J | 48 | 50 J |
| *PW-463* | PW-463 | 6/8/2019 | 2.8 | **74** | **77** |
| *PW-464* | PW-464 | 10/13/2019 | <2.0 | 1.6 J | 1.6 J‡ |

NOTES:

| | |
|---|---|
| ng/L | nanograms per liter |
| **Bold** | Concentration exceeds action level of 70 ppt for the sum of PFOS and PFOA. |
| DUP | Field-duplicate sample |
| < | Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control (QC) failures. |
| I | The reported value represents the estimated maximum possible concentration. Flag applied by the laboratory. |
| J | Estimated concentration, detected greater than the method detection limit (MDL) and less than the RL. Flag applied by the laboratory. |
| ‡ | Minimum concentration, the LHA Combined concentration includes one or more result that is not detected greater than the MDL. |
| N/A | Not applicable. The LHA concentration could not be calculated because one or more PFAS was not detected in the project sample. |

## Table 2 - Summary of Historical Water Supply Well Analytical Results

| Sample Name | Sample Date | Perfluorohexansulfonic acid (PFHxS) | Perfluorohexanoic acid (PFHxA) | Perfluoroheptanoic acid (PFHpA) | Perfluorononanoic acid (PFNA) | Perfluorobutanesulfonic acid (PFBS) | Perfluorodecanoic acid (PFDA) | Perfluoroundecanoic acid (PFUnA) | Perfluorododecanoic acid (PFDoA) | Perfluorotridecanoic acid (PFTrDA) | Perfluorotetradecanoic acid (PFTeA) | N-Methyl perfluorooctane sulfonamidoacetic acid (N-MeFOSAA) | N-Ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA) | 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS) | 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) | 4,8-Dioxa-3H-perfluorononanoic acid (DONA) | Hexafluoropropylene oxide dimer acid (HFPO-DA) | Perfluorooctanesulfonic acid (PFOS) | Perfluorooctanoic acid (PFOA) | LHA Combined (PFOS + PFOA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L |
| Airport Terminal | 08/27/18 | 31 | -- | 5.7 | <2.0 | 4.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **250** | 4.3 | **254** |
| | 03/08/19 | 30 | -- | 5.9 | <2.0 | 4.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **270** | <3.5 B* | **270 B*‡** |
| NPS Well | 08/27/18 | 12 | -- | 1.8 J | <2.0 | 1.3 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 23 | 4.6 | 28 |
| | 09/25/18 | 11 | -- | 1.7 J | <2.0 | 1.2 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 22 | 4.3 | 26 |
| | 03/07/19 | 13 | -- | 1.9 J | <2.0 | 1.4 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 13 | 3.5 | 17 |
| | 06/08/19 | 14 | -- | 1.8 J | <2.0 | 1.5 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 16 | <3.4 B* | 16 B*‡ |
| | 10/11/19 | 10 | 2.2 | 1.4 J | <1.8 | 1.0 J* | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | 4.0 J* | 19 | 2.9 | 22 |
| | 10/11/19 | 9.3 | 1.8 J | 1.3 J | <1.9 | 0.73 J* | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 J* | 18 | 2.8 | 21 |
| PW-001 | 08/28/18 | 350 | -- | 13 | 3.0 | 20 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **2300** | 19 | **2319** |
| | 03/07/19 | 320 | -- | 17 | 2.3 | 21 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **1200** | 13 | **1213** |
| PW-002 | 08/28/18 | 32 | -- | 4.4 | <2.0 | 2.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **160** | 3.0 | **163** |
| | 03/09/19 | 21 | -- | 3.4 | <2.0 | 1.8 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **72** | <2.0 B* | **72 B*‡** |
| | 06/08/19 | 20 | -- | 1.8 J | <2.0 | 1.9 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 33 | 1.8 J | 35 J |
| PW-003 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 1.4 J | 1.4 J‡ |
| PW-004 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-005 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 0.90 J | 0.90 J‡ |
| PW-006¥ | 08/28/18 | 7300 | -- | 48 | 48 | 170 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **40000** | **240** | **40240** |
| | 09/26/18 | 110 | -- | 1.4 J | <2.0 | 9.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **210** | 2.3 | **212** |
| PW-007 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.6 | 1.2 J | 6.8 J |
| PW-008 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 1.3 J | 1.3 J‡ |
| PW-009 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-010 | 08/29/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 06/09/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/12/19 | 2.5 | 0.97 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 2.0 | <1.9 | 2.0 ‡ |
| | 10/12/19 | 2.9 | 1.0 J | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | 2.2 | <2.0 | 2.2 ‡ |

## Table 2 - Summary of Historical Water Supply Well Analytical Results

| Sample Name | Sample Date | Perfluorohexansulfonic acid (PFHxS) | Perfluorohexanoic acid (PFHxA) | Perfluoroheptanoic acid (PFHpA) | Perfluorononanoic acid (PFNA) | Perfluorobutanesulfonic acid (PFBS) | Perfluorodecanoic acid (PFDA) | Perfluoroundecanoic acid (PFUnA) | Perfluorododecanoic acid (PFDoA) | Perfluorotridecanoic acid (PFTrDA) | Perfluorotetradecanoic acid (PFTeA) | N-Methyl perfluorooctane sulfonamidoacetic acid (N-MeFOSAA) | N-Ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA) | 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS) | 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) | 4,8-Dioxa-3H-perfluorononanoic acid (DONA) | Hexafluoropropylene oxide dimer acid (HFPO-DA) | Perfluorooctanesulfonic acid (PFOS) | Perfluorooctanoic acid (PFOA) | LHA Combined (PFOS + PFOA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L |
| PW-011 | 08/29/18 | 30 | -- | 3.4 | <2.0 | 2.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **93** | 3.3 | **96** |
| | 09/25/18 | 34 | -- | 3.1 | <2.0 | 3.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **80** | 3.1 | **83** |
| | 03/08/19 | 32 | -- | 4.5 | <2.0 | 2.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **96** | <2.6 B* | **96 B*‡** |
| | 06/08/19 | 23 | -- | 3.5 | <2.0 | 1.9 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **82** | 2.0 | **84** |
| | 06/08/19 | 23 | -- | 3.4 | <2.0 | 1.8 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **80** | <2.2 B* | **80 B*‡** |
| PW-012 | 08/29/18 | 8.9 | -- | 0.81 J | <2.0 | 1.8 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 7.7 | 0.77 J | 8.5 J |
| | 03/08/19 | 11 | -- | 0.87 J | <2.0 | 1.5 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 25 | <2.0 B* | 25 B*‡ |
| | 06/08/19 | 7.0 | -- | <2.0 | <2.0 | 1.1 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 14 | 0.81 J | 15 J |
| | 10/12/19 | 9.3 | 2.8 | 0.86 J | <1.9 | 0.99 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 13 | 0.74 J | 14 J |
| PW-013 | 08/29/18 | 860 | -- | 230 | 8.9 | 57 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **5500** | **130** | **5630** |
| | 03/07/19 | 650 | -- | 150 | 18 | 34 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **6000** | **110** | **6110** |
| PW-014 | 08/29/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-015 | 08/29/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-016 | 08/30/18 | 1.7 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 1.3 J | 1.3 J‡ |
| PW-017 | 08/30/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-018 | 08/30/18 | 1.2 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.5 | <2.0 | 2.5 ‡ |
| PW-019 | 08/30/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-020 | 08/30/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-021 | 08/30/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-022 | 08/30/18 | 58 | -- | 4.8 | <2.0 | 6.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **520** | 6.9 | **527** |
| | 03/07/19 | 230 | -- | 20 | 1.7 J I | 28 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **1500** | 25 | **1525** |
| | 06/07/19 | 19 | -- | 1.8 J | <2.0 | 1.4 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **120** | 1.3 J | **121 J** |
| | 06/07/19 | 19 | -- | 1.9 J | <2.0 | 1.4 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **120** | 1.7 J | **122 J** |
| PW-031 | 08/27/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-032 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-033 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-034 | 08/28/18 | 1.1 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.5 J | <2.0 | 1.5 J‡ |
| PW-036 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |

## Table 2 - Summary of Historical Water Supply Well Analytical Results

| Sample Name | Sample Date | Perfluorohexansulfonic acid (PFHxS) | Perfluorohexanoic acid (PFHxA) | Perfluoroheptanoic acid (PFHpA) | Perfluorononanoic acid (PFNA) | Perfluorobutanesulfonic acid (PFBS) | Perfluorodecanoic acid (PFDA) | Perfluoroundecanoic acid (PFUnA) | Perfluorododecanoic acid (PFDoA) | Perfluorotridecanoic acid (PFTrDA) | Perfluorotetradecanoic acid (PFTeA) | N-Methyl perfluorooctane sulfonamidoacetic acid (N-MeFOSAA) | N-Ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA) | 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS) | 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) | 4,8-Dioxa-3H-perfluorononanoic acid (DONA) | Hexafluoropropylene oxide dimer acid (HFPO-DA) | Perfluorooctanesulfonic acid (PFOS) | Perfluorooctanoic acid (PFOA) | LHA Combined (PFOS + PFOA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L |
| PW-037 | 08/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 03/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 06/07/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/11/19 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 0.89 J | <1.9 | <1.9 | n/a |
| PW-038 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 03/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 06/07/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/11/19 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | n/a |
| PW-039 | 08/29/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 08/29/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 0.79 J | 0.79 J‡ |
| | 03/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 03/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 06/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/11/19 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | <1.8 | n/a |
| PW-040 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 03/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 06/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/11/19 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 0.66 J | <1.9 | <1.9 | n/a |
| PW-041 | 08/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-042 | 08/29/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-043 | 08/29/18 | <2.0 | -- | 0.94 J | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.6 | 7.6 | 14 |
| PW-044 | 08/29/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.0 | 1.3 J | 3.3 J |
| PW-045 | 08/29/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/11/19 | 0.48 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 0.79 J | <1.9 | 0.79 J‡ |
| PW-046 | 08/30/18 | 1900 | -- | 29 | <2.0 | 120 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **83** | **82** | **165** |
| | 08/30/18 | 1700 | -- | 27 | <2.0 | 110 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **79** | **77** | **156** |
| | 03/08/19 | 320 | -- | 6.2 | <2.0 | 20 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **63** | 20 B | **83 B** |
| PW-047 | 08/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |

## Table 2 - Summary of Historical Water Supply Well Analytical Results

| Sample Name | Sample Date | Perfluorohexansulfonic acid (PFHxS) | Perfluorohexanoic acid (PFHxA) | Perfluoroheptanoic acid (PFHpA) | Perfluorononanoic acid (PFNA) | Perfluorobutanesulfonic acid (PFBS) | Perfluorodecanoic acid (PFDA) | Perfluoroundecanoic acid (PFUnA) | Perfluorododecanoic acid (PFDoA) | Perfluorotridecanoic acid (PFTrDA) | Perfluorotetradecanoic acid (PFTeA) | N-Methyl perfluorooctane sulfonamidoacetic acid (N-MeFOSAA) | N-Ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA) | 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS) | 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) | 4,8-Dioxa-3H-perfluorononanoic acid (DONA) | Hexafluoropropylene oxide dimer acid (HFPO-DA) | Perfluorooctanesulfonic acid (PFOS) | Perfluorooctanoic acid (PFOA) | LHA Combined (PFOS + PFOA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L |
| PW-048 | 08/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-059 | 08/29/18 | 1.2 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 03/07/19 | 0.98 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 06/09/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/12/19 | 1.1 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | n/a |
| PW-061 | 08/27/18 | 1.3 J | -- | 1.3 J | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.4 J | 3.8 | 5.2 J |
| PW-066 | 12/08/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-070 | 08/31/18 | 1.4 J | -- | <2.0 | <2.0 | 1.8 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 1.0 J | 1.0 J‡ |
| PW-071 | 06/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 0.82 J | 0.82 J‡ |
| PW-074 | 09/25/18 | 1.1 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 09/25/18 | 1.1 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-075 | 08/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 1.4 J | 1.4 J‡ |
| PW-200 | 09/24/18 | 36 | -- | 3.6 | <2.0 | 3.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **89** | 3.1 | **92** |
| | 09/24/18 | 37 | -- | 3.7 | <2.0 | 3.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **92** | 3.1 | **95** |
| | 03/07/19 | 26 | -- | 2.5 | <2.0 | 2.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **76** | 2.8 | **79** |
| PW-201 | 09/25/18 | 1.7 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.4 J | <2.0 | 1.4 J‡ |
| PW-202 | 09/25/18 | 20 | -- | 2.7 | <2.0 | 2.1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 68 | 3.1 | **71** |
| | 03/07/19 | 17 | -- | 2.0 | <2.0 | 2.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 32 | 3.0 | 35 |
| | 06/07/19 | 17 | -- | 3.2 | <2.0 | 2.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 38 | 4.2 | 42 |
| PW-203 | 09/25/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 03/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 06/08/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/14/19 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | n/a |
| PW-204 | 09/25/18 | 3.3 | -- | 0.93 J | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.4 | <2.0 | 5.4 ‡ |
| | 06/07/19 | 2.4 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.7 | <2.0 | 4.7 ‡ |
| PW-205 | 06/09/19 | 11 | -- | <2.0 | <2.0 | 2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.0 | 0.93 J | 9.9 J |
| | 10/12/19 | 10 | 3.0 | 0.63 J | <1.9 | 1.4 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 10 | 0.76 J | 11 J |
| PW-206 | 09/28/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-207 | 06/07/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 1.0 J | 1.0 J‡ |

## Table 2 - Summary of Historical Water Supply Well Analytical Results

| Sample Name | Sample Date | Perfluorohexansulfonic acid (PFHxS) | Perfluorohexanoic acid (PFHxA) | Perfluoroheptanoic acid (PFHpA) | Perfluorononanoic acid (PFNA) | Perfluorobutanesulfonic acid (PFBS) | Perfluorodecanoic acid (PFDA) | Perfluoroundecanoic acid (PFUnA) | Perfluorododecanoic acid (PFDoA) | Perfluorotridecanoic acid (PFTrDA) | Perfluorotetradecanoic acid (PFTeA) | N-Methyl perfluorooctane sulfonamidoacetic acid (N-MeFOSAA) | N-Ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA) | 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS) | 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) | 4,8-Dioxa-3H-perfluorononanoic acid (DONA) | Hexafluoropropylene oxide dimer acid (HFPO-DA) | Perfluorooctanesulfonic acid (PFOS) | Perfluorooctanoic acid (PFOA) | LHA Combined (PFOS + PFOA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L |
| PW-208 | 06/07/19 | 2.5 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 8.4 | 0.80 J I | 9.2 J I |
| PW-209 | 09/26/18 | 26 | -- | 3.0 | <2.0 | 2.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **100** | 3.3 | **103** |
| | 03/07/19 | 35 | -- | 5.0 | <2.0 | 2.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **120** | 2.7 | **123** |
| | 06/07/19 | 24 | -- | 3.8 | <2.0 | 1.6 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **120** | 2.5 | **123** |
| PW-210 | 09/26/18 | 30 | -- | 3.1 | <2.0 | 2.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **92** | 2.6 | **95** |
| | 09/26/18 | 32 | -- | 3.0 | <2.0 | 2.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **95** | 2.8 | **98** |
| | 03/07/19 | 26 | -- | 2.6 | <2.0 | 2.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **70** | 2.5 | **73** |
| | 06/08/19 | 24 | -- | 3.2 | <2.0 | 1.9 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **77** | 2.4 | **79** |
| PW-211 | 09/26/18 | 1.1 J | -- | 3.3 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.1 | 15 | 24 |
| | 10/13/19 | <1.9 | 0.83 J | 0.51 J | <1.9 | 1.4 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 3.7 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 1.0 J | 1.0 J | 2.0 J |
| PW-212 | 09/26/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/14/19 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | n/a |
| PW-213 | 11/01/18 | 24 | -- | 2.2 | <2.0 | 3.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 51 | 2.3 | 53 |
| | 03/07/19 | 24 | -- | 2.5 | <2.0 | 3.1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 53 | 2.2 | 55 |
| | 06/09/19 | 20 | -- | 2.1 | <2.0 | 2.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 44 | <2.2 B* | 44 B*‡ |
| PW-214 | 09/27/18 | 0.88 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-216 | 09/27/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-218 | 11/01/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-219 | 09/27/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 09/27/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/14/19 | <1.9 | 0.74 J | 0.49 J | <1.9 | 1.2 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 0.84 J | 0.84 J‡ |
| PW-221 | 11/01/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 06/09/19 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/12/19 | 2.1 | 0.87 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 2.4 | <1.9 | 2.4 ‡ |
| PW-230 | 10/31/18 | 1.2 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 1.1 J | 1.1 J‡ |
| PW-231 | 10/31/18 | 2.6 | -- | 0.96 J | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 1.1 J | 1.1 J‡ |
| PW-232 | 10/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-233 | 10/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-234 | 10/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |

## Table 2 - Summary of Historical Water Supply Well Analytical Results

| Sample Name | Sample Date | Perfluorohexansulfonic acid (PFHxS) | Perfluorohexanoic acid (PFHxA) | Perfluoroheptanoic acid (PFHpA) | Perfluorononanoic acid (PFNA) | Perfluorobutanesulfonic acid (PFBS) | Perfluorodecanoic acid (PFDA) | Perfluoroundecanoic acid (PFUnA) | Perfluorododecanoic acid (PFDoA) | Perfluorotridecanoic acid (PFTrDA) | Perfluorotetradecanoic acid (PFTeA) | N-Methyl perfluorooctane sulfonamidoacetic acid (N-MeFOSAA) | N-Ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA) | 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS) | 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) | 4,8-Dioxa-3H-perfluorononanoic acid (DONA) | Hexafluoropropylene oxide dimer acid (HFPO-DA) | Perfluorooctanesulfonic acid (PFOS) | Perfluorooctanoic acid (PFOA) | LHA Combined (PFOS + PFOA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L |
| PW-235 | 11/01/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-236 | 10/31/18 | 0.96 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/31/18 | 1.0 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-237 | 11/01/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-238 | 11/01/18 | 3.5 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.0 | 0.77 J | 2.8 J |
| PW-239 | 11/01/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-240 | 11/01/18 | 3.3 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-241 | 11/01/18 | 5.8 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.9 | 0.98 J | 3.9 J |
| | 11/01/18 | 6.1 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.7 | 0.89 J | 3.6 J |
| PW-247 | 11/02/18 | 2.7 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | 1.1 J | 1.1 J‡ |
| PW-248 | 11/02/18 | 6.3 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.8 J | 0.97 J | 2.8 J |
| PW-249 | 11/02/18 | 1.5 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.4 J | <2.0 | 1.4 J‡ |
| | 11/02/18 | 1.4 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.3 J | 0.84 J | 2.1 J |
| PW-255 | 10/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-275 | 12/09/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 12/09/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-400 | 09/25/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-401 | 09/25/18 | 18 | -- | 1.6 J | <2.0 | 2.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 40 | 1.4 J | 41 J |
| | 10/31/18 | 20 | -- | 1.7 J | <2.0 | 2.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 36 | 1.6 J | 38 J |
| | 03/08/19 | 20 | -- | 2.0 | <2.0 | 1.8 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 31 | <2.0 B* | 31 B*‡ |
| | 06/09/19 | 15 | -- | 1.7 J | <2.0 | 1.2 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 43 | <2.0 B* | 43 B*‡ |
| | 10/11/19 | 16 | 5.4 | 1.8 J | <1.9 | 1.3 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | 45 | 1.4 J | 46 J |
| PW-402 | 09/25/18 | 36 | -- | 3.3 | <2.0 | 3.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **72** | 3.4 | **75** |
| | 03/07/19 | 30 | -- | 4.4 | <2.0 | 2.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **100** | <2.2 B* | **100 B*‡** |
| | 06/08/19 | 22 | -- | 2.9 | <2.0 | 1.7 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **92** | 1.5 J | **94 J** |
| PW-403 | 09/25/18 | 41 | -- | 3.4 | <2.0 | 5.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **83** | 3.3 | **86** |
| | 06/08/19 | 30 | -- | 2.8 | <2.0 | 3.1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 67 | <2.9 B* | 67 B*‡ |
| | 06/08/19 | 30 | -- | 3.1 | <2.0 | 3.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 65 | 2.6 | 68 |

## Table 2 - Summary of Historical Water Supply Well Analytical Results

| Sample Name | Sample Date | Perfluorohexansulfonic acid (PFHxS) | Perfluorohexanoic acid (PFHxA) | Perfluoroheptanoic acid (PFHpA) | Perfluorononanoic acid (PFNA) | Perfluorobutanesulfonic acid (PFBS) | Perfluorodecanoic acid (PFDA) | Perfluoroundecanoic acid (PFUnA) | Perfluorododecanoic acid (PFDoA) | Perfluorotridecanoic acid (PFTrDA) | Perfluorotetradecanoic acid (PFTeA) | N-Methyl perfluorooctane sulfonamidoacetic acid (N-MeFOSAA) | N-Ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA) | 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS) | 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) | 4,8-Dioxa-3H-perfluorononanoic acid (DONA) | Hexafluoropropylene oxide dimer acid (HFPO-DA) | Perfluorooctanesulfonic acid (PFOS) | Perfluorooctanoic acid (PFOA) | LHA Combined (PFOS + PFOA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L |
| PW-405 | 09/25/18 | 44 | -- | 4.1 | <2.0 | 3.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **86** | 3.9 | **90** |
| | 03/07/19 | 28 | -- | 2.8 | <2.0 | 2.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **78** | 2.7 | **81** |
| | 03/07/19 | 27 | -- | 2.3 | <2.0 | 2.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **76** | 2.5 | **79** |
| | 06/08/19 | 20 | -- | 2.3 | <2.0 | 1.7 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 66 | <2.0 B* | 66 B*‡ |
| PW-406 | 09/25/18 | 36 | -- | 5.2 | <2.0 | 2.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **150** | 3.3 | **153** |
| | 03/07/19 | 28 | -- | 4.3 | <2.0 | 2.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **94** | 5.6 J* | **100 J*** |
| | 03/07/19 | 30 | -- | 4.8 | <2.0 | 2.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **92** | 8.9 J* | **101 J*** |
| | 06/08/19 | 24 | -- | 3.1 | <2.0 | 2.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **74** | <2.1 B* | **74 B*‡** |
| PW-408 | 09/26/18 | 30 | -- | 4.8 | <2.0 | 2.1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **130** | 2.5 | **133** |
| | 03/07/19 | 22 | -- | 3.9 | <2.0 | 2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **97** | 2.5 | **100** |
| | 06/07/19 | 28 | -- | 3.0 | <2.0 | 2.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **88** | 2.7 | **91** |
| PW-413 | 09/27/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-414 | 06/08/19 | 2.1 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.3 | <2.0 | 2.3 ‡ |
| PW-415 | 06/07/19 | 19 | -- | 2.4 | <2.0 | 1.4 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 67 | 1.6 J | 69 J |
| | 10/11/19 | 27 | 15 | 6.0 | <1.9 | 1.7 J | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | <1.9 | **120** | 2.4 | **122** |
| PW-418 | 09/27/18 | 40 | -- | 4.1 | <2.0 | 3.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **74** | 3.4 | **77** |
| | 03/08/19 | 30 | -- | 3.0 | <2.0 | 2.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **89** | <3.1 B* | **89 B*‡** |
| | 06/09/19 | 22 | -- | 2.0 | <2.0 | 2.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 63 | <2.0 B* | 63 B*‡ |
| | 06/09/19 | 22 | -- | 2.0 | <2.0 | 2.1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 66 | <2.0 B* | 66 B*‡ |
| PW-419 | 06/08/19 | 7.7 | -- | 0.81 J | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 14 | <2.0 | 14 ‡ |
| PW-430 | 10/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| | 10/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-431 | 11/02/18 | 5.4 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.1 | <2.0 | 6.1 ‡ |
| PW-432 | 10/31/18 | 2.5 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.0 | <2.0 | 2.0 ‡ |
| PW-433 | 06/09/19 | 1.3 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-434 | 10/31/18 | 4.6 | -- | 0.82 J | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.8 | 0.85 J | 3.7 J |
| PW-435 | 10/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-436 | 10/31/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-438 | 06/09/19 | 2.7 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.7 | <2.0 | 3.7 ‡ |

## Table 2 - Summary of Historical Water Supply Well Analytical Results

| Sample Name | Sample Date | Perfluorohexansulfonic acid (PFHxS) | Perfluorohexanoic acid (PFHxA) | Perfluoroheptanoic acid (PFHpA) | Perfluorononanoic acid (PFNA) | Perfluorobutanesulfonic acid (PFBS) | Perfluorodecanoic acid (PFDA) | Perfluoroundecanoic acid (PFUnA) | Perfluorododecanoic acid (PFDoA) | Perfluorotridecanoic acid (PFTrDA) | Perfluorotetradecanoic acid (PFTeA) | N-Methyl perfluorooctane sulfonamidoacetic acid (N-MeFOSAA) | N-Ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA) | 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS) | 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) | 4,8-Dioxa-3H-perfluorononanoic acid (DONA) | Hexafluoropropylene oxide dimer acid (HFPO-DA) | Perfluorooctanesulfonic acid (PFOS) | Perfluorooctanoic acid (PFOA) | LHA Combined (PFOS + PFOA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L |
| PW-440 | 11/01/18 | <2.0 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-441 | 06/07/19 | 3.9 | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.4 J | <2.0 | 1.4 J‡ |
| PW-442 | 12/07/18 | 1.1 J | -- | <2.0 | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-460 | 11/02/18 | 1.7 J | -- | <2.0 | <2.0 | 1.4 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.0 | <2.0 | n/a |
| PW-461 | 11/02/18 | 1.4 J | -- | 1.6 J | <2.0 | <2.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.3 J | 1.2 J | 2.5 J |
| PW-462 | 06/07/19 | 18 | -- | 2.1 | <2.0 | 1.6 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 48 | 1.8 J | 50 J |
| PW-463 | 06/08/19 | 29 | -- | 3.0 | <2.0 | 2.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **74** | 2.8 | **77** |
| PW-464 | 10/13/19 | 2.1 | 0.51 J | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | 1.6 J | <2.0 | 1.6 J‡ |

ng/L nanograms per liter
**Bold** Concentration exceeds action level.
DUP Field-duplicate sample
< Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control (QC) failures.
I The reported value represents the estimated maximum possible concentration. Flag applied by the laboratory.
J Estimated concentration, detected greater than the method detection limit (MDL) and less than the RL. Flag applied by the laboratory.
J* Estimated concentration due to quality control failures. Flag applied by Shannon & Wilson, Inc. (*)
B* Result is considered not detected due to quality control failures. Result is shown as <LOQ or detected concentration. Flag applied by Shannon & Wilson, Inc. (*)
‡ Minimum concentration, the LHA Combined concentration includes one or more result that is not detected greater than the MDL.
N/A Not applicable. The LHA concentration could not be calculated because one or more PFAS was not detected in the project sample.
¥ PW-006 is associated with a second source area.

## Table 3 - Summary of Onsite POET Pre-Design Analytical Results

| Analytical Method | Analyte | Units | Airport Terminal | PW-001 | PW-013 | PW-046 | PW-048 |
|---|---|---|---|---|---|---|---|
| EPA 537M by ID | 4:2 Fluorotelomer sulfonate | µg/L | <0.00400 | <0.00400 | 0.00259 J | <0.00400 | <0.00400 |
| | 6:2 Fluorotelomer sulfonate | µg/L | 0.223 | 0.635 JH* | 44.6 JH* | <0.00400 | <0.00400 |
| | 8:2 Fluorotelomer sulfonate | µg/L | 0.00228 J | <0.00400 | 0.0285 | <0.00400 | <0.00400 |
| | N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA) | µg/L | <0.00800 | <0.00800 | <0.00800 | <0.00800 | <0.00800 |
| | N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA) | µg/L | <0.00800 | <0.00800 J* | <0.00800 | <0.00800 | <0.00800 |
| | Perfluorobutanoic acid (PFBA) | µg/L | 0.0131 | 0.109 | 0.604 | 0.00845 | 0.00229 J |
| | Perfluorodecanesulfonic acid (PFDS) | µg/L | <0.00200 | <0.00200 | 0.00754 | <0.00200 | <0.00200 |
| | Perfluorodecanoic acid (PFDA) | µg/L | <0.00200 | <0.00200 | 0.00288 J | <0.00200 | <0.00200 |
| | Perfluorododecanoic acid (PFDOA) | µg/L | <0.00200 | <0.00200 J* | <0.00200 | <0.00200 | <0.00200 J* |
| | Perfluoroheptanesulfonic acid (PFHPS) | µg/L | 0.00238 J | 0.0337 | 0.102 | 0.0147 | <0.00200 |
| | Perfluoro-heptanoic acid (PFHpA) | µg/L | 0.00581 | 0.0264 | 0.272 | 0.00827 | <0.00200 |
| | Perfluorohexanoic acid (PFHxA) | µg/L | 0.0269 | 0.216 | 1.32 | 0.0365 | <0.00200 |
| | Perfluoro-hexansulfonic acid (PFHxS) | µg/L | 0.0231 | 0.489 | 0.692 | 0.865 | <0.00200 |
| | Perfluorononanesulfonic acid | µg/L | <0.00200 | <0.00200 | 0.0342 | <0.00200 | <0.00200 |
| | Perfluoro-nonanoic acid (PFNA) | µg/L | <0.00200 | 0.0042 | 0.0142 | 0.00178 J | <0.00200 |
| | Perfluorooctane sulfonamide (FOSA) | µg/L | <0.00200 | 0.00204 J | 0.00942 | <0.00200 | <0.00200 |
| | Perfluoro-octane sulfonate (PFOS) | µg/L | 0.33 | 2.88 | 5.49 | 0.0683 | <0.00200 J* |
| | Perfluoro-octanoic acid (PFOA) | µg/L | 0.00285 J | 0.0241 | 0.129 | 0.0306 | <0.00200 |
| | Perfluoropentanesulfonic acid | µg/L | 0.00287 J | 0.0695 | 0.0664 | 0.071 | <0.00200 |
| | Perfluoropentanoic acid (PFPEA) | µg/L | 0.0462 | 0.500 | 3.78 | 0.0152 | <0.00200 |
| | Perfluorotetradecanoic acid (PFTEA) | µg/L | <0.00200 | <0.00200 J* | <0.00200 | <0.00200 | <0.00200 |
| | Perfluorotridecanoic acid (PFTRIA) | µg/L | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 |
| | Perfluoroundecanoic acid (PFUNA) | µg/L | <0.00200 | <0.00200 J* | <0.00200 | <0.00200 | <0.00200 J* |
| | Perluor-obutane-sulfonic acid (PFBS) | µg/L | 0.00261 J | 0.0252 | 0.0321 | 0.029 | <0.00200 |
| AK102 | Diesel Range Organics | mg/L | <0.319 | <0.323 | <0.311 | 0.230 J | <0.325 |
| AK103 | Residual Range Organics | mg/L | <0.266 | <0.269 | <0.259 | 0.196 J | <0.271 |
| EPA 1664B | Oil & Grease, Total | mg/L | <4.21 B* | <4.21 B* | <4.12 B* | <4.17 B* | <4.21 B* |
| SM 5310B | Total Organic Carbon | mg/L | 1.38 | 2.04 | 1.58 | 2.29 | 1.33 |
| SM21 2540C | Total Dissolved Solids | mg/L | 1000 | 444 | 321 | 437 | 242 |
| SM21 2540D | Total Suspended Solids | mg/L | 0.673 J | 11.9 | 3.14 | 1.36 | 1.57 |
| SM21 4500-H B | pH | pH units | 7.9 | 7.5 | 7.6 | 7.6 | 7.8 |
| SM21 2320B | Alkalinity | mg/L | 225 | 267 | 264 | 338 | 193 |
| SM21 2340B | Hardness as CaCO3 | mg/L | 304 | 311 | 281 | 371 | 204 |
| SM21 2510B | Conductivity | umhos/cm | 1900 | 763 | 528 | 715 | 402 |
| SM21 4500-NH3 G | Ammonia as N | mg/L | 0.791 | 0.180 | 0.174 | 0.0375 J | 0.0504 J |
| SM21 4500NO3-F | Nitrate+Nitrite | mg/L | <0.200 B* | <0.100 | <0.200 B* | 0.834 | <0.100 |

## Table 3 - Summary of Onsite POET Pre-Design Analytical Results

| Analytical Method | Analyte | Units | Airport Terminal | PW-001 | PW-013 | PW-046 | PW-048 |
|---|---|---|---|---|---|---|---|
| SM23 4500S D | Sulfide | µg/L | <50.0 | <50.0 | <50.0 | <50.0 | 40.0 J |
| EPA 300.0 | Chloride | mg/L | 427 | 69.3 | 2.13 | 1.92 | 1.52 |
| | Fluoride | mg/L | 0.0980 J | 0.0510 J | <0.100 | <0.100 | <0.100 |
| | Sulfate | mg/L | 27.9 | 19.6 | 14.0 | 51.3 | 14.5 |
| EPA 200.8 | Aluminum | mg/L | 0.00840 J | <0.0100 | <0.0100 | <0.0100 | 0.00900 J |
| | Antimony | mg/L | <0.000500 | <0.000500 | <0.000500 | <0.000500 | <0.000500 |
| | Arsenic | mg/L | 0.00388 J | 0.0153 | 0.0119 | <0.00250 | 0.00889 |
| | Barium | mg/L | 0.0480 | 0.119 | 0.0773 | 0.0898 | 0.0658 |
| | Beryllium | mg/L | <0.000200 | <0.000200 | <0.000200 | <0.000200 | <0.000200 |
| | Cadmium | mg/L | <0.000250 | <0.000250 | <0.000250 | <0.000250 | <0.000250 |
| | Calcium | mg/L | 70.9 | 107 | 99.5 | 125 | 73.9 |
| | Chromium | mg/L | <0.00100 | <0.00100 | <0.00100 | <0.00100 | <0.00100 |
| | Cobalt | mg/L | <0.00200 | <0.00200 | <0.00200 | <0.00200 | <0.00200 |
| | Copper | mg/L | 0.0724 | 0.0299 | 0.0464 | 0.0786 | 0.0585 |
| | Iron | mg/L | 0.725 | 5.87 | 2.56 | 1.31 | 2.20 |
| | Lead | mg/L | 0.00301 | 0.000429 | 0.00223 | 0.00347 | 0.00418 |
| | Magnesium | mg/L | 30.9 | 10.6 | 7.82 | 14.5 | 4.80 |
| | Manganese | mg/L | 0.182 | 0.496 | 0.464 | 0.174 | 0.137 |
| | Molybdenum | mg/L | 0.00176 J | 0.000746 J | <0.00100 | <0.00100 | 0.00153 J |
| | Nickel | mg/L | 0.00323 JH* | 0.00753 | 0.00349 JH* | 0.00541 JH* | <0.00232 B* |
| | Phosphorus | mg/L | <0.100 | <0.100 | <0.100 | <0.100 | <0.100 |
| | Potassium | mg/L | 10.9 | 7.18 | 4.51 | 5.31 | 3.20 |
| | Selenium | mg/L | <0.00250 | <0.00250 | <0.00250 | <0.00250 | <0.00250 |
| | Silicon | mg/L | 5.83 | 7.10 | 6.27 | 3.96 | 3.26 |
| | Silver | mg/L | <0.000500 | <0.000500 | <0.000500 | <0.000500 | <0.000500 |
| | Sodium | mg/L | 251 | 29.7 | 2.37 | 2.54 | 1.78 |
| | Thallium | mg/L | <0.000500 | <0.000500 | <0.000500 | <0.000500 | <0.000500 |
| | Tin | mg/L | 0.00106 | <0.000500 | 0.00158 | 0.00106 | 0.000959 J |
| | Titanium | mg/L | <0.0125 | <0.0125 | <0.0125 | <0.0125 | <0.0125 |
| | Vanadium | mg/L | <0.0100 | <0.0100 | <0.0100 | <0.0100 | <0.0100 |
| | Zinc | mg/L | 0.127 | 0.0867 | 0.267 | 0.241 | 0.446 |
| SOP BAL-4100 | AS(III) | µg/L | 1.33 | 14.0 | 7.47 | 0.0650 J | 8.64 |
| | AS(V) | µg/L | 1.21 | 1.82 | 1.04 | <0.216 | 0.610 |
| | Dimethylarsinic acid (DMAs) | µg/L | <0.227 | <0.227 | <0.227 | <0.227 | <0.227 |
| | Monomethylarsonic acid (MMAs) | µg/L | <0.248 | <0.248 | <0.248 | <0.248 | <0.248 |

## Table 3 - Summary of Onsite POET Pre-Design Analytical Results

Notes:

| | |
|---|---|
| EPA | Environmental Protection Agency |
| mg/L | milligram per liter |
| µg/L | microgram per liter |
| umhos/cm | micromhos per centimeter |
| < | Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control failures. |
| J | Estimated concentration, detected greater than the method detection limit (MDL) and less than the RL. Flag applied by the laboratory. |
| J* | Estimated concentration due to quality control failures. Flag applied by Shannon & Wilson, Inc. (*) |
| JH* | Estimated concentration, biased high due to quality control failures. Flag applied by Shannon & Wilson, Inc. (*) |
| B* | Result is considered not detected due to quality control failures. Result is shown as <LOQ or detected concentration. Flag applied by Shannon & Wilson, Inc. (*) |

## Table 4 - Summary of Surface Water Analytical Results

| | Analyte | Perluoro-butane sulfonic acid (PFBS) | Perfluoro-heptanoic acid (PFHpA) | Perfluoro-nonanoic acid (PFNA) | Perfluoro-hexane sulfonic acid (PFHxS) | Perfluoro-octanoic acid (PFOA) | Perfluoro-octane sulfonate (PFOS) |
|---|---|---|---|---|---|---|---|
| | Action Level | 2,000 | | | | 400 | 400 |
| Sample Name | Sample Date | ng/L | ng/L | ng/L | ng/L | ng/L | ng/L |
| *SW-020* | 3/7/2019 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| *SW-021* | 3/7/2019 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |

NOTES:

ng/L nanograms per liter

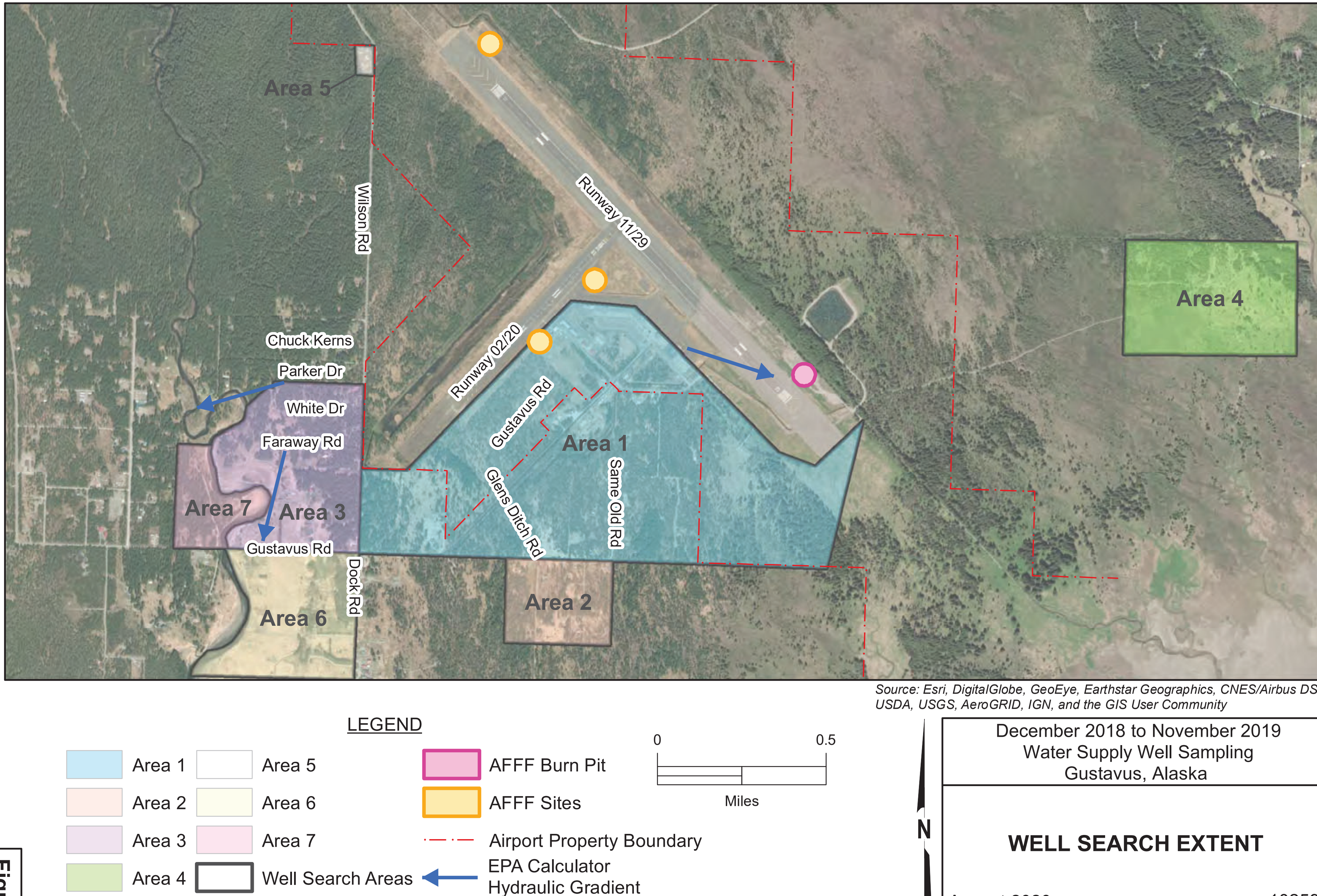
< Analyte not detected; listed as less than the reporting limit (RL).

## Table 5 - Gustavus Water Supply Well Trend Analysis

| Sample Name | Sample Date | Sample Location | PFOA (ng/L) | PFOS (ng/L) | LHA Combined (PFOA + PFOS) | Exceed LHA Level?[a] | Trends[b] |
|---|---|---|---|---|---|---|---|
| NPS Well | Aug-2018 | NPS Well | 4.6 | 23 | 28 | No | Decreasing Trend for PFOA; Stable Trend for PFOS and LHA |
| | Sep-2018 | | 4.3 | 22 | 26 | | |
| | Mar-2019 | | 3.5 | 13 | 17 | | |
| | Jun-2019 | | <3.4 B* | 16 | 16 B*‡ | | |
| | Oct-2019 | | 2.9 | 19 | 22 | | |
| PW-011 | Aug-2018 | PW-011 | 3.3 | **93** | **96** | Yes | Decreasing Trend for PFOA; Stable Trend for PFOS and LHA |
| | Sep-2018 | | 3.1 | **80** | **83** | | |
| | Mar-2019 | | <2.6 B* | **96** | **96 B*‡** | | |
| | Jun-2019 | | 2.0 | **82** | **84** | | |
| PW-012 | Aug-2018 | PW-012 | 0.77 J | 7.7 | 8.5 J | No | Stable Trend for PFOA, PFOS, and LHA |
| | Mar-2019 | | <2.0 B* | 25 | 25 B*‡ | | |
| | Jun-2019 | | 0.81 J | 14 | 15 J | | |
| | Oct-2019 | | 0.74 J | 13 | 14 J | | |
| PW-037 | Aug-2018 | PW-037 | <2.0 | <2.0 | N/A | No | Cannot assess a trend |
| | Mar-2019 | | <2.0 | <2.0 | N/A | | |
| | Jun-2019 | | <2.0 | <2.0 | N/A | | |
| | Oct-2019 | | <1.9 | <1.9 | N/A | | |
| PW-038 | Aug-2018 | PW-038 | <2.0 | <2.0 | N/A | No | Cannot assess a trend |
| | Mar-2019 | | <2.0 | <2.0 | N/A | | |
| | Jun-2019 | | <2.0 | <2.0 | N/A | | |
| | Oct-2019 | | <1.8 | <1.8 | N/A | | |
| PW-039 | Aug-2018 | PW-039 | <2.0 | <2.0 | N/A | No | Cannot assess a trend |
| | Mar-2019 | | <2.0 | <2.0 | N/A | | |
| | Jun-2019 | | <2.0 | <2.0 | N/A | | |
| | Oct-2019 | | <1.8 | <1.8 | N/A | | |
| PW-040 | Aug-2018 | PW-040 | <2.0 | <2.0 | N/A | No | Cannot assess a trend |
| | Mar-2019 | | <2.0 | <2.0 | N/A | | |
| | Jun-2019 | | <2.0 | <2.0 | N/A | | |
| | Oct-2019 | | <1.9 | <1.9 | N/A | | |
| PW-059 | Aug-2018 | PW-059 | <2.0 | <2.0 | N/A | No | Cannot assess a trend |
| | Mar-2019 | | <2.0 | <2.0 | N/A | | |
| | Jun-2019 | | <2.0 | <2.0 | N/A | | |
| | Oct-2019 | | <1.9 | <1.9 | N/A | | |
| PW-203 | Sep-2018 | PW-203 | <2.0 | <2.0 | N/A | No | Cannot assess a trend |
| | Mar-2019 | | <2.0 | <2.0 | N/A | | |
| | Jun-2019 | | <2.0 | <2.0 | N/A | | |
| | Oct-2019 | | <2.0 | <2.0 | N/A | | |
| PW-401 | Sep-2018 | PW-401 | 1.4 J | 40 | 41 J | No | No Trends |
| | Oct-2018 | | 1.6 J | 36 | 38 J | | |
| | Mar-2019 | | <2.0 B* | 31 | 31 B*‡ | | |
| | Jun-2019 | | <2.0 B* | 43 | 43 B*‡ | | |
| | Oct-2019 | | 1.4 J | 45 | 46 J | | |

NOTES:
The higher detected result is reported for field-duplicate samples.
Trends were only evaluated for locations with more than four results and at least one detected result.

a EPA LHA level is 70 ng/L for PFOS and PFOA combined; following DEC guidance results are compared to 65 ng/L.
b Mann-Kendall trend analysis at a 95% confidence level was calculated using the EPA statistics software ProUCL Version 5.1
**Bold** Concentration exceeds EPA LHA level
< Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control failures.
J Estimated concentration, detected greater than the method detection limit (MDL) and less than the reporting limit (RL). Flag applied by the laboratory.
B* Result is considered not detected due to a blank detection. Result is reported as less than the RL or detected concentration. Flag applied y Shannon & Wilson,
EPA Environmental Protection Agency
LHA Lifetime Health Advisory
ng/L nanograms per liter




Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

December 2018 to November 2019
Water Supply Well Sampling
Gustavus, Alaska

**WELL SEARCH EXTENT**

August 2020 | 102599

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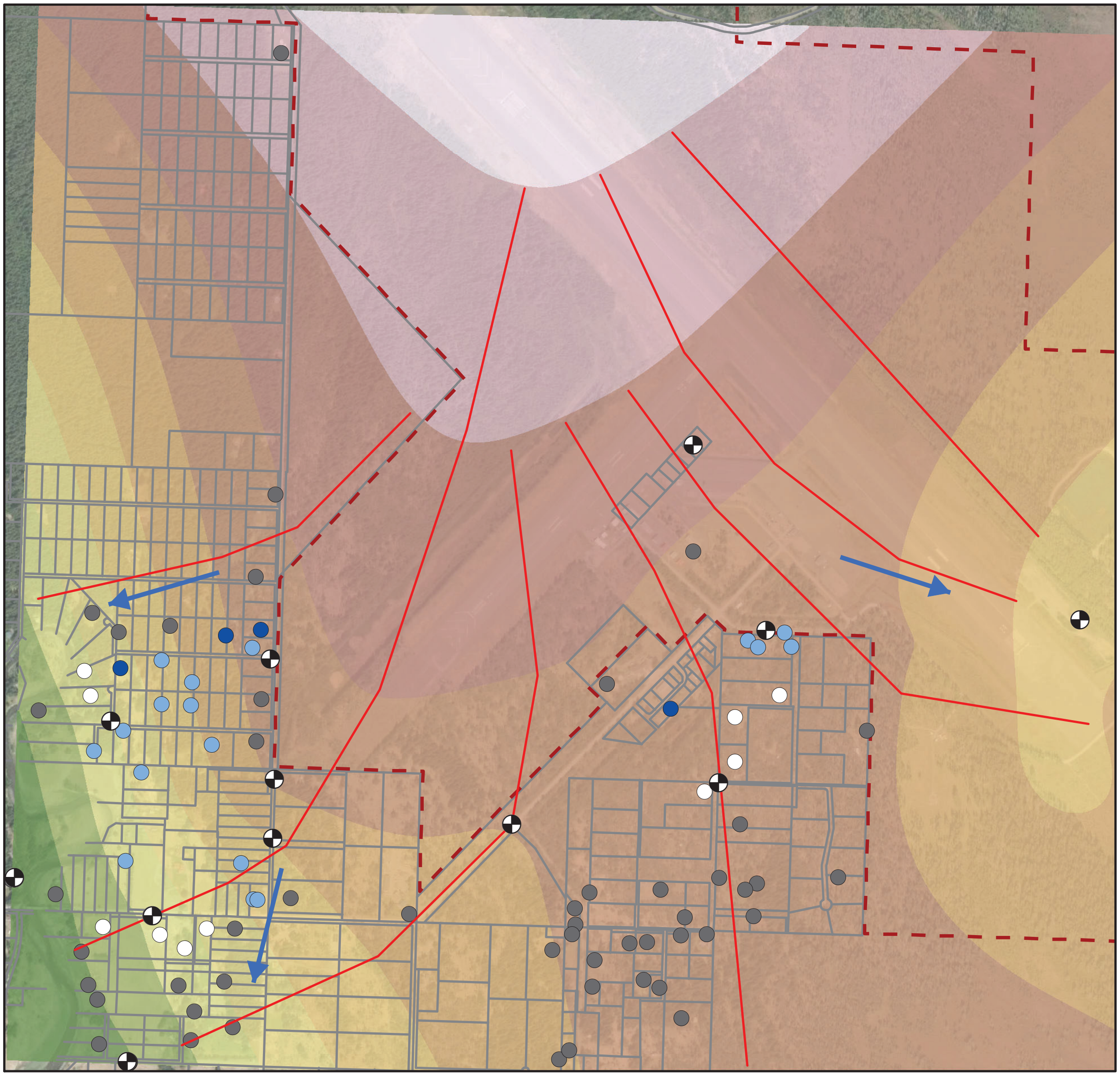
**Figure 1**

**Figure 1**



**LEGEND**

*Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community*

**Groundwater Elevations**

- 10 - 12 feet
- 12 - 14 feet
- 14 - 16 feet
- 16 - 18 feet
- 16 - 20 feet
- 20 - 22 feet
- 22 - 24 feet
- 24 - 26 feet
- 26 - 28 feet
- 28 - 30 feet

**Well Monitoring Network**

- Annually
- Quarterly
- Not In Network
- Proposed Annual
- Monitoring Well
- Airport Property Boundary
- Property Lines
- Interpolated Hydraulic Gradient
- EPA Calculated Hydraulic Gradient

0 2,000

Feet

N

December 2018 to November 2019
Water Supply Well Sampling
Gustavus, Alaska

## GROUNDWATER GRADIENT AND WELL MONITORING NETWORK

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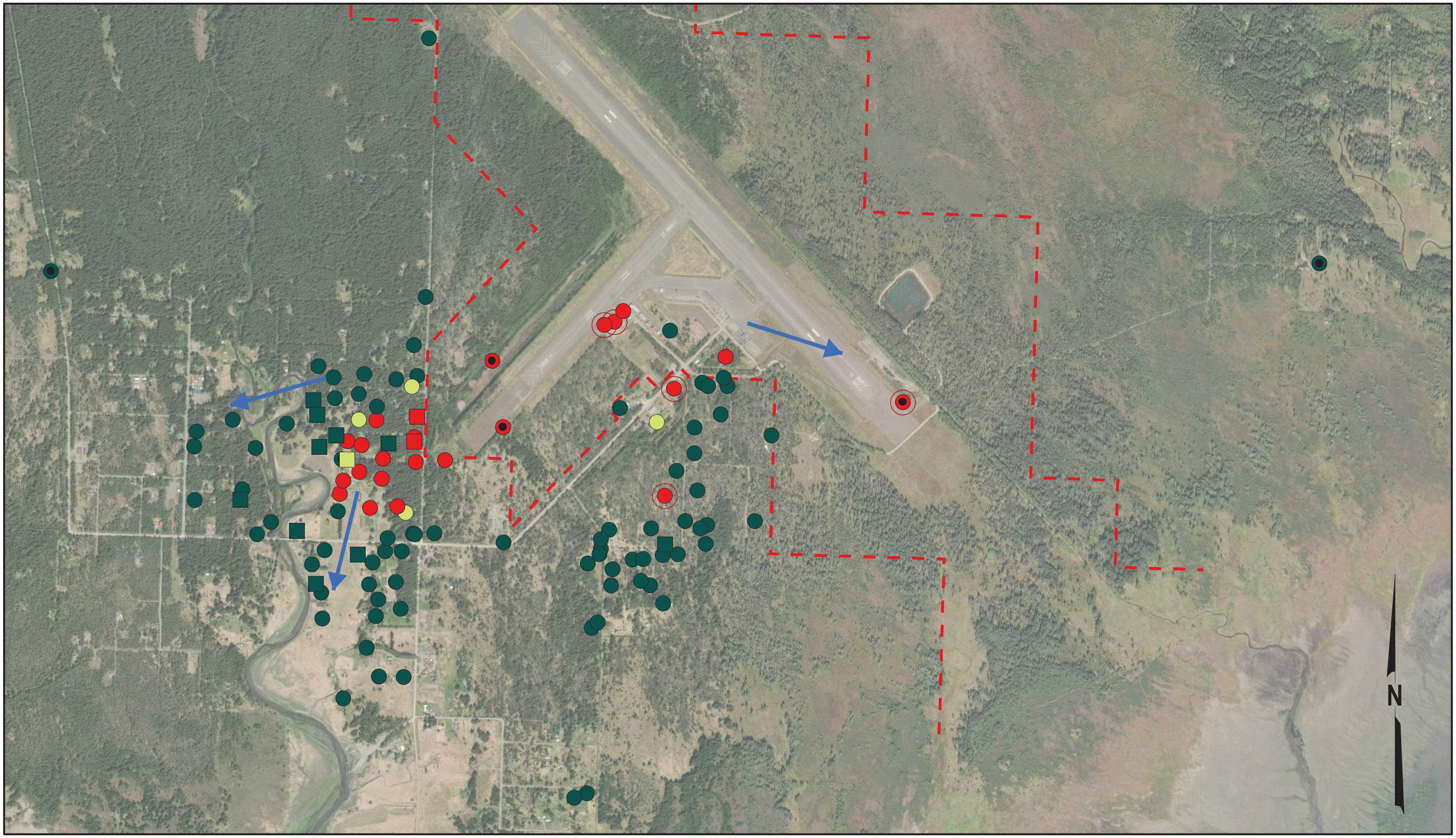
**Figure 2**




## LEGEND

Wells sampled before April 2019: compared to former DEC action level*

- ≤17 nanograms per liter (ng/L)
- 18 to 69 ng/L
- ≥70 ng/L (over former action level)

Wells sampled after April 2019: compared to EPA health advisory level (sum of PFOS and PFOA)

- ≤17 ng/L
- 18 to 69 ng/L
- ≥70 ng/L (over EPA advisory)

PFOS ≥ 400 ng/L

Surface Water Sample

Airport Property Boundary

EPA Calculator Hydraulic Gradient

0 0.5 1

Miles

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

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

December 2018 to November 2019
Water Supply Well Sampling
Gustavus, Alaska

**HIGHEST REPORTED WATER SUPPLY WELL ANALYTICAL RESULTS**

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**Figure 3**