Groundwater Investigation Report

Land Application Area
4958 County Road 8 Southeast
Saint Cloud, Minnesota

Prepared for

Jonny Rooter Sewer & Drain Cleaning, Inc.

&

Minnesota Pollution Control Agency

Project B2305038.02
December 19, 2024

Braun Intertec Corporation

BRAUN INTERTEC
The Science You Build On.

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December 19, 2024 Project B2305038.02

Mr. Wes Anderson
Jonny Rooter Sewer & Drain Cleaning, Inc.
3653 Quail Road Northeast
Sauk Rapids, MN 56379

Re: Groundwater Investigation
Land Application Area
4958 County Road 8 Southeast
Saint Cloud, Minnesota

Dear Mr. Anderson:

On behalf of Jonny Rooter Sewer & Drain Cleaning, Inc., Braun Intertec Corporation has completed the groundwater investigation of the above-referenced site (Site) in accordance with the authorized scope of services described in our proposal QTB193493 dated May 3, 2024. Our proposal incorporated the requirements outlined in the *Request for Additional Work* letter dated February 21, 2024, as well as the comments and revision requests provided by Ms. Sondra Campbell with the Minnesota Pollution Control Agency (MPCA) in an email dated April 16, 2024, which were provided to the MPCA in a revised Work Plan dated May 28, 2024. The revised Work Plan was approved in an email from Ms. Campbell on May 30, 2024.

The objective of the groundwater investigation was to evaluate seasonal variations in the on-Site groundwater flow direction, as well as on-Site trends in the concentrations of Per- and Polyfluoroalkyl Substances (PFAS). In addition, a select number of off-Site domestic wells (chosen by Ms. Campbell) were also sampled and analyzed for PFAS, to evaluate off-Site concentrations of PFAS in groundwater.

This Groundwater Investigation Report was prepared on behalf of and for use by Jonny Rooter Sewer & Drain Cleaning, Inc. and the MPCA. No other party has a right to rely on the contents of this Groundwater Investigation Report without the written authorization of Braun Intertec.

We appreciate the opportunity to provide our professional services to you for this project. If you have any questions or comments regarding this report or the project in general, please contact Aaron Volker at 320.980.6461 or Ted Hubbes at 218.263.8869.

Sincerely,

BRAUN INTERTEC CORPORATION

Aaron P. Volker
Project Scientist

Ted R. Hubbes, PG, CHMM
Senior Manager, Senior Scientist

Attachment: Groundwater Investigation Report

AA/EOE

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A. Introduction

A.1. Authorization

Braun Intertec Corporation received authorization from Mr. Wes Andersen of Jonny Rooter Sewer & Drain Cleaning, Inc. to conduct a groundwater investigation of the land application area located at 4958 County Road 8 Southeast in Saint Cloud, Minnesota (Site), in accordance with the scope of services described in the Braun Intertec proposal QTB193493 dated May 3, 2024.

This Groundwater Investigation Report was prepared on behalf of and for use by Jonny Rooter Sewer & Drain Cleaning, Inc. and the MPCA. No other party has a right to rely on the contents of this Groundwater Investigation Report without the written authorization of Braun Intertec.

Investigation activities were completed in general accordance with the revised Work Plan prepared by Braun Intertec and dated May 28, 2024. The revised Work Plan was approved by Ms. Sondra Campbell of the MPCA on May 30, 2024.

A.2. Project Objective

The objective of the groundwater investigation is to evaluate on-Site trends in the groundwater flow direction, as well as on-Site trends in the concentrations of Per- and Polyfluoroalkyl Substances (PFAS). In addition, a select number of off-Site domestic wells (chosen by Ms. Campbell) were also sampled and analyzed for PFAS to evaluate off-Site concentrations of PFAS.

B. Site Background

B.1. Site Location and Description

The Site is a grass-covered area on the northwestern portion of the property located at 4958 County Road 8 Southeast (the Property). The Site is located within the southeast quarter of the northeast quarter of Section 30, Township 35 North, Range 30 West, in the city of Saint Cloud, Sherburne County, Minnesota. A Site location map is included as Figure 1.

The Property consists of an approximately 50-acre parcel of land. The northeastern portion of the Property is developed with a homestead and the southern two-thirds of the Property is developed as a solar farm. A Site Diagram is included as Figure 2.

B.2. Notice of Violation (NOV)

On May 17, 2023, Jonny Rooter Sewer and Drain, Inc. was issued a Notice of Violation (NOV) by the MPCA. The NOV indicated that on May 3, 2023, MPCA staff determined that the Regulated Parties (Jonny Rooter Sewer and Drain, Inc.) discharged wastes from the clean out of industrial business and residential waste from floor drains, separators and traps, and septic systems from a vacuum tank truck to the unsaturated zone by land applying the waste to a vacant field located at 4958 County Road 8 Southeast, in Saint Cloud, Minnesota.

B.3. Previous Site Investigations

B.3.a. Domestic Well Sampling & Analysis Report

At the request of MPCA, Braun Intertec completed a well receptor survey, which identified several drinking water wells within 1,000 feet of the Site. In addition, sampling and analysis of the domestic wells located at 2011 49th Street Southeast and 4958 County Road 8 Southeast, in Saint Cloud, Minnesota was conducted in July 2023. The results of the well sampling and analysis are presented in the report entitled: *Domestic Well Sampling & Analysis Report, Two Domestic Wells, 2011 49th Street Southeast, 4958 County Road 8 Southeast, Saint Cloud, Minnesota*, dated August 29, 2023 (2023 Report). A summary of the 2023 Report is presented below.

The following conclusions were made as a result of the analysis performed on the domestic wells:

1. Well #640304 (4958 County Road 8 Southeast) – This well is located in the apparent upgradient direction from the Site. No volatile organic compounds (VOCs), diesel range organics (DRO), gasoline range organics (GRO), 1,4-dioxane, E.coli, Nitrogen (ammonia) and total suspended solids (TSS) were detected at concentrations equal to or greater than the laboratory method reporting limits. Various concentrations of arsenic, barium, and cadmium were detected at concentrations below drinking water criteria, and were detected at concentrations that are similar and may represent naturally occurring concentrations. The detected concentration of Perfluorooctanoic acid (PFOA) (detected at a concentration of 0.0246 micrograms per liter [µg/L]) exceeds the current health-based value (HBV) of 0.00024 µg/L. The combination of Per- and Polyfluorinated Substances (PFAS) detected exceeded the MDH's Health Risk Index (HRI) for the combination of PFAS detected. The Nitrate (as Nitrogen) concentrations (detected at a

concentration of 15,200 µg/L) exceed its drinking water criteria (DWC) of 10,000 µg/L, though the detected concentration was less than its March 2000 analysis (detected at a concentration of 43,200 µg/L - which was analyzed shortly after the well was installed in December 1999). The Client indicated that the water from this well is not consumed and the property owner obtains its potable water from a bottled source.

2. 2011 49th Street Southeast (*no unique well number available*) – The well is located immediately north of the Site in the apparent side gradient direction. No VOCs, DRO, GRO, 1,4-dioxane, E.coli, Nitrogen (ammonia) and TSS were detected at concentrations equal to or greater than the laboratory method reporting limits. Various concentrations of arsenic, barium, and cadmium were detected at concentrations below drinking water criteria, and were detected at concentrations that are similar and may represent naturally occurring concentrations. None of the individual detected concentrations of PFAS exceeded an established DWC, nor did the combination of detected PFAS exceed the MDH's HRI. Coliform (total) was detected at a concentration of 2.0 µg/L.

B.3.b. Soil and Groundwater Assessment Report

To evaluate potential soil and groundwater impacts on the Site, an initial investigation on the Site was conducted in October 2023. The results of soil and groundwater assessment are presented in the report entitled: *Soil and Groundwater Assessment Report, 4958 County Road 8 Southeast, Saint Cloud, Minnesota*, dated March 1, 2024 (2024 Report). A summary of the 2024 Report is presented below.

Fourteen (14) push probe soil borings (designated as PP-1 through PP-14) were completed within the land application investigation area (Site) to depths ranging from 5 to 30-feet bgs. Two analytical soil samples per boring were collected in the upper 5-feet. The soil samples were collected in the 0 to 2.5- foot depth interval and the 2.5 to 5-foot depth interval. Since there were no obvious field indications of contamination noted at depth, no analytical soil samples were collected from depths greater than 5- feet bgs.

The following provides a summary of the soil analytical results.

- No PAHs or GRO were detected at concentrations greater than or equal to the laboratory reporting limits.

- Various petroleum VOCs (Ethylbenzene, Toluene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, and Xylenes) were detected at concentrations greater than or equal to

the laboratory reporting limits at three of the fourteen sample locations, however none of the detected concentrations exceeded the respective Residential/Recreational SRVs or SLVs.

- DRO was detected in 4 of the 28 analytical soil samples (PP-4, PP-9 and PP-11), at concentrations ranging from 9.43 to 26.3 mg/kg, which are below the MPCA unregulated fill criterion of 100 mg/kg.

- Varying concentrations of the RCRA metals were detected in each of the soil samples analyzed. However, none of the metal concentrations exceeded the respective Residential/Recreational SRVs and SLVs. The detected RCRA metal concentrations were within the concentration range that may represent naturally occurring concentrations[1].

- Varying concentrations of PFAS were detected in 15 of the 28 soil samples analyzed across the Site. However, none of the PFAS concentrations exceeded their respective Residential/Recreational SRVs and SLVs, with the exception of the detected concentrations of PFOA in soil sample PP-1 (0-2.5') and PP-5 (0-2.5').
    - PFOA was detected in samples PP-1 (0-2.5') and PP-5 (0-2.5') at concentrations of 0.00079 and 0.00042 mg/kg, respectively. These detected concentrations of PFOA exceed the recently updated SRV (updated in April 2024) of 0.00036 mg/kg.

Temporary monitoring wells (designated as PP-5, PP-7, and PP-11) were installed in three of the soil borings to evaluate groundwater conditions at the Site. Based on groundwater elevation data collected from the three temporary monitoring wells, groundwater measurements showed depth to water ranging between 25.10 and 27.55-feet bgs.

The groundwater samples collected from the temporary wells were submitted to accredited laboratories for analysis. The following provides a summary of the groundwater analytical results.

- No VOCs, GRO DRO, or PAHs were detected at concentrations greater than or equal to the laboratory reporting limits.

[1] https://mrdata.usgs.gov/ds-801/; Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1270, 1984

- Barium (dissolved) was the only RCRA metal detected in any of the analytical groundwater samples. Barium was detected in the groundwater samples at concentrations ranging from 62.9 to 73.1 µg/L, which is below the DWC of 2,000 µg/L.

- Varying concentrations of PFAS were detected in each analytical groundwater samples though none of the individual compounds exceeds a respective DWC, with the exception of the following compounds:
    - Perfluorooctane sulfonate (PFOS) was detected at a concentration of 0.0075 µg/L in PP-7, which exceeds its DWC of 0.0023 µg/L.
    - Perfluorooctanoic acid (PFOA) was detected at concentrations of 0.0148 and 0.0229 in PP-7 and PP-11, respectively. These detected concentrations exceed the DWC of 0.00024 µg/L.
    - The PFAS HRI Score for the groundwater samples collected from soil borings PP-5 was 0.0. An HRI Score 1.0 or less indicates that the concentrations of PFAS in the sample collected from the temporary monitoring well does not exceed regulatory criteria.
    - The PFAS HRI Scores from the groundwater samples collected from soil borings PP-7 and PP-11 were 1,874.4 and 2898.7, respectively, which indicates an exceedance of established regulatory criteria.

B.4. MPCA Investigation Report Review and Request for Additional Work

Following the MPCA's review of the Soil and Groundwater Assessment Report, the MPCA issued a letter on February 21, 2024, requesting that a Work Plan be submitted for the following:

1. Additional drinking water sampling for PFAS analysis for domestic wells within 1,000-feet of the Site.
2. The installation of permanent monitoring well network at the Site to monitor groundwater flow direction and PFAS concentration trends over time.

C. Potential Off-Site PFAS Sources

C.1. Land Application of Municipal Bio-Solids

Mr. Anderson obtained information from Mr. Elijah Studer, an Environmental Compliance Coordinator with the City of Saint Cloud, indicating that over one-million gallons of biosolids were applied to the solar farm area immediately to the south of the land application area (located on the Property) between 2000 and 2006.

Below is the summary table provided to Mr. Anderson:

Month & Year of Application	Approximate Total Gallons Applied	Gallons per Acre Reported to MPCA	Acres Covered Reported to MPCA
April 2000	202,100	6,969	29.0
November 2003	504,400	13,451	37.5
November 2004	296,400	9,880	30.0
September 2006	104,010	3,467	30.0

In addition, the Site is located within an agricultural area, where several nearby properties have permits to apply biosolids. According to information obtained on the MPCA's *Land Application Sites in Minnesota* webpage (https://gisdata.mn.gov/dataset/env-land-application-sites), the following properties located within 1-mile of the Site have permits to apply biosolids:

- 2140 49th Street SE, which is located approximately 750 feet north of the Site, in the apparent upgradient direction.
- Parcel ID 25-00029-2400, which is located approximately 4,000 feet east of the Site, in the apparent side-gradient direction.
- Parcel ID 25-00020-3000, which is located approximately 4,300 feet northeast of the Site, in the apparent upgradient direction.

C.2. Septic Systems

All of the domestic properties within the vicinity of the land application area utilize septic systems. Concentrations of PFAS compounds, including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), are present in many household products; and studies have shown that septic systems can be a source of PFAS to the environment due to the use of consumer products[2].

D. Published Geologic Information

D.1. Topography

According to the United States Geological Survey (USGS) 7.5-minute topographic map series, Saint Cloud, Minnesota quadrangle, the Site is located at an elevation of approximately 1,020 feet above mean sea level and is relatively flat, within an overall slope downward towards the west-southwest (towards the Mississippi River located approximately 1-milesouthwest from the Site).

D.2. Soil

We reviewed the United States Department of Agriculture (USDA) National Resource Conservation Service (NRCS) website to obtain soil information regarding the Site. According to the NRCS, the soil at the Site reportedly consists of loamy sand and sand of the Hubbard-Mosford complex and loamy sand and sand of the Hubbard unit.

D.3. Geology

The published uppermost bedrock unit in the Site is comprised of the St. Cloud, Rockville, and Reformatory granites of east-central Minnesota (Morey and Meints, 2000). The depth to bedrock in the vicinity of the Site is approximately 100 feet below ground surface (bgs) (Olson and Mossler, 1982).

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[2] Poly- and Perfluoroalkyl Substances in Municipal Wastewater Treatment Plants in the United States: Seasonal Patterns and Meta-Analysis of Long-Term Trends and Average Concentrations, Southern Nevada Water Authority (SNWA), Kyle A. Thompson et all.

A pilot study on the assessment of trace organic contaminants including pharmaceuticals and personal care products from on-site wastewater treatment systems along Skaneateles Lake in New York State, USA Subedi, Bikram; et all. Water Research (2015), 72 (), 28-39CODEN: WATRAG; ISSN:0043-1354.

D.4. Hydrogeology

Based on well and boring records reviewed on the Minnesota Well Index (MWI), the reported depth to groundwater in the vicinity of the Site is approximately 20 to 30 feet bgs.

According to Part B of the *Geologic Atlas of Sherburne County,* the published regional groundwater flow direction within the unconsolidated deposits in the Site vicinity is generally to the west-southwest, towards the Mississippi River (Minnesota Department of Natural Resources, 2017).

Site specific observations regarding geology and hydrogeology are discussed in Section G of this report.

E. Scope of Services

The following tasks were conducted at the Site as part of this groundwater investigation:

- Coordinated with the Braun Intertec drilling crew to clear public utilities through Gopher State One Call and private utilities for the domestic well locations.
- Installed four permanent monitoring wells (MW-1 through MW-4) and collected groundwater samples.
- Conducted environmental monitoring during drilling and screened soil samples collected from the borings for the presence of organic vapors using a photoionization detector (PID). Visual and olfactory observations regarding potential contamination were also made and recorded.
- Coordinated with a licensed surveyor contractor to survey the monitoring wells.
- Requested off-Site access for sampling of eleven private domestic wells.
- Sampled eight domestic wells for PFAS.
- Evaluated the data and prepared this report.

E.1. Deviations from Work Plan/Proposal

The MPCA approved Work Plan requested sampling of eleven domestic wells for analysis of PFAS. One of the respondents (2025 52nd Street Southeast) indicated that they would not allow access to the property.

Three attempts (2 mailed access agreement letters and 1 in person visit) were made to gain access to the two non-responsive properties (2101 49th Street Southeast and 22217 52nd Street Southeast). As of date, access has yet to be granted to these two properties.

F. Investigation Methods and Procedures

The field work relating to the investigation was conducted on the following dates:

- June 13, 2024 – Initial domestic well access agreement letters mailed out.
- June 24 and 25, 2024 – Four monitoring wells (designated as MW-1 through MW-4) were installed on the land application area.
- July 1, 2024 – Monitoring wells were developed.
- July 10, 2024 – Monitoring wells were sampled for PFAS analysis
- July 19, 2024 – Second round of domestic well access agreement letters mailed out to non-responsive parties via certified mail (requiring signature of acceptance of letter).
- July 25, 2024 – Monitoring wells surveyed by a licensed surveyor.
- August 29, 2024 – Eight domestic wells sampled for PFAS.
- August 29, 2024 – Visited two remaining non-responsive parties to sample their domestic wells (no one was home – access not granted).
- October 4, 2042 – Monitoring wells sampled for PFAS analysis.

Prior to beginning the drilling activities, public utilities were cleared through Gopher State One Call.

Field methods and results are discussed in the following sections. Global Positioning System (GPS) coordinates of investigation locations are provided in Appendix A, soil boring logs for the monitoring wells are provided in Appendix B, monitoring well construction, development, and sampling documentation is provided in Appendix C, laboratory analytical reports are provided in Appendix D, well and boring reports for sampled domestic wells are included in Appendix E, and Braun Intertec Standard Operating Procedures (SOPs) are provided in Appendix F.

Four monitoring wells (designated as MW-1 through MW-4) were installed at the Site as follows:

- MW-1 (Unique ID# 1856812) was advanced to a depth of 31 feet bgs on the north-central portion of the land application area.
- MW-2 (Unique ID# 1856813) was advanced to a depth of 33 feet bgs on the east-central portion of the land application area.
- MW-3 (Unique ID# 1856814) was advanced to a depth of 30 feet bgs to the south (apparent downgradient direction) of the land application area (not within the land application area).
- MW-4 (Unique ID# 1856815) was advanced to a depth of 33 feet bgs west of the southwestern portion (apparent downgradient direction) of the land application area (not within the land application area).

F.1. Domestic Well Sampling

Ms. Campbell had requested that domestic wells on the following properties be sampled for Per- and Polyfluoroalkyl Substances (PFAS):

1. 1965 49th Street Southeast (no unique well number available)
2. 2053 49th Street Southeast (Unique Well Number 497680)
3. 2101 49th Street Southeast (Unique Well Number 709277)**
4. 4959 County Road 8 Southeast (Unique Well Number 570862)
5. 1881 49th Street Southeast (Unique Well Number 719180)
6. 1950 49th Street Southeast (Unique Well Number 759189)
7. 2011 49th Street Southeast (no unique well number available)
8. 2025 52nd Street Southeast (Unique Well Number 131376)*
9. 2217 52nd Street Southeast (Unique Well Number 192313)**
10. 2317 52nd Street Southeast (Unique Well Number 192134)
11. 5276 County Road 8 Southeast (Unique Well Number 131369)

Notes:

**The property owner indicated they would not provide access for sampling their property located at 2025 52nd Street South.*

***No access has been granted to sample the domestic wells of the properties located at 2101 49th Street Southeast and 2217 52nd Street.*

F.1.a. Domestic Well Sampling and Analytical Testing

Upon receipt of access, a domestic well water sample was collected from an exterior spigot. To collect the domestic well water sample, the water supply well was purged until the temperature of the well had

stabilized to within 1 degree of variation. Once purging was completed, the exterior spigot was cleaned using a mixture of PFAS free water and Alconox (laboratory grade soap) followed by a final rinse using PFAS free water. Once the spigot was cleaned, water from the spigot was collected in the laboratory supplied containers, preserved appropriately, and submitted to the laboratory for PFAS analysis using EPA Method 1633.

F.2. Soil Evaluation

F.2.a. Monitoring Wells

Braun Intertec installed four monitoring wells (designated as MW-1 through MW-4) at the Site to depths ranging from 30 to 33 feet bgs.

The monitoring wells were completed by using a hollow-stem auger rig equipped with 4 ¼-inch inside diameter hollow stem auger. Soil sampling retrieved during the monitoring well installation was conducted in general accordance with American Society for Testing and Materials (ASTM) D 1586, "Penetration Test and Split-Barrel Sampling of Soils."

The boreholes were advanced with the hollow-stem auger to the desired test depths. A 140-pound hammer falling 30 inches was then used to drive the standard 2-inch split-barrel sampler a total penetration of 1 1/2 feet below the tip of the hollow-stem auger. After advancing the tooling, the split-barrel sampler was removed from the borehole and the soil sample was retrieved for field screening and classification. The process was then repeated to the termination depths of the monitoring well.

Prior to arrival on-Site, the drill rig and sampling equipment were cleaned with a high pressure, hot water sprayer. Between monitoring well locations, non-dedicated sampling equipment was set aside, and a new set of cleaned sampling equipment was used.

Cuttings generated during the installation of the monitoring wells were containerized in 55-gallon drums. One soil drum was designated to each monitoring well location.

Following the construction of the monitoring wells, the monitoring wells were surveyed by a licensed surveyor. Survey information is summarized in Appendix A.

F.2.b. Soil Classification and Monitoring

Soil samples from the monitoring wells were visually and manually classified in the field by an environmental technician using ASTM D 2487 "Standard Practice for Classification of Soils for Engineering

Purposes (Unified Soil Classification System)" and ASTM D 2488 "Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)".

Soil samples retrieved were examined by an environmental technician for unusual staining, odors, and other apparent signs of contamination. In addition, the soil samples were screened for the presence of organic vapors using a PID. The PID was equipped with a 10.6-electron-volt lamp and calibrated to an isobutylene standard. The PID was used to perform a headspace method of field analyses in accordance with Braun Intertec SOPs. Soil boring logs for the monitoring wells are included as Appendix B.

F.2.c. Soil Analyses

One near surface soil sample (upper 1-foot of cuttings) was collected for laboratory analysis at each monitoring well location. The soil samples were submitted to Pace Analytical Laboratory Services, LLC (Pace) in Minneapolis, Minnesota for PFAS analysis using EPA Method 1633.

F.3. Groundwater Evaluation

Four permanent monitoring wells (designated as MW-1 through MW-4) were installed to evaluate groundwater flow direction and trends in PFAS concentrations. The wells were permitted with the MDH. The permanent monitoring well locations are shown on Figures 2 through 5.

F.3.a. Permanent Monitoring Wells

Permanent monitoring wells were constructed using 2-inch inside-diameter PVC riser and 10-foot long, 10-slot screen. After the well materials were centered inside of the augers, a sand pack was installed in the annulus space as the augers were retracted by pouring sand into the open drill stem. The sand pack was placed extending at least 2 feet above the screened interval. A 2- to 3-foot-thick bentonite seal was installed on top of the sand pack and hydrated. The remainder of the annulus space was grouted to the surface. The wells were finished approximately 2.5 feet above grade. A 6-inch locking steel protective cover was installed over the well.

Monitoring well construction information is included in Appendix C Following installation, the elevation of the top of riser and ground surface was surveyed to the nearest 0.01 inch.

F.3.b. Monitoring Well Development

The newly installed wells were developed by alternately removing water with a PFAS free disposable bailer and surging the well until a relatively sediment-free discharge was obtained, temperature and pH stabilized within three consecutive readings (± 0.1^0 C and ± 0.1 unit), or a minimum of five well volumes were removed, whichever occurred first.

The monitoring well development summary sheets are provided in Appendix C.

F.3.c. Permanent Monitoring Well Sampling

Prior to sampling, static groundwater levels in each monitoring well were measured to the nearest 0.01 foot and recorded. The monitoring wells were sampled from the least impacted to those with likely higher concentrations of contaminants. Prior to sampling, each monitoring well was purged until field parameters measured after a minimum of one well volume removed had stabilized for at least three consecutive readings or until a maximum of five well volumes were removed.

Following monitoring well purging, groundwater samples were collected using new lengths of PFAS free tubing connected to a low-flow peristaltic pump. Water samples retrieved were examined by the field technician for unusual odors, petroleum-like sheen, and other apparent signs of contamination. The groundwater samples were placed directly into laboratory supplied containers, preserved appropriately, and submitted to the laboratory for chemical analysis. Purge water removed from the monitoring wells was containerized and stored on-Site prior to off-Site disposal.

Groundwater sampling sheets are provided in Appendix C.

F.3.d. Monitoring Well Groundwater Analyses

The groundwater samples collected from the permanent monitoring and domestic wells were submitted to Pace and analyzed for PFAS using EPA Method 1633.

G. Investigation Results

G.1. Geologic Conditions

Soil boring logs with descriptions of the various soil strata encountered during the soil boring operations and water level information are contained in Appendix B. The depths shown as changes between the soil types are approximate. The actual changes may be transitional, and the transition depths are likely to be horizontally variable.

Approximately 6-inches to 1-foot of topsoil was observed in each monitoring well location. Underlying the topsoil was poorly graded sand (with varying amounts of silt) to the termination of each monitoring well. The soils became more dense/cobbly with depth, resulting in refusal of the auger equipment in in MW-1, at a depth of 31 feet bgs.

Groundwater was encountered at depths ranging from 23.9 to 25.3 feet bgs.

G.2. Hydrogeology

Two rounds of groundwater elevation data were collected from the monitoring wells. Groundwater measurements in July 2024 showed depth to water elevations ranging between 991.12 feet AMSL and 992.61 feet AMSL and groundwater measurements in October 2024 showed depth to water elevations ranging between 991.37 feet AMSL and 991.88 feet AMSL.

Based on groundwater elevation data from these wells, the groundwater flow direction of the unconsolidated materials is generally to the south-southwest, towards the Mississippi River (see Figures 4 and 5).

Appendix C includes monitoring well construction, development, and sampling information.

G.3. Field Screening

Soil recovered from the installation of the monitoring wells was screened by the field technician for evidence of contamination, including odors, staining, and the presence of debris. No odors, staining, or debris were observed in the soils recovered from any of the monitoring wells.

Organic vapor/PID readings were recorded for soil samples collected from each monitoring well. Observed organic vapor concentrations ranged from 0.0 to 0.8 parts per million (ppm), which are considered to be general background readings. A summary of the soil screening results for the soil samples is provided in Table 1 and are also included on the boring logs in Appendix B.

Groundwater samples were examined by the field technician for evidence of contamination, including unusual odors, petroleum-like sheen, and other apparent signs of contamination. No odors, sheens, or other signs of contamination were observed in the groundwater recovered from any of the temporary and/or permanent monitoring wells.

G.4. Soil Cutting Analytical Results

This section provides a discussion of soil analytical results. A summary of the soil analytical results is provided in Table 2. The complete laboratory reports with chain-of-custody forms are included in Appendix D.

The soil analytical results can be compared with the Soil Reference Values (SRVs), Background Threshold Values (BTVs), and Screening Soil Leaching Values (SLVs), which are also listed on Table 2. The SRVs and SLVs are allowable risk-based contaminant concentrations derived by the Minnesota Pollution Control Agency (MPCA) using risk assessment methodology, modeling, and risk management policy to guide investigation and cleanup actions. SRVs relate to direct-contact exposure scenarios and SLVs relate to potential leaching of contaminants to groundwater. BTVs were established by the MPCA based on an estimate of state-wide natural background concentrations for inorganics and ambient background concentrations for organics. BTVs are used in instances where the MPCA calculated a health-based SRV that is below estimated background values (MPCA guidance document c-r1-05, April 2021).

Concentrations of contaminants in soil, SRVs, BTVs (where applicable), and SLVs are expressed in units of micrograms per kilogram (µg/kg).

The following provides a summary of the soil analytical results.

- Various concentrations of PFAS were detected in the soil cuttings in MW-1, MW-2, and MW-3, though none of the detected concentrations exceeded a regulatory criterion with the exception of the detected concentration of PFOA in samples collected from the cuttings of monitoring wells MW-1 and MW-2.
    - Perfluorooctanoic acid (PFOA) was detected in the soil cuttings from MW-1 and MW-2 at concentrations of 1.5 and 0.61 µg/kg, respectively.
    - These detected concentrations exceed the Residential/Recreational SRV of 0.36 µg/kg.

- No PFAS were detected at concentrations equal to or greater than the laboratory method reporting limits in the soil cuttings from MW-4.

- It should be noted that PFOS was the only detected PFAS detected in MW-3. MW-3 is outside the limits of the land application area.

G.5. Groundwater Analytical Results

This section provides a discussion of the groundwater analytical results. A summary of the permanent monitoring wells and domestic well analytical results are provided in Tables 3 through 5. For comparison purposes, these tables include current Drinking Water Criteria (DWC) from the Minnesota Department of Health (MDH) Human Health-Based Water guidance applicable to groundwater. In addition, the tables also include the Health Risk Index (HRI), which evaluates the concurrent exposures to multiple chemicals.

Drinking Water Criteria and HRI include a combination of MDH Health Risk Limits (HRLs), MDH Health Based Values (HBVs), MDH Risk Assessment Advice (RAA), and Maximum Contaminant Levels (MCLs) established by the Environmental Protection Agency (EPA). Concentrations of contaminants in water and Drinking Water Criteria are expressed in units of nanograms per liter (ng/L).

Figure 3 depicts the analytical result exceedances for the groundwater samples. The complete laboratory reports with chain-of-custody forms are included in Appendix D.

The following provides a summary of the groundwater analytical results.

Permanent Monitoring Wells

- Various concentrations of PFAS were detected in the monitoring wells sampled during the July and October 2024 sampling events. The following PFAS compounds were detected at a concentration that exceeds an established regulatory criterion:

  - Perfluorooctanoic acid (PFOA) was detected in each of the monitoring wells at concentrations exceeding the regulatory criteria of 0.0079 ng/L.
    - PFOA was detected in MW-1 during the July and October sampling events at concentrations of 9.9 and 8.6 ng/L, respectively.
    - PFOA was detected in MW-2 during the July and October sampling events at concentrations of 16.7 and 13.0 ng/L, respectively.
    - PFOA was detected in MW-3 during the July and October sampling events at concentrations of 6.6 and 6.2 ng/L, respectively.
    - PFOA was detected in MW-4 during the July and October sampling events at concentrations of 20.5 and 17.7 ng/L, respectively.

  - Perfluorooctanesulfonic acid (PFOS) was detected in each of the monitoring wells, with PFOS exceeding the regulatory criteria of 2.3 ng/L in MW-2 and MW-4.
    - PFOS was detected in MW-2 during the July and October sampling events at concentrations of 3.4 and 3.3 ng/L, respectively.
    - PFOS was detected in MW-4 during the July and October sampling events at concentrations of 6.5 and 7.6 ng/L, respectively.

  - The HRI for MW-1, MW-2, MW-3, and MW-4 were greater than 1, indicating an exceedance of the Drinking Water Criteria.

- The HRIs for MW-1 for the July and October sampling events were 1,254.19 and 1,088.90, respectively.
- The HRIs for MW-2 for the July and October sampling events were 2,115.81 and 1,647.31, respectively.
- The HRIs for MW-3 for the July and October sampling events were 836.31 and 785.56, respectively.
- The HRIs for MW-4 for the July and October sampling events were 2,598.01 and 2,244.02, respectively.

Based on the two rounds of monitoring well sampling and analysis, the concentrations of PFOS and PFOA detected in the monitoring wells during the second round of sampling are less than and/or very similar to the concentrations detected during the first round of sampling. In addition, the HRI for the monitoring wells was lower during the second round of sampling.

Domestic Wells

- Various concentrations of PFAS were detected in all of the domestic wells that were sampled at the time this report was issued. The following domestic wells/properties had concentrations of PFAS exceeding regulatory criteria:
  - 1881 49th Street Southeast (Unique Well #719180) had PFOA detected at a concentration of 1.2 ng/L, which exceeds the DWC of 0.0079 ng/L. In addition, the Health Risk Index for this well was 151.99, an exceedance of the Drinking Water Criteria. This property is located approximately 850 feet upgradient of the land application area, in a west-northwest direction. The well record for this well indicates that it is screened from 72 to 80 feet bgs, beneath a rocky clay layer that extends from the ground surface to 35 feet bgs.
  - 2317 52nd Street Southeast (Unique Well #192314) had PFOA detected at a concentration of 57.8 ng/L, which exceed the DWC of 0.0079 ng/L. This well also had PFOS detected at a concentration of 4.5 ng/L, which exceeds the DWC of 2.3 ng/L. In addition, the Health Risk Index for this well was 7,318.99, an exceedance of the Drinking Water Criteria. This property is located approximately 1,800 feet cross-gradient of the land application area, in a southeast direction. This property is also located approximately 500 feet south of the solar farm (the Property), where the City of Saint Cloud land applied biosolids. The well record for this well indicates that it is screened from 87 to 95 feet bgs, beneath a clay layer that is present from 34 to 71 feet bgs.

- 4958 County Road 8 Southeast (Unique Well ID #640304) had PFOA detected at a concentration of 24.6 ng/L, which exceed the DWC of 0.0079 ng/L. In addition, the Health Risk Index for this well was 3,114.32, an exceedance of the Drinking Water Criteria. This property is located approximately 550 feet upgradient of the land application area, in an east direction. The well record for this well indicates that it is screened from 39 to 43 feet bgs, beneath a clay that extends from 21 to 28 feet bgs.
- 4959 County Road 8 Southeast (Unique Well ID #570862) had PFOA detected at a concentration of 60.2 ng/L, which exceed the DWC of 0.0079 ng/L. This well also had PFOS detected at a concentration of 6.0 ng/l, which exceeds the DWC of 2.3 ng/L. In addition, the Health Risk Index for this well was 7,623.47, an exceedance of the Drinking Water Criteria. This property is located approximately 1,000 feet upgradient of the land application area, in an east direction. The well record for this well indicates that it is screened from 48 to 52 feet bgs, with only a 3 foot clay layer present from 2 to 5 feet bgs.
- 5276 County Road 8 Southeast had PFOA detected at a concentration of 61.2 ng/L, which exceeds the DWC of 0.0079 ng/L. This well also had PFOS detected at a concentration of 3.6 ng/L, which exceeds the DWC of 2.3 ng/L. In addition, the Health Risk Index for this well was 7,749.00, an exceedance of the Drinking Water Criteria. This property is located approximately 1,500 feet cross-gradient of the land application area, in a southeast direction. This property is also located approximately 200 feet south of the solar farm (the Property), where the City of Saint Cloud land applied biosolids. The well record for this well indicates that it is screened from 45 to 49 feet bgs and there is no clay layer identified in the well report.

Copies of the readily available well and boring reports for the domestic wells that were sampled at the time this report was issued are included in Appendix E.

G.6. Quality Assurance/Quality Control

Samples were placed in clean, laboratory-supplied containers, preserved, labeled, and transported to Pace laboratory in Minneapolis, Minnesota under refrigerated conditions using chain-of-custody procedures. Chain-of-custody forms were reviewed at sample check-in and determined to be in general agreement with the contents of the sample coolers. Analyses were performed using EPA or other recognized standard procedures, and samples were analyzed within the EPA recommended holding times.

A quality assessment of field procedures and analytical laboratory reports was performed to evaluate potential effects on data quality used to support project objectives. All applicable Braun Intertec SOPs were followed as prescribed unless otherwise noted in this report.

Laboratory reporting limits were compared against Drinking Water Criteria (DWC) for groundwater samples. Reporting limits for some of the compounds analyzed during the investigation exceeded their respective regulatory standards.

Trip blanks accompanied the groundwater investigative samples and was analyzed for PFAS. No PFAS were detected in the trip blanks at concentrations greater than the laboratory method reporting limits.

An equipment blank was collected off of the drilling equipment used to install the monitoring wells and was analyzed for PFAS. No PFAS were detected in the equipment blank at concentrations greater than the laboratory method reporting limits.

We collected a blank of the water utilized to mix the grout used during well installation. The grout water, which originated from a municipal water supply, was passed through a garden hose to fill the drill rig's water reservoir that was utilized to mix the bentonite grout. A sample of this water was collected for PFAS analysis. PFBA was the only PFAS compound detected in the water sample used to mix the bentonite grout. PFBA was detected in the grout water sample at a concentration of 4.6 ng/L, which is less than its DWC of 7,000 ng/L. The concentration of PFBA in the monitoring well samples ranged between 18.8 to 43.8 ng/L. The detected concentration of PFBA in the bentonite grout does not appear to represent a significant source of PFBA in the monitoring well samples.

The laboratory noted that the extraction volume for sample MW-1 collected during the October sampling event was reduced due to the presence of high total suspended solids (TSS). This volume reduction caused elevated reporting limits for all analytes in the sample, and the laboratory reported this sample's results down to the method detection limit (MDL) to compensate for the higher limits, which resulted in some of the analytical results being "J" flagged. A "J" flag indicates that the result is estimated to be at a concentration above the method detection limit, but below the method reporting limit.

In summary, data quality control items identified during the quality review were evaluated, and all data collected are acceptable for use in this investigation for the intended purpose of identifying PFAS impacts within the project area.

H. Conclusions

- Site soils consist of topsoil overlying poorly graded sands with varying amounts of silt to the terminus of the borings. The gravel content increased with depth.

- The groundwater flow direction at the Site is to the southwest, towards the Mississippi River.

- PFAS compounds were detected in soil samples collected within and outside of the land application area at the Site. Localized areas of PFAS soil exceedances are intermittent within the land application area. It should be noted that one PFAS compound was detected in MW-3 (southernmost monitoring well), which is located outside of the land application area .

- PFAS compounds were detected in all of the monitoring wells installed at the Site. The only PFAS compounds detected above drinking water criteria were PFOA and PFOS.

- The concentrations of PFOS and PFOA detected in the monitoring wells during the second round of sampling are less than and/or very similar to those compounds detected during the first round of sampling.

- PFAS was detected in all of the domestic wells sampled, with exceedances detected in five of the nine domestic wells sampled since this investigation began. PFOA and PFOS were the only PFAS compounds detected in exceedance of the current drinking water standards. The highest concentration of PFOA were detected in domestic well water on properties approximately 550 feet and 1,000 feet to the east (up-gradient), and 1,500 feet (or more) to the southeast (cross-gradient). The PFOA concentrations in some of the upgradient wells were more than double than what has been detected in the on-Site monitoring wells. In addition, a PFAS exceedance was also detected in an upgradient domestic well located approximately 800 feet to the northwest of the land application area.

- Based on the findings of this investigation, there appear to be multiple sources contributing to PFAS detected on the Site and surrounding properties. Potential sources may include: numerous residential septic systems and biosolids land applied to the surrounding agricultural farmland. Therefore, the data indicates that the discharged wastes in the application area on the Site do not appear to be the only source or primary source of the PFAS detected in groundwater in the area.

I. Recommendations

- We request the MPCA review the groundwater investigation and consider regulatory file closure.

- Since the land application activities on the Site do not appear to be the primary source of the regional PFAS groundwater impacts and the on-Site soil exceedances only slightly exceed the residential standard, it does not appear likely that the removal of the PFAS impacted soils on the Site would have a significant reduction in the PFAS groundwater impacts which appear to be regional in nature. Therefore, it appears that soil removal at the Site would have a negligible impact on regional PFAS concentrations. We request the MPCA's permission to thin spread the soil cuttings generated during the installation of the monitoring wells on the Site.

- Containerized purged groundwater from the monitoring wells contains PFAS at concentrations exceeding regulatory criteria. Once the groundwater investigation is completed to the satisfaction of the MPCA, the purged water should be properly disposed of at a facility that can accept the water. In addition, the monitoring wells should be properly sealed and abandoned.

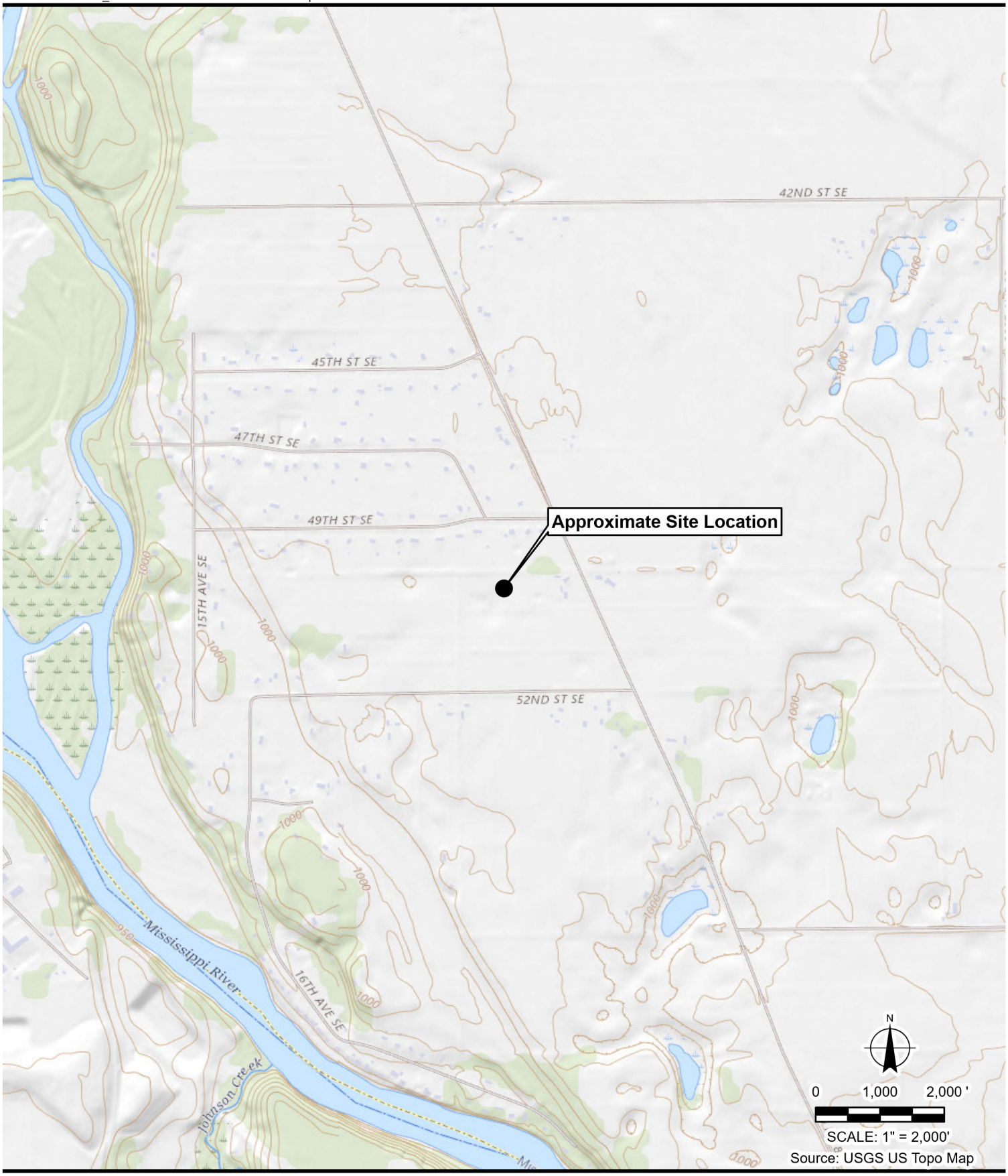
J. Assessment Limitations

The analyses and conclusions submitted in this report are based on field observations and the results of laboratory analyses of soil and groundwater samples collected from investigation locations for this project.

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Figures

F:\2023\B2305038_01\GIS\B2305038.01\B2305038.01.aprx



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Project No:	B2305038.01
Drawing No:	Fig1_SiteLocation
Drawn By:	MMH
Date Drawn:	12/6/2023
Checked By:	APV
Last Modified:	12/6/2023

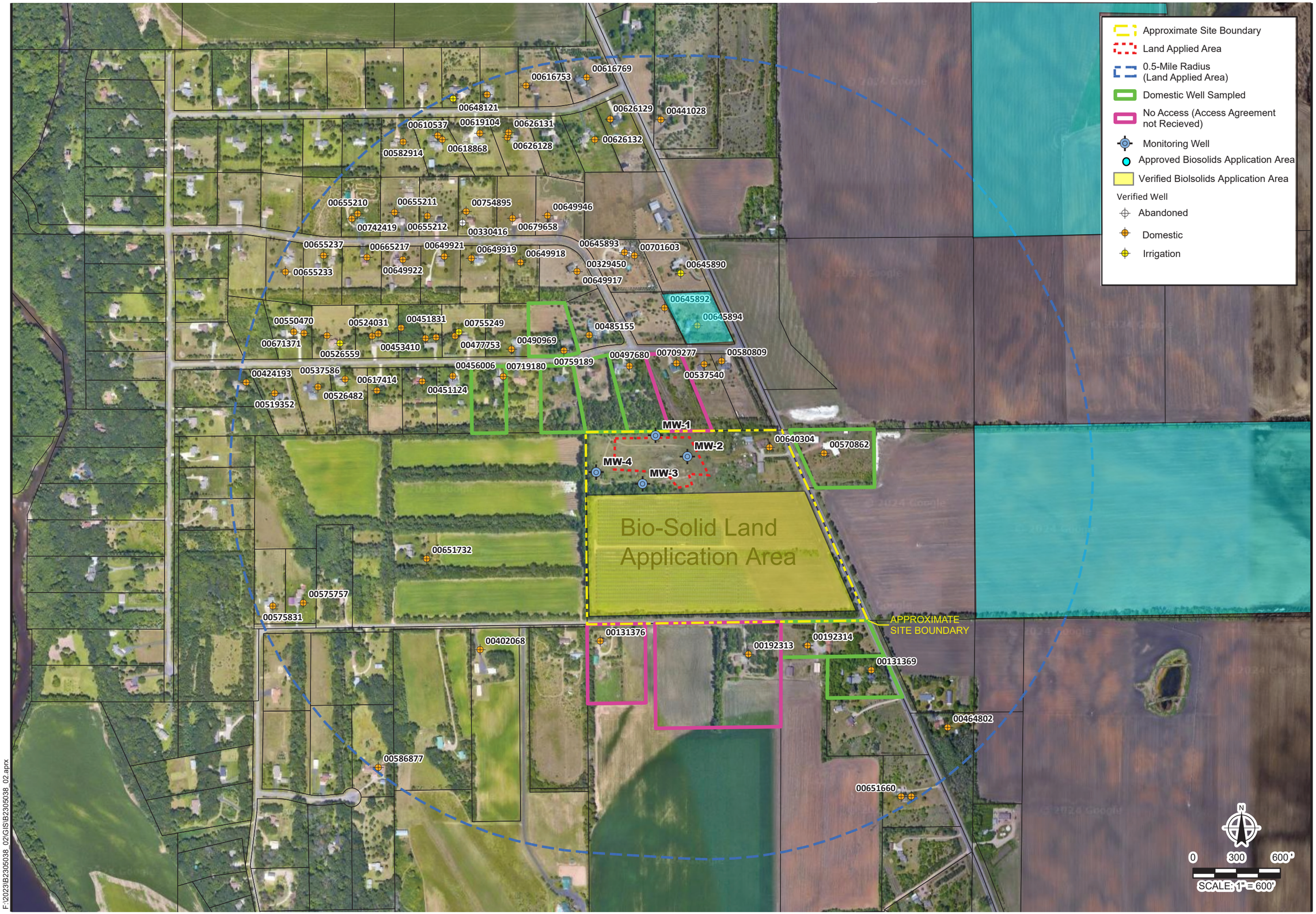
Land Application Investigation

4956 County Road SE

St. Cloud, Minnesota

Site Location Map

Figure 1



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Drawing Information

Project No: B2305038_02

Drawing No: Fig2_Sampling

Drawn By:	SL
Drawn Drawn:	10/15/2024
Checked By:	AV
Last Modified:	10/15/2024

Project Information

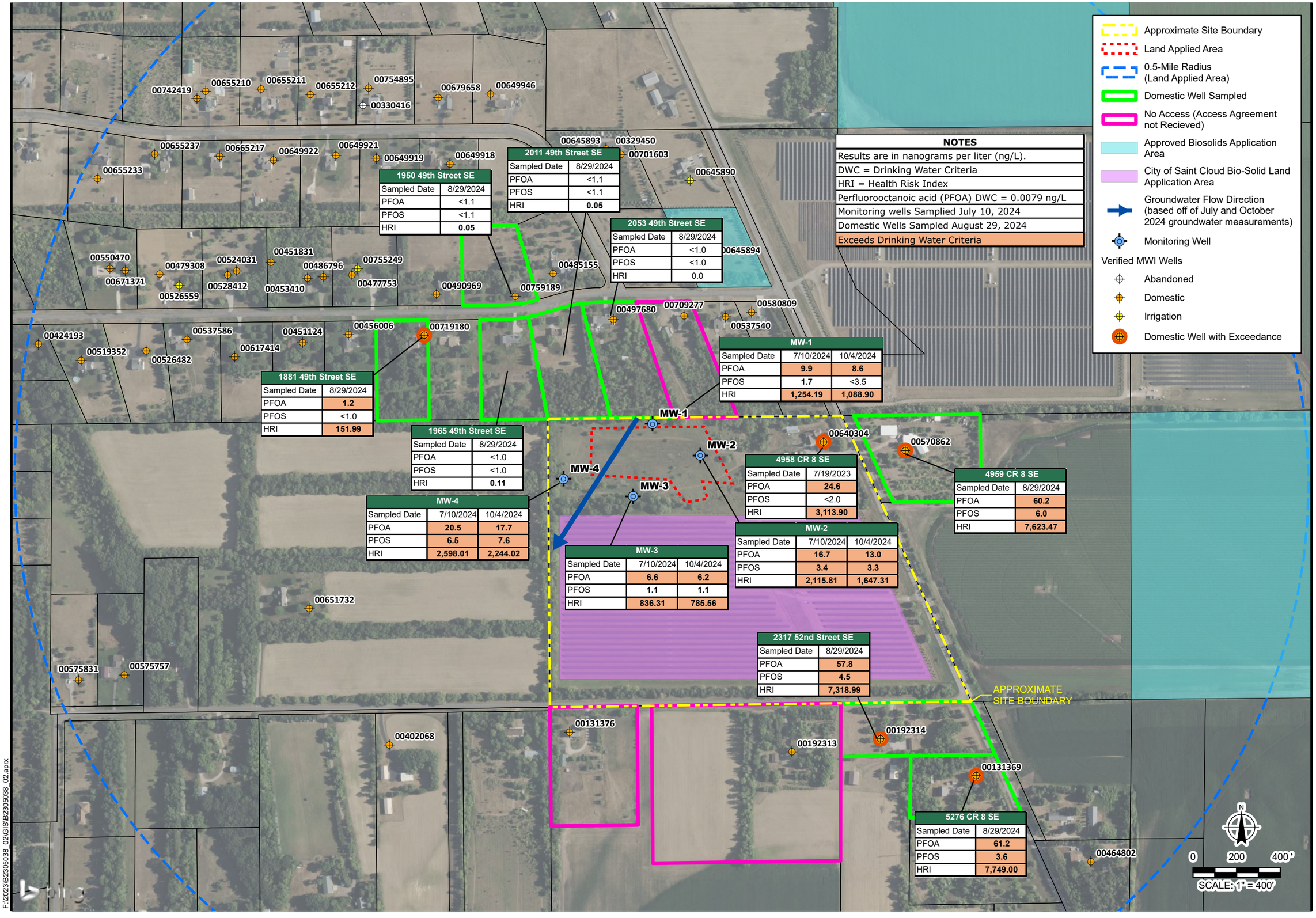
NOV - Land Application of Business Wastes

4958 County Road 8 Southeast

Saint Cloud, Minnesota

Sampling Diagram

Figure 2



1950 49th Street SE

Sampled Date	8/29/2024
PFOA	<1.1
PFOS	<1.1
HRI	**0.05**

2011 49th Street SE

Sampled Date	8/29/2024
PFOA	<1.1
PFOS	<1.1
HRI	**0.05**

2053 49th Street SE

Sampled Date	8/29/2024
PFOA	<1.0
PFOS	<1.0
HRI	0.0

1881 49th Street SE

Sampled Date	8/29/2024
PFOA	**1.2**
PFOS	<1.0
HRI	**151.99**

1965 49th Street SE

Sampled Date	8/29/2024
PFOA	<1.0
PFOS	<1.0
HRI	**0.11**

MW-1

Sampled Date	7/10/2024	10/4/2024
PFOA	**9.9**	**8.6**
PFOS	**1.7**	<3.5
HRI	**1,254.19**	**1,088.90**

MW-2

Sampled Date	7/10/2024	10/4/2024
PFOA	**16.7**	**13.0**
PFOS	**3.4**	**3.3**
HRI	**2,115.81**	**1,647.31**

MW-3

Sampled Date	7/10/2024	10/4/2024
PFOA	**6.6**	**6.2**
PFOS	**1.1**	**1.1**
HRI	**836.31**	**785.56**

MW-4

Sampled Date	7/10/2024	10/4/2024
PFOA	**20.5**	**17.7**
PFOS	**6.5**	**7.6**
HRI	**2,598.01**	**2,244.02**

4958 CR 8 SE

Sampled Date	7/19/2023
PFOA	**24.6**
PFOS	<2.0
HRI	**3,113.90**

4959 CR 8 SE

Sampled Date	8/29/2024
PFOA	**60.2**
PFOS	**6.0**
HRI	**7,623.47**

2317 52nd Street SE

Sampled Date	8/29/2024
PFOA	**57.8**
PFOS	**4.5**
HRI	**7,318.99**

5276 CR 8 SE

Sampled Date	8/29/2024
PFOA	**61.2**
PFOS	**3.6**
HRI	**7,749.00**

NOTES

Results are in nanograms per liter (ng/L).
DWC = Drinking Water Criteria
HRI = Health Risk Index
Perfluorooctanoic acid (PFOA) DWC = 0.0079 ng/L
Monitoring wells Samplied July 10, 2024
Domestic Wells Sampled August 29, 2024
Exceeds Drinking Water Criteria

- Approximate Site Boundary
- Land Applied Area
- 0.5-Mile Radius (Land Applied Area)
- Domestic Well Sampled
- No Access (Access Agreement not Recieved)
- Approved Biosolids Application Area
- City of Saint Cloud Bio-Solid Land Application Area
- Groundwater Flow Direction (based off of July and October 2024 groundwater measurements)
- Monitoring Well

Verified MWI Wells

- Abandoned
- Domestic
- Irrigation
- Domestic Well with Exceedance

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Drawing Information

Project No: B2305038_02

Drawing No: Fig3_Results

Drawn By:	SL
Drawn Drawn:	10/15/2024
Checked By:	AV
Last Modified:	12/4/2024

Project Information

NOV - Land Application of Business Wastes

4958 County Road 8 Southeast

Saint Cloud, Minnesota

Groundwater Exceedance Diagram

Figure 3

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MONITORING WELL

GROUNDWATER CONTOUR INTERVAL

(988.XX') **GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)**

GROUNDWATER FLOW DIRECTION (JULY 2024)

NOTES
Groundwater Elevation collected on July 10, 2024
Feet is Above Mean Sea Level

40' 0 80'

SCALE: 1"= 80'

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Project No:	B2305038.02
Drawing No:	B2305038-02
Drawn By:	MMH
Date Drawn:	10/15/24
Checked By:	APV
Last Modified:	10/16/24

Project Information

Groundwater Investigation

4958 County Road 8 SE

St. Cloud, Minnesota

On-Site Groundwater Flow Direction - July 2024

Figure 4

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MONITORING WELL

GROUNDWATER CONTOUR INTERVAL

(988.XX') **GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)**

GROUNDWATER FLOW DIRECTION (OCTOBER 2024)

NOTES
Groundwater Elevation collected on October 4, 2024
Feet is Above Mean Sea Level

N

40' 0 80'

SCALE: 1"= 80'

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Drawing Information

Project No: B2305038.02

Drawing No: B2305038-02

Drawn By:	MMH
Date Drawn:	10/15/24
Checked By:	APV
Last Modified:	10/16/24

Project Information

Groundwater Investigation

4958 County Road 8 SE

St. Cloud, Minnesota

On-Site Groundwater Flow Direction - October 2024

Figure 5

Tables

Table 1
Summary of Soil Screening Results
Groundwater Investigation
Saint Cloud, Minnesota
Project: B2305038.02

Depth (feet)	MW-1	MW-2	MW-3	MW-4
0-1	0.2	0.6	0.1	0.0
1-2				
2-3	0.2	0.6	0.3	0.2
3-4				
4-5	0.2	0.6	0.1	0.0
5-6				
6-7				
7-8				
8-9				
9-10	0.1	0.6	0.2	0.2
10-11				
11-12				
12-13				
13-14				
14-15	0.2	0.6	0.3	0.2
15-16				
16-17				
17-18				
18-19				
19-20	0.2	0.7	0.2	0.3
20-21				
21-22				
22-23				
23-24				
24-25	0.1	0.7	0.2	0.2
25-26				
26-27				
27-28				
28-29				
29-30	0.2	0.8	0.3	0.3
30-31				
32-32	EOB 31'		EOB 30'	
32-33		EOB 33'		EOB 32'

Notes:
Concentrations in parts per million (ppm)
EOB = End of boring
GRAY = Interval not sampled due to drilling method

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Table 2
Soil Analytical Results

Saint Cloud, Minnesota
Project B2305038.02

Compound/Parameter	CAS No.	Sample Identifier and Date Collected				Residential/ Recreational SRV (µg/kg)	Commercial/ Industrial SRV (µg/kg)	SLV (µg/kg)
		MW-1 Cuttings (0-1')	**MW-2 Cuttings (0-1')**	**MW-3 Cuttings (0-1')**	**MW-4 Cuttings (0-1')**			
		07/01/2024	07/01/2024	07/01/2024	07/01/2024			
Per- and Polyfluoroalkyl Substances (PFAS) (µg/kg)								
Perfluorobutanesulfonic acid (PFBS)	375-73-5	<0.20	**0.2**	<0.20	<0.20	1,100	14,000	NE
Perfluorodecanoic acid (PFDA)	335-76-2	**0.49**	**0.206**	<0.20	<0.20	NE	NE	NE
Perfluorohexanoic acid (PFHxA)	307-24-4	**0.38**	<0.20	<0.20	<0.20	1,900	24,000	NE
Perfluorononanoic acid (PFNA)	375-95-1	**0.203**	**0.209**	<0.20	<0.20	NE	NE	NE
Perfluorooctane sulfonamide (PFOSA)	754-91-6	<0.20	**0.202**	<0.20	<0.20	NE	NE	NE
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	<0.20	**3.8**	**0.202**	<0.20	13	180	NE
Perfluorooctanoic acid (PFOA)	335-67-1	**1.5**	**0.61**	<0.20	<0.20	0.36	2	NE
Perfluoropentanoic acid (PFPeA)	2706-90-3	**0.99**	<0.40	<0.40	<0.39	NE	NE	NE
All other reported PFAS	---	<RL	<RL	<RL	<RL	---	---	---

Notes
Minnesota Pollution Control Agency (MPCA) Soil Reference Values (SRVs) updated in March 2024 and Soil Leaching Values (SLVs) updated in June 2013.
µg/kg = Micrograms per kilogram.
< = Not detected at or above the laboratory reporting limit indicated.
--- = Not analyzed or calculated for this parameter or not applicable.
Bold indicates the compound was detected at or above the laboratory reporting limit.
NE = Regulatory limit not established for this parameter.
RL = Reporting limits for other parameters that are not listed individually in this table because their concentrations were below reporting limits provided in the laboratory report.

Exceeds Residential/Recreational SRV
Exceeds Commercial/Industrial SRV

Table 3
Monitoring Well Groundwater Analytical Results - July and October 2024
Groundwater Investigation
Saint Cloud, Minnesota
Project B2305038.02

Compound/Parameter	CAS No.	Sample Identifier, Depth to Groundwater, Groundwater Elevation, and Date Collected										Drinking Water Criteria (ng/L)	Source-Date
		MW-1		MW-2		MW-3		MW-4		TRIP BLANK	TRIP BLANK		
		27.92'	28.65'	27.10'	27.85'	20.95'	21.70'	26.91'	27.65'				
		992.61'	991.86'	992.52'	991.77'	992.12'	991.37'	992.13'	991.39'				
		Upgradient		Sidegradient		Downgradient		downgradient					
		07/10/2024	10/4/2024	07/10/2024	10/4/2024	07/10/2024	10/4/2024	07/10/2024	10/4/2024	7/10/2024	7/10/2024		
Per- and Polyfluroinated Alkyl Substances (PFAS) (ng/L)													
Perfluorobutanesulfonic acid (PFBS)	375-73-5	**7.1**	**8.8** J	**10.1**	**5.9**	**15.2**	**11.9**	**6.0**	**4.9**	<1.0	<0.97	100	HRL-23
Perfluorobutanoic acid (PFBA)	375-22-4	**22.4**	**41.3** J	**43.8**	**31.4**	**28.3**	**18.4**	**18.8**	**16.1**	<4.0	<3.9	7000	HRL-18
Perfluoroheptanesulfonic acid (PFHpS)	375-92-8	**8.1**	<4.8	**13.4**	<0.99	**9.0**	<1.0	**8.3**	<1.0	<1.0	<0.97	NE	---
Perfluoroheptaonic acid (PFHpA)	375-85-9	<1.0	**10.2** J	<1.0	**9.7**	<1.0	**5.6**	<1.0	**6.1**	<1.0	<0.97	NE	---
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	**7.5**	**7.5** J	**7.6**	**6.2**	**8.3**	**5.3**	**6.1**	**5.1**	<1.0	<0.97	47	HRL-23
Perfluorohexanoic acid (PFHxA)	307-24-4	**9.7**	**7.6** J	**28.6**	**22.4**	**11.5**	**8.3**	**11.5**	**9.6**	<1.0	<0.97	200	HRL-23
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	**1.7**	<3.5	**3.4**	**3.3**	**1.1**	**1.1**	**6.5**	**7.6**	<1.0	<0.97	2.3	HBV-24
Perfluorooctanoic acid (PFOA)	335-67-1	**9.9**	**8.6** J	**16.7**	**13.0**	**6.6**	**6.2**	**20.5**	**17.7**	<1.0	<0.97	0.0079	HBV-24
Perfluoropentanoic acid (PFPeA)	2706-90-3	**9.9**	**9.1** J	**35.3**	**26.0**	**12.9**	**11.8**	**9.7**	**7.8**	<2.0	<1.9	NE	---
All other reported PFAS	---	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	---	---
Health Risk Index (HRI) using HRLs & HBVs	---	**1254.19**	**1,088.90**	**2115.81**	**1647.31**	**836.31**	**785.56**	**2598.01**	**2244.02**	0	0	1	---

Notes

The hierarchy of Drinking Water Criteria (DWC) presented is: Minnesota Department of Health (MDH) Health Risk Limit (HRL) and MDH Health-Based Value (HBV), as available. The most conservative values for chronic or cancer exposures are presented. The dates of promulgation are provided, if available.

ng/L = Nanograms per liter.

< = Not detected at or above the laboratory reporting limit indicated.

--- = Not analyzed or calculated for this parameter or not applicable.

Bold indicates the compound was detected at or above the laboratory reporting limit.

Indicated depths are feet below ground surface.

RL = Reporting limits for other parameters that are not listed individually in this table because their concentrations were below reporting limits provided in the laboratory report.

NE = Regulatory limit not established for this parameter.

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Exceeds DWC or HRI

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Table 4
Domestic Well Groundwater Analytical Results
Groundwater Investigation
Saint Cloud, Minnesota
Project B2305038.02

Compound/Parameter	CAS No.	Property Sampled and Date Collected										Drinking Water Criteria (ng/L)	Source-Date
		4959 County Road 8 SE	**4958 County Road 8 SE**	**1881 49th Street SE**	**1950 49th Street SE**	**1965 49th Street SE**	**2011 49th Street SE**	**2053 49th Street SE**	**2317 52nd Street SE**	**5276 County Road 8 SE**	**Trip Blank**		
		Upgradient of Site	**Upgradient of Site**	**Side gradient to Site**	**Side gradient to Site**	**Side gradient to Site**	**Side gradient to Site**	**Up gradient to Site**	**Side gradeint to Site**	**Side gradient to Site**			
		08/29/2024	7/19/2023	08/29/2024	08/29/2024	08/29/2024	08/29/2024	08/29/2024	08/29/2024	08/29/2024	08/29/2024		
Per- and Polyfluorinated Alkyl Substances (PFAS) (ng/L)													
Perfluorobutanesulfonic acid (PFBS)	375-73-5	**10.2**	**9.7**	**4.3**	**4.3**	**6.0**	**4.1**	<1.0	**12.2**	**11.1**	<0.97	100	HRL-23
Perfluorobutanoic acid (PFBA)	375-22-4	**32.2**	----	**15.8**	**19.4**	**15.2**	**20.6**	**6.7**	**25.1**	**20.0**	<3.9	7000	HRL-18
Perfluoroheptaonic acid (PFHpA)	375-85-9	**20.0**	**13.9**	**2.0**	<1.1	**1.4**	<1.1	<1.0	**19.2**	**23.5**	<0.97	NE	---
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	**18.4**	**10.1**	**1.4**	<1.1	**1.4**	<1.1	<1.0	**16.2**	**17.7**	<0.97	47	HRL-23
Perfluorohexanoic acid (PFHxA)	307-24-4	**23.0**	**17.8**	**4.1**	**1.3**	**4.6**	**1.1**	<1.0	**21.4**	**22.1**	<0.97	200	HRL-23
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	**6.0**	<2.0	<1.0	<1.1	<1.0	<1.1	<1.0	**4.5**	**3.6**	<0.97	2.3	HBV-24
Perfluorooctanoic acid (PFOA)	335-67-1	**60.2**	**24.6**	**1.2**	<1.1	<1.0	<1.1	<1.0	**57.8**	**61.2**	<0.97	0.0079	HBV-24
Perfluoropentanesulfonic acid (PFPeS)	2706-91-4	**1.0**	----	<1.0	<1.1	<1.0	<1.1	<1.0	**1.1**	**1.2**	<0.97	NE	---
Perfluoropentanoic acid (PFPeA)	2706-90-3	**23.7**	----	**4.5**	<2.2	**5.1**	<2.1	<2.1	**20.6**	**19.6**	<1.9	NE	---
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	<1.0	<2.0	<1.0	<1.1	<1.0	<1.1	<1.0	<1.0	<1.0	<0.97	NE	---
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	<1.0	<2.0	<1.0	<1.1	<1.0	<1.1	<1.0	<1.0	<1.0	<0.97	NE	---
Perfluoroundecanoic acid (PFUnA)	2058-94-8	<1.0	<2.0	<1.0	<1.1	<1.0	<1.1	<1.0	<1.0	<1.0	<0.97	NE	---
All other reported PFAS	---	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	---	---
Health Risk Index (HRI) using HRLs & HBVs	---	**7623.47**	**3114.32**	**151.99**	**0.05**	**0.11**	**0.05**	0.00	**7318.99**	**7749.00**	0	1	---

Notes

The hierarchy of Drinking Water Criteria (DWC) presented is: Minnesota Department of Health (MDH) Health Risk Limit (HRL) and MDH Health-Based Value (HBV), as available. The most conservative values for chronic or cancer exposures are presented. The dates of promulgation are provided, if available.

ng/L = Nanograms per liter.

< = Not detected at or above the laboratory reporting limit indicated.

--- = Not analyzed or calculated for this parameter or not applicable.

Bold indicates the compound was detected at or above the laboratory reporting limit.

Indicated depths are feet below ground surface.

RL = Reporting limits for other parameters that are not listed individually in this table because their concentrations were below reporting limits provided in the laboratory report.

NE = Regulatory limit not established for this parameter.

Exceeds DWC or HRI

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Table 5
Groundwater Analytical Results
Groundwater Investigation
Saint Cloud, Minnesota
Project B2305038.02

Compound/Parameter	CAS No.	Sample Identifier, Unique Well ID, Screened Depth, and Date Collected																		Drinking Water Criteria (ng/L)	Source-Date
		4959 County Road 8 SE	4958 County Road 8 SE	MW-1		MW-2		1950 49th Street SE	1881 49th Street SE	1965 49th Street SE	2011 49th Street SE	2053 49th Street SE	2317 52nd Street SE	5276 County Road 8 SE	MW-3		MW-4			
		570862	640304	856812		856813		759189	719180	No Number Available	No Number Available	497680	192314	131369	856814		856815			
		48-52'	39-43'	21-31'		23-33'		76-84'	72-80'	Unknown	Unknown	108-116'	87-95'	45-49'	20-30'		22-32'			
		Upgradient East-Northeast of Site	Upgradient East-Northeast of Site	Upgradient North side of Site		Side gradient East side of Site		Side gradient Northwest of Site	Side gradient Northwest of Site	Side gradient Northwest of Site	Side gradient North of Site	Side gradient North of Site	Side gradeint South-Southeast of Site	Side gradeint South-Southeast of Site	Downgradient South side of Site		Downgradient Southwest side of Site			
		08/29/2024	7/19/2023	07/10/2024	10/4/2024	07/10/2024	10/4/2024	08/29/2024	08/29/2024	08/29/2024	08/29/2024	08/29/2024	08/29/2024	08/29/2024	07/10/2024	10/4/2024	07/10/2024	10/4/2024		
Per- and Polyfluroinated Alkyl Substances (PFAS) (ng/L)																					
Perfluorobutanesulfonic acid (PFBS)	375-73-5	**10.2**	**9.7**	**7.1**	**8.8** J	**10.1**	**5.9**	**4.3**	**4.3**	**6.0**	**4.1**	<1.0	**12.2**	**11.1**	**15.2**	**11.9**	**6.0**	**4.9**	100	HRL-23
Perfluorobutanoic acid (PFBA)	375-22-4	**32.2**	----	**22.4**	**41.3** J	**43.8**	**31.4**	**19.4**	**15.8**	**15.2**	**20.6**	**6.7**	**25.1**	**20.0**	**28.3**	**18.4**	**18.8**	**16.1**	7000	HRL-18
Perfluoroheptanesulfonic acid (PFHpS)	375-92-8	<1.0	----	**8.1**	<4.8	**13.4**	<0.99	<1.1	<1.0	<1.0	<1.1	<1.0	<1.0	<1.0	**9.0**	<1.0	**8.3**	<1.0	NE	---
Perfluoroheptaonic acid (PFHpA)	375-85-9	**20.0**	**13.9**	<1.0	**10.2** J	<1.0	**9.7**	<1.1	**2.0**	**1.4**	<1.1	<1.0	**19.2**	**23.5**	<1.0	**5.6**	<1.0	**6.1**	NE	---
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	**18.4**	**10.1**	**7.5**	**7.5** J	**7.6**	**6.2**	<1.1	**1.4**	**1.4**	<1.1	<1.0	**16.2**	**17.7**	**8.3**	**5.3**	**6.1**	**5.1**	47	HRL-23
Perfluorohexanoic acid (PFHxA)	307-24-4	**23.0**	**17.8**	**9.7**	**7.6** J	**28.6**	**22.4**	**1.3**	**4.1**	**4.6**	**1.1**	<1.0	**21.4**	**22.1**	**11.5**	**8.3**	**11.5**	**9.6**	200	HRL-23
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	**6.0**	<2.0	**1.7**	<3.5	**3.4**	**3.3**	<1.1	<1.0	<1.0	<1.1	<1.0	**4.5**	**3.6**	**1.1**	**1.1**	**6.5**	**7.6**	2.3	HBV-24
Perfluorooctanoic acid (PFOA)	335-67-1	**60.2**	**24.6**	**9.9**	**8.6** J	**16.7**	**13.0**	<1.1	**1.2**	<1.0	<1.1	<1.0	**57.8**	**61.2**	**6.6**	**6.2**	**20.5**	**17.7**	0.0079	HBV-24
Perfluoropentanesulfonic acid (PFPeS)	2706-91-4	**1.0**	----	<1.0	<3.6	<1.0	<0.99	<1.1	<1.0	<1.0	<1.1	<1.0	**1.1**	**1.2**	<1.0	<1.0	<1.0	<1.0	NE	---
Perfluoropentanoic acid (PFPeA)	2706-90-3	**23.7**	----	**9.9**	**9.1** J	**35.3**	**26.0**	<2.2	**4.5**	**5.1**	<2.1	<2.1	**20.6**	**19.6**	**12.9**	**11.8**	**9.7**	**7.8**	NE	---
All other reported PFAS	---	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL	<RL		<RL		---	---
Health Risk Index (HRI) using HRLs & HBVs	---	**7623.47**	**3114.32**	**1254.19**	**1088.90**	**2115.81**	**1647.31**	**0.05**	**151.99**	**0.11**	**0.05**	0.00	**7318.99**	**7749.00**	**836.31**	**785.56**	**2598.01**	**2244.02**	1	---

Notes

The hierarchy of Drinking Water Criteria (DWC) presented is: Minnesota Department of Health (MDH) Health Risk Limit (HRL) and MDH Health-Based Value (HBV), as available. The most conservative values for chronic or cancer exposures are presented. The dates of promulgation are provided, if available.

ng/L = Nanograms per liter.

< = Not detected at or above the laboratory reporting limit indicated.

--- = Not analyzed or calculated for this parameter or not applicable.

Bold indicates the compound was detected at or above the laboratory reporting limit.

Indicated depths are feet below ground surface.

RL = Reporting limits for other parameters that are not listed individually in this table because their concentrations were below reporting limits provided in the laboratory report.

NE = Regulatory limit not established for this parameter.

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Exceeds DWC or HRI

Appendix A

GPS Coordinates of Investigation Locations

Appendix A
Boring Locations and GPS Coordinates Summary
Groundwater Investigation
Project Saint Cloud, Minnesota
Project: B2305038.02

Monitoring Well ID	Unique Well ID	Total Depth of Well (feet bgs)	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation
MW-1	856812	31	289646.8801	439792.9724	1016.99	1020.53
MW-2	856813	33	289517.2424	440015.4128	1016.58	1019.62
MW-3	856814	30	289327.9593	439708.352	1009.55	1013.07
MW-4	856815	32	289394.3628	439383.9683	1015.54	1019.04

Note:
bgs = Below ground surface

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Appendix B

Monitoring Well Logs

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The Science You Build On.

LOG OF BORING

Environmental Boring Log - Not For Geotechnical Design

Project Number B2305038.02
Environmental Investigation
Groundwater Investigation
4958 County Road 8 Southeast
Saint Cloud, Minnesota

BORING: **MW-1**
LOCATION: See attached sketch
DATUM: Sherburne County NAD83(2011)
NORTHING: 289646.8801 EASTING: 439792.9724
WEATHER:

DRILLER: Braun	LOGGED BY: A. Volker		
SURFACE ELEVATION: 1016.99'	RIG:	METHOD: Direct Push	During Drilling 25.00 ft
START DATE: 06/24/24	END DATE: 06/24/24	SURFACING: Soil	After Drilling

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Recovery %	PID ppm	Well	Tests or Remarks
0.6		Black (TOPSOIL)			0.2		
		POORLY GRADED SAND with SILT (SP-SM), medium to fine-grained, trace Gravel, brown, moist			0.2		
					0.2		
10.0		POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, brown, moist			0.1		
					0.2		
20.0					0.2		
22.0		POORLY GRADED SAND (SP), fine to coarse-grained, little Gravel, brown, moist					
	▽	POORLY GRADED SAND (SP), fine to coarse-grained, with Gravel, brown, moist to wet			0.1		
31.0					0.2		
		Auger Refusal Permanent Monitoring Well Installed					

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

Environmental Boring Log - Not For Geotechnical Design

Project Number B2305038.02
Environmental Investigation
Groundwater Investigation
4958 County Road 8 Southeast
Saint Cloud, Minnesota

BORING: **MW-2**
LOCATION: See attached sketch
DATUM: Sherburne County NAD83(2011)
NORTHING: 289517.2424 EASTING: 440015.4128
DRILLER: Braun LOGGED BY: A. Volker WEATHER:
SURFACE ELEVATION: 1016.58' RIG: METHOD: Direct Push
During Drilling 25.30 ft
START DATE: 06/24/24 END DATE: 06/24/24 SURFACING: Soil
After Drilling

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Recovery %	PID ppm	Well	Tests or Remarks
1.0		TOPSOIL, black, moist			0.6		
		SILTY SAND (SM), fine to medium-grained, black, moist			0.6		
4.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, brown, moist			0.6		
10.0		POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, brown, moist to wet			0.6		
22.0	▽	POORLY GRADED SAND (SP), fine to coarse-grained, with Gravel, brown, moist to wet			0.7		
33.0		END OF BORING Permanent Monitoring Well Installed			0.7 0.8		

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

Environmental Boring Log - Not For Geotechnical Design

Project Number B2305038.02
Environmental Investigation
Groundwater Investigation
4958 County Road 8 Southeast
Saint Cloud, Minnesota

BORING: **MW-3**
LOCATION: See attached sketch
DATUM: Sherburne County NAD83(2011)
NORTHING: 289327.9593 EASTING: 439708.352
WEATHER:

DRILLER: Braun	LOGGED BY: A. Volker		
SURFACE ELEVATION: 1009.55'	RIG:	METHOD: Direct Push	During Drilling 23.90'
START DATE: 06/24/24	END DATE: 06/24/24	SURFACING: Soil	After Drilling

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Recovery %	PID ppm	Well	Tests or Remarks
1.0		TOPSOIL, black, moist			0.1		
		SILTY SAND (SM), fine to medium-grained, trace Gravel, black, moist			0.3		
4.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, brown, moist			0.1		
12.0		POORLY GRADED SAND (SP), fine to medium-grained, trace Gravel, brown, moist to wet			0.2		
	▽				0.3		
					0.2		
25.0		POORLY GRADED SAND (SP), fine to coarse-grained, trace Gravel, brown, wet			0.2		
30.0		END OF BORING Permanent Monitoring Well Installed			0.3		

5 10 15 20 25 30 35

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The Science You Build On.

LOG OF BORING

Environmental Boring Log - Not For Geotechnical Design

Project Number B2305038.02
Environmental Investigation
Groundwater Investigation
4958 County Road 8 Southeast
Saint Cloud, Minnesota

BORING: **MW-4**
LOCATION: See attached sketch
DATUM: Sherburne County NAD83(2011)
NORTHING: 289394.3628 EASTING: 439383.9683
WEATHER:

DRILLER: Braun	LOGGED BY: A. Volker		
SURFACE ELEVATION: 1015.54'	RIG:	METHOD: Direct Push	▽ During Drilling 24.19 ft
START DATE: 06/24/24	END DATE: 06/24/24	SURFACING: Soil	▼ After Drilling

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Recovery %	PID ppm	Well	Tests or Remarks
1.0		TOPSOIL, black, moist			0.0		
		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist			0.2		
4.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, brown, moist			0.0		
10.0		POORLY GRADED SAND (SP), fine to medium-grained, little Gravel, brown, moist			0.2		
20.0		POORLY GRADED SAND (SP), fine to coarse-grained, little Gravel, brown, moist to wet			0.3		
25.0	▽	POORLY GRADED SAND (SP), fine to coarse-grained, with Gravel, brown, wet			0.2		
32.0		END OF BORING Permanent Monitoring Well Installed			0.3		

5 10 15 20 25 30 35

Appendix C

Monitoring Well Construction, Development, and Sampling Information

MONITORING WELL / PIEZOMETER DATA SHEET

(ABOVE GRADE)

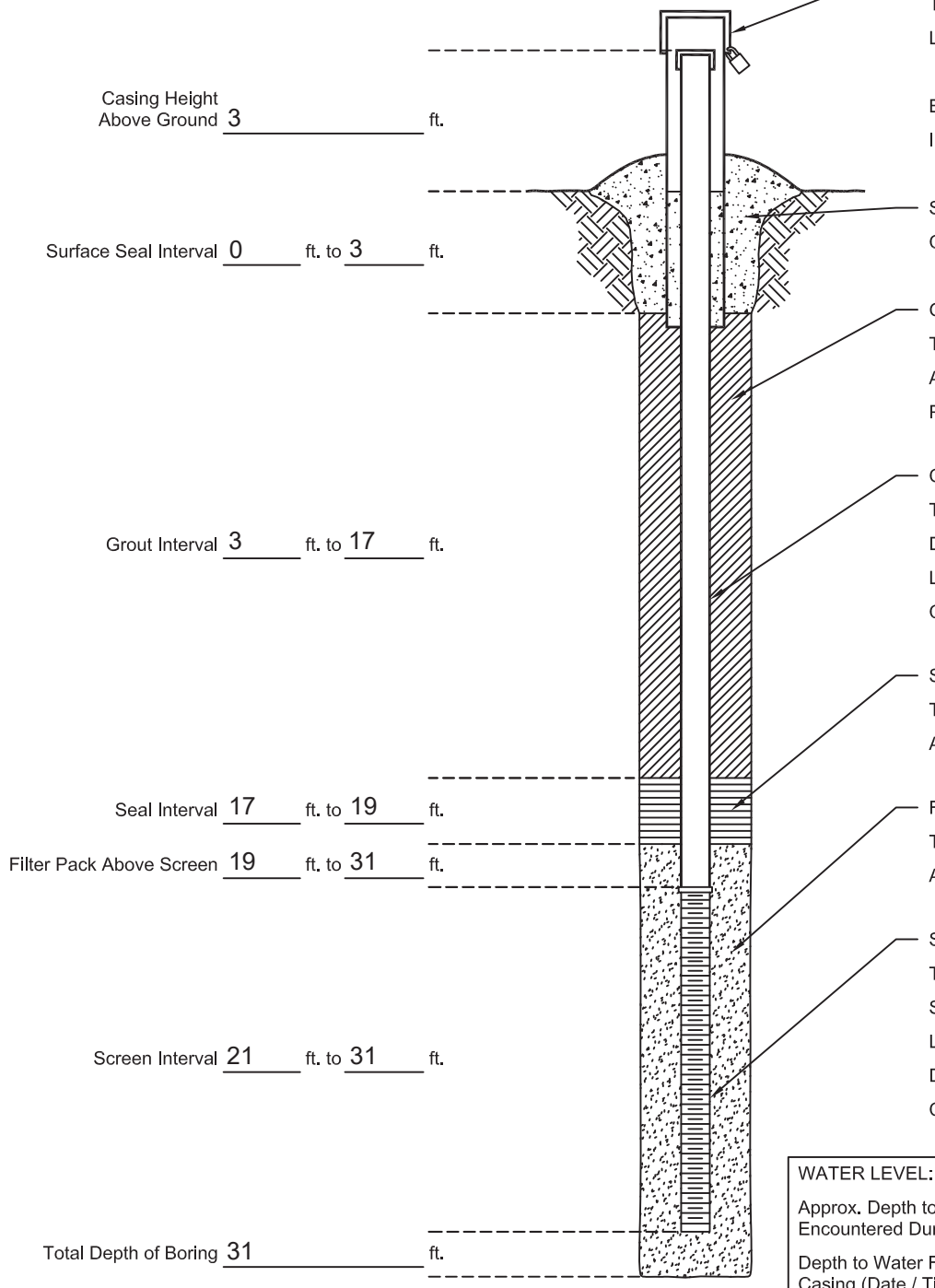
Unique Well Number: 856182 | Boring / Well ID: MW-1/856812

Project Number: B2305038.02 | Project Name: Groundwater Inv. | Location:

Well Location: 4958 County Road 8 SE, St. Cloud, MN | Date of installation: 6/24/2024

Driller: Braun Intertec | Field Personnel: P. Shenoi/C.Kiel | Weather: Partly Cloudy, 78 degrees

Drilling Method: Hollow Stem Auger | Borehole Diameter: 4-1/4"



Casing Height Above Ground: 3 ft.

Surface Seal Interval: 0 ft. to 3 ft.

Grout Interval: 3 ft. to 17 ft.

Seal Interval: 17 ft. to 19 ft.

Filter Pack Above Screen: 19 ft. to 31 ft.

Screen Interval: 21 ft. to 31 ft.

Total Depth of Boring: 31 ft.

PROTECTIVE CASING:
- Type: ProTop
- Lock No.: 2106

BUMPER POST:
- Installed: Yes ☐ No ☑

SURFACE SEAL:
- Concrete Surface Seal: Yes ☑ No ☐

GROUT:
- Type of Grout Material: Quick Grout
- Amount of Material Used (lb.): 2 bags
- Proportions: Bentonite 100 Cement

CASING:
- Type: PVC
- Diameter (in.): 2"
- Length bgs (ft.): 21
- Cap / S-Plug: Yes ☐ No ☑

SEAL:
- Type of Seal Material: 3/8" Hole Plug
- Amount of Material Used (lb.): 1/2 bag

FILTER:
- Type of Filter Material: Red Flint
- Amount of Material Used (lb.): 4 bags

SCREEN:
- Type: PVC
- Slot Size: 0.010
- Length (ft.): 10
- Diameter (in.): 2"
- Cap / Plug on Bottom: Yes ☑ No ☐

WATER LEVEL:
- Approx. Depth to First Water Encountered During Drilling: 25' bgs
- Depth to Water From Top of Casing (Date / Time): 25' bgs @ 1252 6/24/2024

Completed By: P. Shenoi | Date: 6/24/2024 | Reviewed By:

MONITORING WELL / PIEZOMETER DATA SHEET

(ABOVE GRADE)

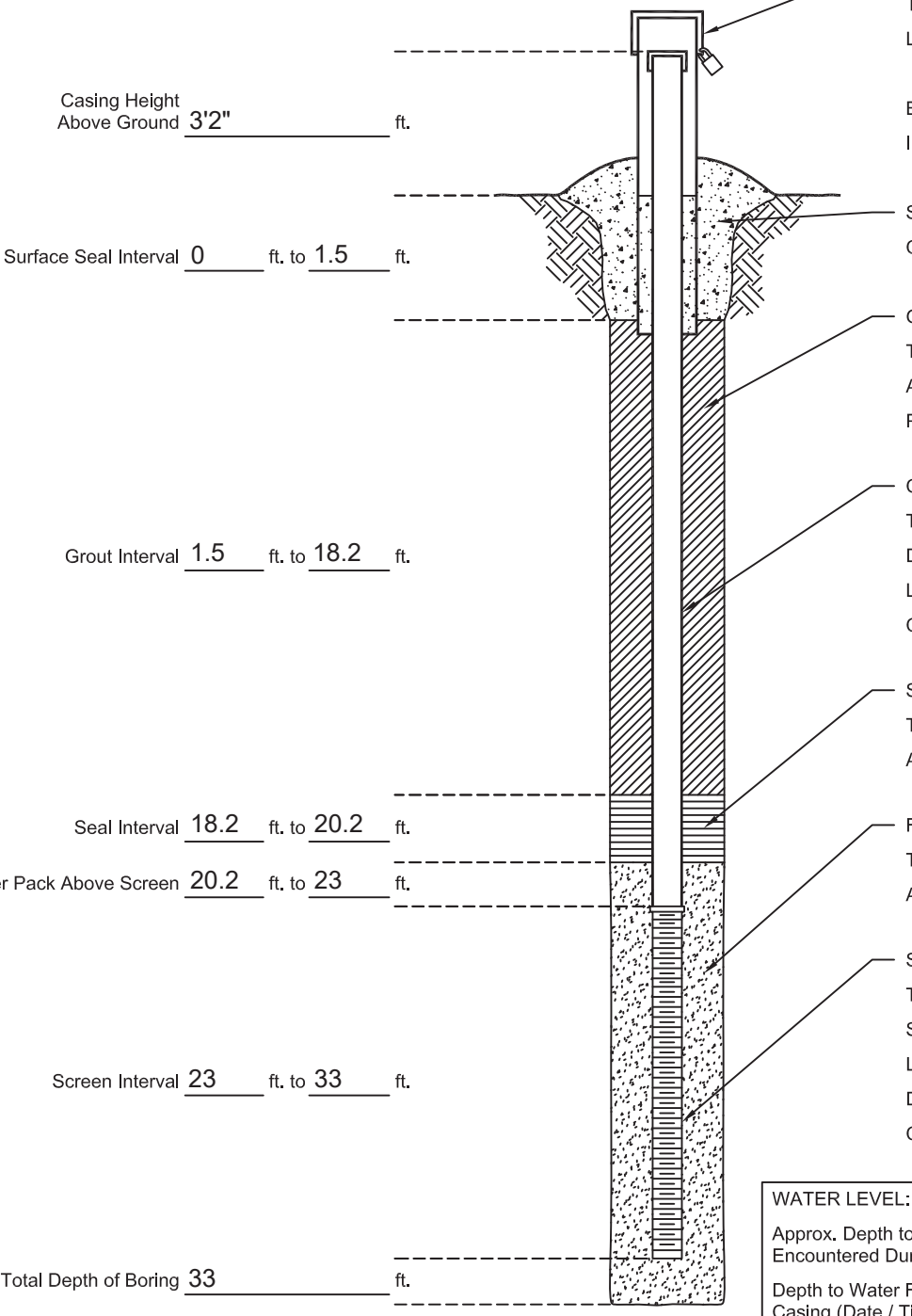
Unique Well Number: 856183 | Boring / Well ID: MW-2/856813

Project Number: B2305038.02 | Project Name: Groundwater Inv. | Location:

Well Location: 4958 County Road 8 SE, St. Cloud, MN | Date of installation: 6/25/2024

Driller: Braun Intertec | Field Personnel: P. Shenoi/C.Kiel | Weather: Partly Cloudy, 85 degrees

Drilling Method: Hollow Stem Auger | Borehole Diameter: 4-1/4"



Casing Height Above Ground: 3'2" ft.

Surface Seal Interval: 0 ft. to 1.5 ft.

Grout Interval: 1.5 ft. to 18.2 ft.

Seal Interval: 18.2 ft. to 20.2 ft.

Filter Pack Above Screen: 20.2 ft. to 23 ft.

Screen Interval: 23 ft. to 33 ft.

Total Depth of Boring: 33 ft.

PROTECTIVE CASING:
- Type: ProTop
- Lock No.: 2106

BUMPER POST:
- Installed: Yes ☐ No ☑

SURFACE SEAL:
- Concrete Surface Seal: Yes ☑ No ☐

GROUT:
- Type of Grout Material: Quick Grout
- Amount of Material Used (lb.): 3 bags
- Proportions: Bentonite 100 Cement

CASING:
- Type: PVC
- Diameter (in.): 2"
- Length bgs (ft.): 20
- Cap / S-Plug: Yes ☐ No ☑

SEAL:
- Type of Seal Material: 3/8" Hole Plug
- Amount of Material Used (lb.): 1/2 bag

FILTER:
- Type of Filter Material: 40 Sand
- Amount of Material Used (lb.): 4 bags

SCREEN:
- Type: PVC
- Slot Size: 0.010
- Length (ft.): 10
- Diameter (in.): 2"
- Cap / Plug on Bottom: Yes ☑ No ☐

WATER LEVEL:

Approx. Depth to First Water Encountered During Drilling	25.25 @ 13:50
Depth to Water From Top of Casing (Date / Time)	23.62' @ 16:50 6/25/2024

Completed By: P. Shenoi | Date: 6/25/2024 | Reviewed By:

MONITORING WELL / PIEZOMETER DATA SHEET

(ABOVE GRADE)

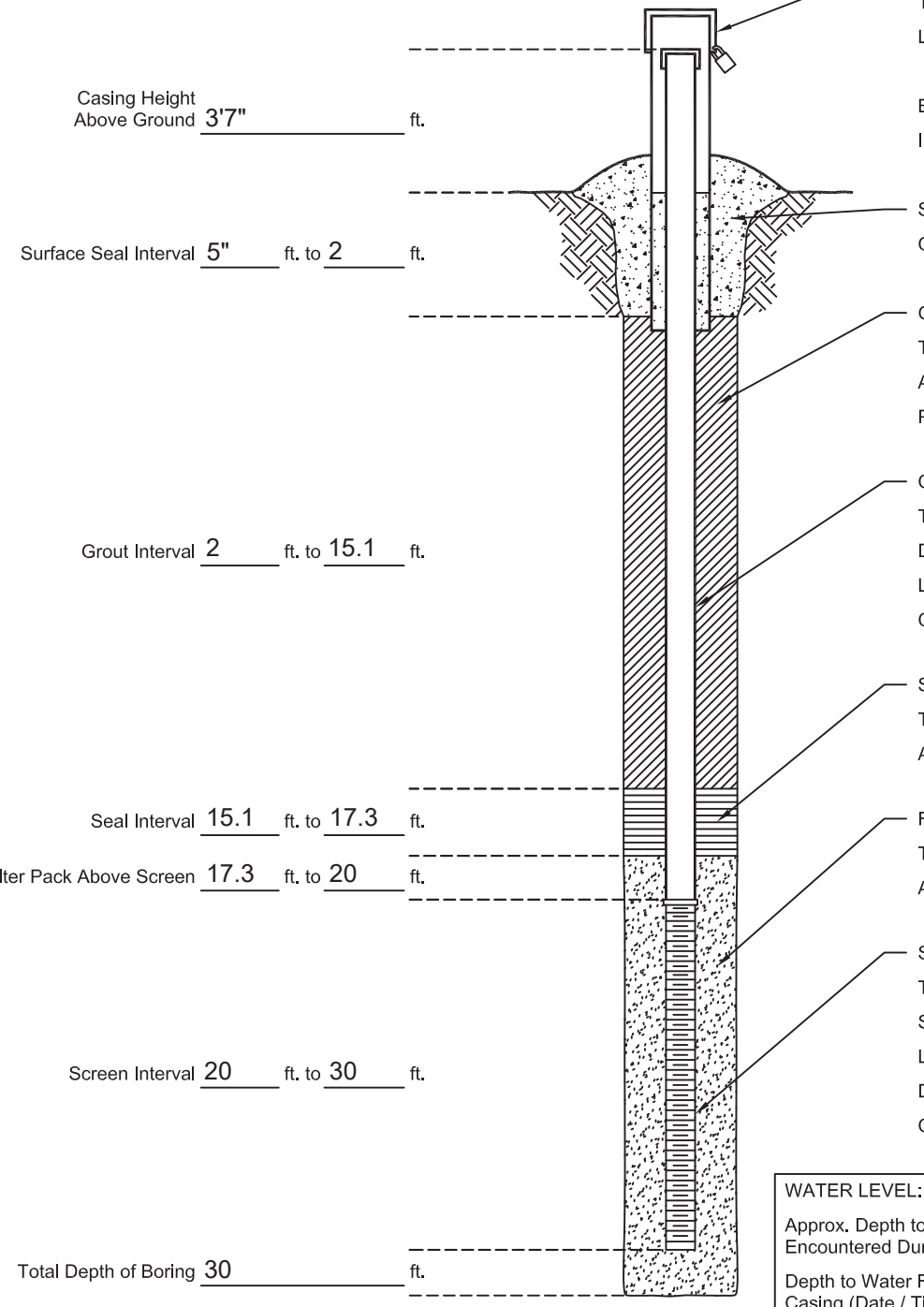
Unique Well Number: 856184 | Boring / Well ID: MW-3/856814

Project Number: B2305038.02 | Project Name: Groundwater Inv. | Location:

Well Location: 4958 County Road 8 SE, St. Cloud, MN | Date of installation: 6/24/2024

Driller: Braun Intertec | Field Personnel: P. Shenoi/C.Kiel | Weather: Cloudy, 76 degrees

Drilling Method: Hollow Stem Auger | Borehole Diameter: 4-1/4"



Casing Height Above Ground: 3'7" ft.

Surface Seal Interval: 5" ft. to 2 ft.

Grout Interval: 2 ft. to 15.1 ft.

Seal Interval: 15.1 ft. to 17.3 ft.

Filter Pack Above Screen: 17.3 ft. to 20 ft.

Screen Interval: 20 ft. to 30 ft.

Total Depth of Boring: 30 ft.

PROTECTIVE CASING:
- Type: ProTop
- Lock No.: 2106

BUMPER POST:
- Installed: Yes ☐ No ☑

SURFACE SEAL:
- Concrete Surface Seal: Yes ☑ No ☐

GROUT:
- Type of Grout Material: Quick Grout
- Amount of Material Used (lb.): 3 bags
- Proportions: Bentonite 100 Cement

CASING:
- Type: PVC
- Diameter (in.): 2"
- Length bgs (ft.): 20
- Cap / S-Plug: Yes ☐ No ☑

SEAL:
- Type of Seal Material: 3/8" Hole Plug
- Amount of Material Used (lb.): 1/2 bag

FILTER:
- Type of Filter Material: 40 Sand
- Amount of Material Used (lb.): 4 bags

SCREEN:
- Type: PVC
- Slot Size: 0.010
- Length (ft.): 10
- Diameter (in.): 2"
- Cap / Plug on Bottom: Yes ☑ No ☐

WATER LEVEL:
- Approx. Depth to First Water Encountered During Drilling: 23.85 @ 15:50
- Depth to Water From Top of Casing (Date / Time): 19.2' @ 8:10 6/25/2024

Completed By: P. Shenoi | Date: 6/24/2024 | Reviewed By:

MONITORING WELL / PIEZOMETER DATA SHEET

(ABOVE GRADE)

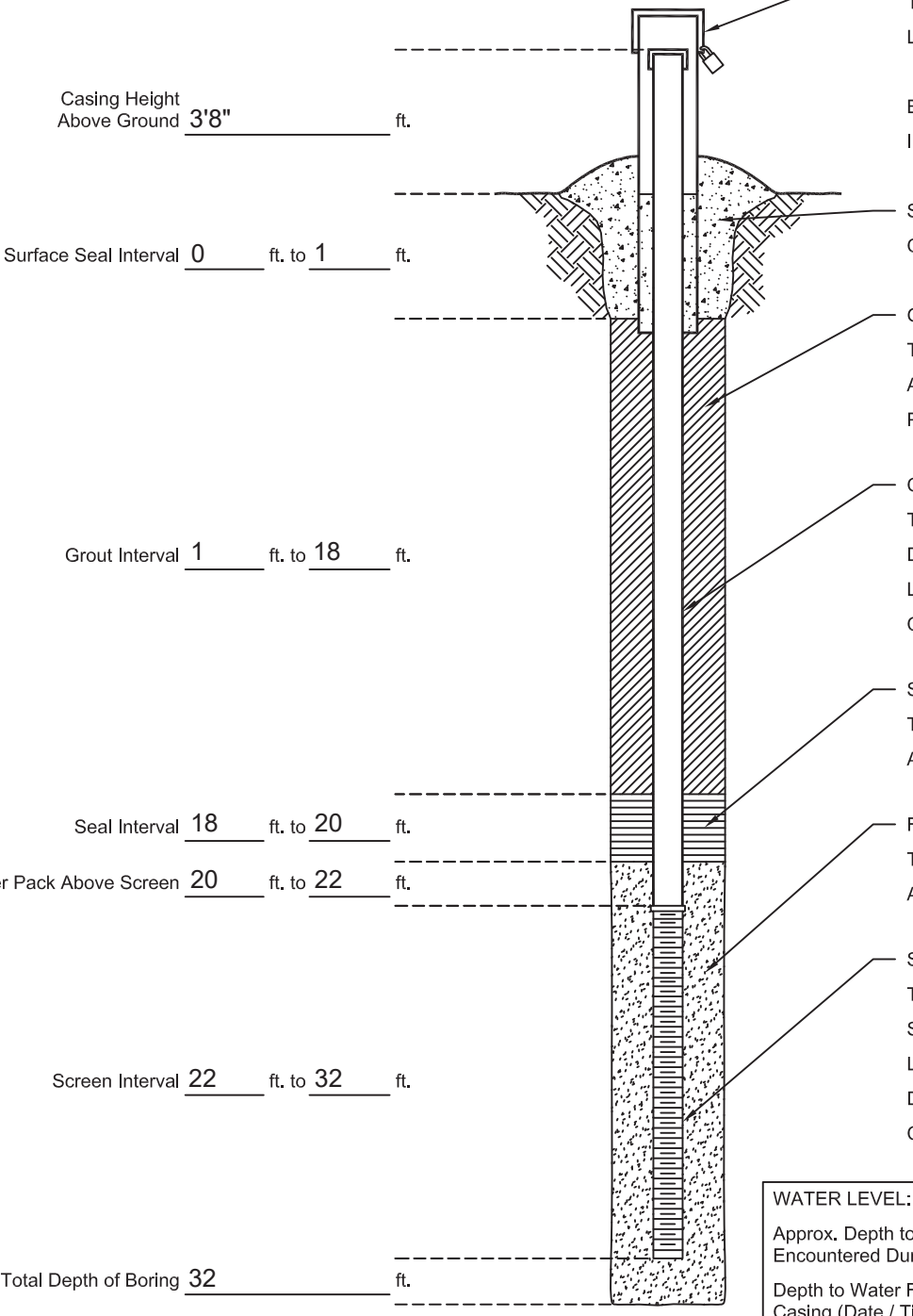
Unique Well Number: 856185 | Boring / Well ID: MW-4/856815

Project Number: B2305038.02 | Project Name: Groundwater Inv. | Location:

Well Location: 4958 County Road 8 SE, St. Cloud, MN | Date of installation: 6/25/2024

Driller: Braun Intertec | Field Personnel: P. Shenoi/C.Kiel | Weather: Cloudy, 75 degrees

Drilling Method: Hollow Stem Auger | Borehole Diameter: 4-1/4"



Casing Height Above Ground: 3'8" ft.

Surface Seal Interval: 0 ft. to 1 ft.

Grout Interval: 1 ft. to 18 ft.

Seal Interval: 18 ft. to 20 ft.

Filter Pack Above Screen: 20 ft. to 22 ft.

Screen Interval: 22 ft. to 32 ft.

Total Depth of Boring: 32 ft.

PROTECTIVE CASING:
- Type: ProTop
- Lock No.: 2106

BUMPER POST:
- Installed: Yes ☐ No ☑

SURFACE SEAL:
- Concrete Surface Seal: Yes ☑ No ☐

GROUT:
- Type of Grout Material: Quick Grout
- Amount of Material Used (lb.): 3 bags
- Proportions: Bentonite 100 Cement

CASING:
- Type: PVC
- Diameter (in.): 2"
- Length bgs (ft.): 20
- Cap / S-Plug: Yes ☐ No ☑

SEAL:
- Type of Seal Material: 3/8" Hole Plug
- Amount of Material Used (lb.): 1/2 bag

FILTER:
- Type of Filter Material: 40 Sand
- Amount of Material Used (lb.): 4 bags

SCREEN:
- Type: PVC
- Slot Size: 0.010
- Length (ft.): 10
- Diameter (in.): 2"
- Cap / Plug on Bottom: Yes ☑ No ☐

WATER LEVEL:

Approx. Depth to First Water Encountered During Drilling	24.19 @ 9:45
Depth to Water From Top of Casing (Date / Time)	23.12' 6/25/2024

Completed By: P. Shenoi | Date: 6/25/2024 | Reviewed By:

BRAUN INTERTEC

Well Development Record

Project Name/Location: Groundwater Investigation	Date: 7.1.24	Well ID: MW- 1
Project Number: B2305038.02	Field Personnel: Cooper Ling	
Depth to Water, ft. (DTW): 28.0	Well Depth, ft. (WD): 33.65	Casing Diameter, in.: 2
Water Column (WC), ft (WD - DTW): 5.65	X (casing conversion), gal/ft: 2" = 0.16 4" = 0.65 6" = 1.5	
Well Volume, gal: WC x X = 0.904		
Development Equipment Used: bailer		Pump Intake, ft: N/A
Start Time, hrs: 10:55	Water Quality Meter Used: Oakton pH Meter	Calibrated Today? (Y) N

Jar	Time	Depth to Water (ft)	Pump Rate* (gpm)	Volume Pumped (gal)	Temp (°C)	pH	Spec. Cond. ( )	Turbidity (NTU)	Other (color, odor, sheen)
0	10:58			0	7.42	11.3	N/A	N/A	
1	11:00	---		1	7.25	11.2			
2	11:03	---		2	7.17	11.0			
3	11:06	---		3	7.29	11.0			
4	11:11	---		4	7.30	11.0			
5	11:15	---		5	7.31	11.6			
6		---		6					
7		---		7					
8		----		8					
9		---		9					
10		---		10					
11		--		11					
12				12					
13				13					
14				14					
15				15					
16				16					

* Pump Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes)

Stabilization Criteria	± 0.1° C	± 0.1 unit	± 5%	<10 NTU OR ±5%	
Calculated Criteria					

Stop Time: 11:16			
Duration, min:	Purged Dry?	Y (N)	
Total Volume Purged (gal): 5.0	No. of Well Volumes Purged = Total Volume Purged / Well Volume = 5.5		

Notes: Minimum of 5 volumes removed

Well development criteria: Continue development until a turbidity reading of 10 NTUs or less. If the turbidity reading cannot be reached the temperature, pH, specific conductance must meet the Stabilization Criteria, and, if available, the change in turbidity must be less than ±5%. Slow recharging wells should be purged dry 3 times.

BRAUN INTERTEC

Well Development Record

Project Name/Location: Groundwater Investigation		Date: 7.1.24	Well ID: MW- 2
Project Number: B2305038.02		Field Personnel: Cooper Ling	
Depth to Water, ft. (DTW): 27.12	Well Depth, ft. (WD): 35.05	Casing Diameter, in.: 2	
Water Column (WC), ft (WD - DTW): 7.93	X (casing conversion), gal/ft: 2" = 0.16 4" = 0.65 6" = 1.5		
Well Volume, gal: WC x X = 1.27			
Development Equipment Used: bailer		Pump Intake, ft: N/A	
Start Time, hrs: 15:13	Water Quality Meter Used: Oakton pH Meter	Calibrated Today? (Y) N	

	Time	Depth to Water (ft)	Pump Rate* (gpm)	Volume Pumped (gal)	Temp (°C)	pH	Spec. Cond. ( )	Turbidity (NTU)	Other (color, odor, sheen)
0	15:16			0	11.4	7.61	N/A	N/A	
1	15:21	---		1	10.6	7.45			
2	15:26	---		2	11.0	7.42			
3	15:31	---		3	11.1	7.43			
4	15:36	---		4	11.3	7.43			
5	15:41	---		5	11.2	7.41			
6	15:45	---		6	11.2	7.42			
7	15:51	---		7	11.2	7.42			
8	15:57	----		8	11.2	7.42			
9	16:01	---		9	11.2	7.42			
10		---		10					
11		--		11					
12				12					
13				13					
14				14					
15				15					
16				16					

* Pump Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes)

Stabilization Criteria	± 0.1° C	± 0.1 unit	± 5%	<10 NTU OR ±5%	
Calculated Criteria					

Stop Time: 16:02			
Duration, min:	Purged Dry?	Y (N)	
Total Volume Purged (gal): 9	No. of Well Volumes Purged = Total Volume Purged / Well Volume =	6	

Notes: Minimum of 5 volumes removed

Well development criteria: Continue development until a turbidity reading of 10 NTUs or less. If the turbidity reading cannot be reached the temperature, pH, specific conductance must meet the Stabilization Criteria, and, if available, the change in turbidity must be less than ±5%. Slow recharging wells should be purged dry 3 times.

BRAUN INTERTEC

Well Development Record

Project Name/Location: Groundwater Investigation		Date: 7.1.24	Well ID: MW- 3
Project Number: B2305038.02		Field Personnel: Cooper Ling	
Depth to Water, ft. (DTW): 21.40	Well Depth, ft. (WD): 32.45	Casing Diameter, in.: 2	
Water Column (WC), ft (WD - DTW): 11.05	X (casing conversion), gal/ft: 2" = 0.16 4" = 0.65 6" = 1.5		
Well Volume, gal: WC x X = 1.77			
Development Equipment Used: bailer		Pump Intake, ft: N/A	
Start Time, hrs: 13:46	Water Quality Meter Used: Oakton pH Meter	Calibrated Today? (Y) N	

	Time	Depth to Water (ft)	Pump Rate* (gpm)	Volume Pumped (gal)	Temp (°C)	pH	Spec. Cond. ( )	Turbidity (NTU)	Other (color, odor, sheen)
0	13:48			0	14.3	7.72	N/A	N/A	
1	13:54	---		1	12.8	7.49			
2	13:57	---		2	13.6	7.45			
3	14:01	---		3	14.5	7.42			
4	14:05	---		4	14.9	7.41			
5	14:10	---		5	15.3	7.38			
6	14:15	---		6	11.1	7.41			
7	14:20	---		7	11.3	7.42			
8	14:24	----		8	11.3	7.42			
9	14:29	---		9	11.3	7.43			
10	14:37	---		10	11.2	7.43			
11	14:38	--		11	11.3	7.42			
12				12					
13				13					
14				14					
15				15					
16				16					

* Pump Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes)

Stabilization Criteria	± 0.1° C	± 0.1 unit	± 5%	<10 NTU OR ±5%	
Calculated Criteria					

Stop Time: 14:40			
Duration, min:	Purged Dry?	Y (N)	
Total Volume Purged (gal): 11	No. of Well Volumes Purged = Total Volume Purged / Well Volume =		7

Notes: Minimum of 5 volumes removed

Well development criteria: Continue development until a turbidity reading of 10 NTUs or less. If the turbidity reading cannot be reached the temperature, pH, specific conductance must meet the Stabilization Criteria, and, if available, the change in turbidity must be less than ±5%. Slow recharging wells should be purged dry 3 times.

BRAUN INTERTEC

Well Development Record

Project Name/Location: Groundwater Investigation	Date: 7.1.24	Well ID: MW- 4
Project Number: B2305038.02	Field Personnel: Cooper Ling	
Depth to Water, ft. (DTW): 27.02	Well Depth, ft. (WD): 35.15	Casing Diameter, in.: 2
Water Column (WC), ft (WD - DTW): 8.13	X (casing conversion), gal/ft: 2" = 0.16 4" = 0.65 6" = 1.5	
Well Volume, gal: WC x X = 1.30		
Development Equipment Used: bailer		Pump Intake, ft: N/A
Start Time, hrs: 12:15	Water Quality Meter Used: Oakton pH Meter	Calibrated Today? (Y) N

	Time	Depth to Water (ft)	Pump Rate* (gpm)	Volume Pumped (gal)	Temp (°C)	pH	Spec. Cond. ( )	Turbidity (NTU)	Other (color, odor, sheen)
0	12:17			0	~~7.7~~ 12.1	~~12~~ 7.7	N/A	N/A	
1	12:20	---		1	11.1	7.5			
2	12:26	---		2	11.6	7.41			
3	12:32	---		3	11.4	7.40			
4	12:38	---		4	11.6	7.42			
5	12:43	---		5	11.6	7.41			
6	12:49	---		6	11.5	7.40			
7	12:53	---		7	11.5	7.41			
8		----		8					
9		---		9					
10		---		10					
11		--		11					
12				12					
13				13					
14				14					
15				15					
16				16					

* Pump Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes)

Stabilization Criteria	± 0.1° C	± 0.1 unit	± 5%	<10 NTU OR ±5%	
Calculated Criteria					

Stop Time: 12:54			
Duration, min:	Purged Dry?	Y (N)	
Total Volume Purged (gal): 6.5	No. of Well Volumes Purged = Total Volume Purged / Well Volume =		5

Notes: Minimum of 5 volumes removed

Well development criteria: Continue development until a turbidity reading of 10 NTUs or less. If the turbidity reading cannot be reached the temperature, pH, specific conductance must meet the Stabilization Criteria, and, if available, the change in turbidity must be less than ±5%. Slow recharging wells should be purged dry 3 times.

BRAUN INTERTEC

Groundwater Monitoring Data Sheet

Client Name:	Project Name: Groundwater inv.	Well # or Sample ID: MW-1
Contact:	Project Number: B2305038	Date: 7/10/24
Weather Conditions: Sunny 80°		Field Personnel: Cooper C.

Well Information

Chronology:	Key Number: 2106	Casing Locked: Y N
Casing Diameter, in: 2"	X (casing conversion), gal/ft: 2" = 0.16, 4" = 0.65, 6" = 1.5	Well Material: PVC
Depth to Water (DTW), ft: 27.92	Well Depth (WD), ft: 33.65	Tubing Material: HDPE
Water Column (WC), ft (WD - DTW): 5.73	Well Volume, gal: WC x X = 0.917	
Equipment Used: Peristaltic	Pump Intake Depth, ft: 29'	Purge Start Time: 10:26
Well Purging Procedure(s): Volume Purge (Low-Flow) Micropurge		

Stabilization Information

Water Meter Used: Hanna — Calibrated Today? Y N

	Time	Depth to Water (ft)	Purge Rate* (GPM)	Volume Purged (gal)	Temp (°C)	Spec. Cond. (µS/cm)	pH	ORP** (mV)	D.O.** (mg/L)	Turbidity** (NTU)
1	10:28	27.92		—	14.67	0.630	7.44	19.4	7.00	
2	10:43	"	0.0656	1	12.47	0.590	7.27	-13.2	7.03	
3	10:58	"	0.0656	2	12.42	0.585	7.14	-0.9	6.78	
4	11:13	"	"	3	11.60	0.581	7.14	-5.5	7.35	
5	11:28	"	"	4	11.52	0.580	7.14	-4.4	7.32	
6										
7										
8										
9										
10										

* Purge Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes)

** If required by sampling plan

Stabilization Criteria (difference in final three well volumes or final turbidity result)	±0.1°C	±5%	±0.1	±10 mV	±0.5 mg/L	±5% if >10 NTU
Stabilization Criteria in units (conductivity and turbidity)						
Actual differences or turbidity in final 3 well volumes						

Stabilized: (Y) N	Purge Rate (GPM): 0.0656	**Comments/Observations:**
Purge Stop Time: 11:30	Purged Dry: Y (N)	
Duration, min: 60	Final Depth to Water (ft.):	
Total Volume Purged (gal): 4	No. of Well Volumes Purged = Total Volume Purged / Well Volume = 4	

Sample Collection

Sample Date: 7/10/24	Color:	Odor:
Sample Time: 11:30	Phases:	Sampling Method:
Field Filtered?: Y (N)	Filter Method:	Parameters Filtered:

ID	Quantity	Vendor	Sample Parameter	Material	Type	Volume	Pres.

Duplicate Collected Here? Y — Duplicate ID:

BRAUN INTERTEC

Groundwater Monitoring Data Sheet

Client Name:	Project Name:	Well # or Sample ID: MW-2
Contact:	Project Number: B2305038	Date: 7/10/24
Weather Conditions: Sunny 80°		Field Personnel: Cooper C

Well Information

Chronology:	Key Number: 2106	Casing Locked: Y N
Casing Diameter, in: 2"	X (casing conversion), gal/ft: 2" = 0.16, 4" = 0.65, 6" = 1.5	Well Material: PVC
Depth to Water (DTW), ft: 27.10	Well Depth (WD), ft: 33.05	Tubing Material: HDPE
Water Column (WC), ft (WD - DTW): 5.95	Well Volume, gal: WC x X = 0.952	
Equipment Used: Peristaltic	Pump Intake Depth, ft:	Purge Start Time: 15:17
Well Purging Procedure(s): Volume Purge Low-Flow Micropurge		

Stabilization Information

Water Meter Used: | Calibrated Today? Y N

	Time	Depth to Water (ft)	Purge Rate* ( )	Volume Purged ( )	Temp (°C)	Spec. Cond. (µS/cm)	pH	ORP** (mV)	D.O.** (mg/L)	Turbidity** (NTU)
1	15:13	27.10								
2	15:25	|		1						
3	15:37	|		2						
4	15:49	|		3						
5	16:01	|		4						
6	16:13			5						
7										
8										
9										
10										

* Purge Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes) ** If required by sampling plan

Stabilization Criteria (difference in final three well volumes or final turbidity result)	±0.1°C	±5%	±0.1	±10 mV	±0.5 mg/L	±5% if >10 NTU
Stabilization Criteria in units (conductivity and turbidity)						
Actual differences or turbidity in final 3 well volumes						

Stabilized: Y N	Purge Rate (GPM): 0.0820
Purge Stop Time: 16:15	Purged Dry: Y (N)
Duration, min: 60	Final Depth to Water (ft.): 27.10
Total Volume Purged (gal): 5	No. of Well Volumes Purged = Total Volume Purged / Well Volume = 5

Comments/Observations: Hanna WQM Error Code 4 stopped working

Sample Collection

Sample Date: 7/10/24	Color:	Odor:
Sample Time: 16:20	Phases:	Sampling Method:
Field Filtered?: Y N	Filter Method:	Parameters Filtered:

ID	Quantity	Vendor	Sample Parameter	Material	Type	Volume	Pres.

Duplicate Collected Here? Y | Duplicate ID:

BRAUN INTERTEC

Groundwater Monitoring Data Sheet

Client Name:	Project Name:	Well # or Sample ID: MW-3
Contact:	Project Number: B230038	Date: 7/10/24
Weather Conditions:		Field Personnel: Cooper C.

Well Information

Chronology:	Key Number: 2101	Casing Locked: (Y) N
Casing Diameter, in: 2"	X (casing conversion), gal/ft: 2" = 0.16, 4" = 0.65, 6" = 1.5	Well Material: PVC
Depth to Water (DTW), ft: 20.95	Well Depth (WD), ft: 32.45	Tubing Material: HDPE
Water Column (WC), ft (WD - DTW): 11.5	Well Volume, gal: WC x X = 1.84	
Equipment Used: Peristaltic	Pump Intake Depth, ft: 23'	Purge Start Time: 13:16
Well Purging Procedure(s): Volume Purge (Low-Flow) Micropurge		

Stabilization Information

Water Meter Used: | Calibrated Today? Y N

	Time	Depth to Water (ft)	Purge Rate* ( )	Volume Purged ( )	Temp (°C)	Spec. Cond. (µS/cm)	pH	ORP** (mV)	D.O.** (mg/L)	Turbidity** (NTU)
1	13:16	20.95		—	10.65	0.627	8.05	9.0	7.73	
2	13:26	|		1	9.73	0.627	7.72	-26.1	6.92	
3	13:36	|		2	9.85	0.628	7.45	-17.9	6.80	
4	13:46	|		3	9.80	0.628	7.43	-21.2	6.91	
5	13:56			4	9.87	0.628	7.43	-18.4	6.90	
6										
7										
8										
9										
10										

* Purge Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes) | ** If required by sampling plan

Stabilization Criteria (difference in final three well volumes or final turbidity result)	±0.1°C	±5%	±0.1	±10 mV	±0.5 mg/L	±5% if >10 NTU
Stabilization Criteria in units (conductivity and turbidity)						
Actual differences or turbidity in final 3 well volumes						

Stabilized: (Y) N	Purge Rate (GPM): 0.0984	**Comments/Observations:**
Purge Stop Time: 13:57	Purged Dry: Y (N) ~~20.95~~	
Duration, min: 40	Final Depth to Water (ft.): 20.95	
Total Volume Purged (gal): 4	No. of Well Volumes Purged = Total Volume Purged / Well Volume =	

Sample Collection

Sample Date: 7/10/24	Color:	Odor:
Sample Time: 14:15	Phases:	Sampling Method:
Field Filtered?: Y (N)	Filter Method:	Parameters Filtered:

ID	Quantity	Vendor	Sample Parameter	Material	Type	Volume	Pres.
Duplicate Collected Here?		Y	Duplicate ID:				

BRAUN INTERTEC

Groundwater Monitoring Data Sheet

Client Name:	Project Name:	Well # or Sample ID: MW-4
Contact:	Project Number: B2305038	Date: 7/10/24
Weather Conditions:		Field Personnel: Cooper L.

Well Information

Chronology:	Key Number: Z106	Casing Locked: (Y) N
Casing Diameter, in:	X (casing conversion), gal/ft: *2" = 0.16, 4" = 0.65, 6" = 1.5*	Well Material: PVC
Depth to Water (DTW), ft: 26.91	Well Depth (WD), ft: 35.15	Tubing Material: HDPE
Water Column (WC), ft (WD - DTW): 8.24	Well Volume, gal: WC x X = 1.31	
Equipment Used: Peristaltic	Pump Intake Depth, ft: 27'	Purge Start Time: 11:58
Well Purging Procedure(s): Volume Purge	Low-Flow	Micropurge

Stabilization Information

Water Meter Used: | Calibrated Today? Y N

	Time	Depth to Water (ft)	Purge Rate* ( )	Volume Purged ( )	Temp (°C)	Spec. Cond. (µS/cm)	pH	ORP** (mV)	D.O.** (mg/L)	Turbidity** (NTU)
1	12:00	26.91	~~0.0895~~	—	12.38	0.600	7.98	25.9	9.78	
2	12:11	|	0.0894	1	11.45	0.585	7.60	-19.4	9.07	
3	12:22	|	|	2	11.31	0.585	7.30	-9.1	8.80	
4	12:33	|	|	3	11.40	0.583	7.23	-7.9	8.95	
5	12:44	|	|	4	11.41	0.583	7.23	-6.9	8.42	
6										
7										
8										
9										
10										

* Purge Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes) | ** If required by sampling plan

Stabilization Criteria (difference in final three well volumes or final turbidity result)	±0.1°C	±5%	±0.1	±10 mV	±0.5 mg/L	±5% if >10 NTU
Stabilization Criteria in units (conductivity and turbidity)						
Actual differences or turbidity in final 3 well volumes						

Stabilized: (Y) N	Purge Rate (GPM): 0.0894	**Comments/Observations:**
Purge Stop Time: 12:45	Purged Dry: Y (N)	
Duration, min: 45	Final Depth to Water (ft.): 26.91	
Total Volume Purged (gal): 4	No. of Well Volumes Purged = Total Volume Purged / Well Volume = 4	

Sample Collection

Sample Date: 7/10/24	Color:	Odor:
Sample Time: 12:58	Phases:	Sampling Method:
Field Filtered?: Y N	Filter Method:	Parameters Filtered:

ID	Quantity	Vendor	Sample Parameter	Material	Type	Volume	Pres.
Duplicate Collected Here?		Y	Duplicate ID:				

BRAUN INTERTEC

Groundwater Monitoring Data Sheet

Client Name:	Project Name: GW Investigation	Well # or Sample ID: MW-1
Contact:	Project Number: B2305038.02	Date: 10/4/24
Weather Conditions:		Field Personnel: Cooper L.

Well Information

Chronology:	Key Number:	Casing Locked: (Y) N
Casing Diameter, in:	X (casing conversion), gal/ft: *2" = 0.16, 4" = 0.65, 6" = 1.5*	Well Material: PVC
Depth to Water (DTW), ft: 28.65	Well Depth (WD), ft: 20 31	Tubing Material: HDPE
Water Column (WC), ft (WD - DTW): 2.35	Well Volume, gal: WC x X = 0.376	
Equipment Used:	Pump Intake Depth, ft:	Purge Start Time: 10:08

Well Purging Procedure(s): Volume Purge Low-Flow Micropurge

Stabilization Information

Water Meter Used: | Calibrated Today? Y N

	Time	Depth to Water (ft)	Purge Rate* ( )	Volume Purged (gal)	Temp (°C)	Spec. Cond. (µS/cm)	pH	ORP** (mV)	D.O.** (mg/L)	Turbidity** (NTU)
1	10:08	28.65		0	11.12	3	7.55	187.2	~~82.1~~ 9.65	
2	10:~~18~~			0.5	9.74	599	7.10	203.6	~~77.7~~ 8.97	
3	10:28			1.0	9.75	595	7.04	202.8	~~9.46~~ 11.36	
4	10:38			1.5	9.85	598	6.97	198.9	10.94	
5	10:48			2	9.84	597	6.99	199.2	11.06	
6										
7										
8										
9										
10										

* Purge Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes) ** If required by sampling plan

Stabilization Criteria (difference in final three well volumes or final turbidity result)	±0.1°C	±5%	±0.1	±10 mV	±0.5 mg/L	±5% if >10 NTU
Stabilization Criteria in units (conductivity and turbidity)						
Actual differences or turbidity in final 3 well volumes						

Stabilized: (Y) N	Purge Rate (GPM): 0.049	Comments/Observations:
Purge Stop Time: 10:48	Purged Dry: Y (N)	
Duration, min: 40 min	Final Depth to Water (ft.):	
Total Volume Purged (gal): 2	No. of Well Volumes Purged = Total Volume Purged / Well Volume = 5.32	

Sample Collection

Sample Date:	Color:	Odor:
Sample Time:	Phases:	Sampling Method:
Field Filtered?: Y N	Filter Method:	Parameters Filtered:

ID	Quantity	Vendor	Sample Parameter	Material	Type	Volume	Pres.
Duplicate Collected Here?		Y	Duplicate ID:				

BRAUN INTERTEC

Groundwater Monitoring Data Sheet

Client Name:	Project Name:	Well # or Sample ID: MW-2
Contact:	Project Number:	Date:
Weather Conditions:		Field Personnel: Cooper L.

Well Information

Chronology:	Key Number:	Casing Locked: Y N
Casing Diameter, in:	X (casing conversion), gal/ft: *2" = 0.16, 4" = 0.65, 6" = 1.5*	Well Material: PVC
Depth to Water (DTW), ft: 27.85	Well Depth (WD), ft: 33	Tubing Material: HDPE
Water Column (WC), ft (WD - DTW): 5.15	Well Volume, gal: WC x X = 0.824	
Equipment Used:	Pump Intake Depth, ft:	Purge Start Time: 13:25

Well Purging Procedure(s): Volume Purge Low-Flow Micropurge

Stabilization Information

Water Meter Used: Calibrated Today? Y N

	Time	Depth to Water (ft)	Purge Rate* ( )	Volume Purged ( )	Temp (°C)	Spec. Cond. (µS/cm)	pH	ORP** (mV)	D.O.** (mg/L)	Turbidity** (NTU)
1	13:25	27.85		0	9.76	689	7.10	194.6	12.64	
2	13:35			1.0	9.43	694	7.05	193.9	12.76	
3	13:46			2.0	9.36	696	7.05	192.4	12.82	
4	13:55			3.0	9.35	698	7.05	191.3	12.84	
5										
6										
7										
8										
9										
10										

* Purge Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes) ** If required by sampling plan

Stabilization Criteria (difference in final three well volumes or final turbidity result)	±0.1°C	±5%	±0.1	±10 mV	±0.5 mg/L	±5% if >10 NTU
Stabilization Criteria in units (conductivity and turbidity)						
Actual differences or turbidity in final 3 well volumes						

Stabilized: Y N	Purge Rate (GPM): 0.098	Comments/Observations:
Purge Stop Time: 13:55	Purged Dry: Y N	
Duration, min: 30	Final Depth to Water (ft.):	
Total Volume Purged (gal): 3	No. of Well Volumes Purged = Total Volume Purged / Well Volume = 3.64	

Sample Collection

Sample Date: 10/4	Color:	Odor:
Sample Time: 14:00	Phases:	Sampling Method:
Field Filtered?: Y N	Filter Method:	Parameters Filtered:

ID	Quantity	Vendor	Sample Parameter	Material	Type	Volume	Pres.
Duplicate Collected Here?		Y	Duplicate ID:				

BRAUN INTERTEC

Groundwater Monitoring Data Sheet

Client Name:	Project Name:	Well # or Sample ID: MW-3
Contact:	Project Number:	Date: 10/4/24
Weather Conditions:		Field Personnel: Cooper L.

Well Information

Chronology:	Key Number:	Casing Locked: (Y) N
Casing Diameter, in:	X (casing conversion), gal/ft: *2" = 0.16, 4" = 0.65, 6" = 1.5*	Well Material: PVC
Depth to Water (DTW), ft: 21.70	Well Depth (WD), ft: 30	Tubing Material: HDPE
Water Column (WC), ft (WD - DTW): 8.3	Well Volume, gal: WC x X = 1.3	
Equipment Used:	Pump Intake Depth, ft:	Purge Start Time: 12:35

Well Purging Procedure(s): Volume Purge Low-Flow Micropurge

Stabilization Information

Water Meter Used: Calibrated Today? Y N

	Time	Depth to Water (ft)	Purge Rate* ( )	Volume Purged ( )	Temp (°C)	Spec. Cond. (µS/cm)	pH	ORP** (mV)	D.O.** (mg/L)	Turbidity** (NTU)
1	12:35	21.70			10.99	572	7.44	187.1	11.19	
2	12:40			0.5	8.75	570	7.04	191.5	11.93	
3	12:45			1.0	8.78	569	7.04	183.7	11.96	
4	12:50			1.5	8.88	568	7.04	183.6	10.99	
5	12:55			2.0	8.88	570	7.07	186.7	10.75	
6	13:05			3.0	887	570	7.07	186.9	10.71	
7	13:15			4.0	8.89	570	7.08	186.9	10.69	
8										
9										
10										

* Purge Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes) ** If required by sampling plan

Stabilization Criteria (difference in final three well volumes or final turbidity result)	±0.1°C	±5%	±0.1	±10 mV	±0.5 mg/L	±5% if >10 NTU
Stabilization Criteria in units (conductivity and turbidity)						
Actual differences or turbidity in final 3 well volumes						

Stabilized: (Y) N	Purge Rate (GPM): 0.098	**Comments/Observations:**
Purge Stop Time:	Purged Dry: Y (N)	
Duration, min: 40	Final Depth to Water (ft.):	
Total Volume Purged (gal): 4.0	No. of Well Volumes Purged = Total Volume Purged / Well Volume = 3.08	

Sample Collection

Sample Date:	Color:	Odor:
Sample Time: 13:15	Phases:	Sampling Method:
Field Filtered?: Y N	Filter Method:	Parameters Filtered:

ID	Quantity	Vendor	Sample Parameter	Material	Type	Volume	Pres.
Duplicate Collected Here?		Y	Duplicate ID:				

BRAUN INTERTEC

Groundwater Monitoring Data Sheet

Client Name:	Project Name:	Well # or Sample ID: MW-4
Contact:	Project Number:	Date: 10/4/24
Weather Conditions:		Field Personnel: Cooper L.

Well Information

Chronology:	Key Number:	Casing Locked: Y N
Casing Diameter, In:	X (casing conversion), gal/ft: 2" = 0.16, 4" = 0.65, 6" = 1.5	Well Material: PVC
Depth to Water (DTW), ft: 27.65	Well Depth (WD), ft: 32	Tubing Material: HDPE
Water Column (WC), ft (WD - DTW): 4.35	Well Volume, gal: WC x X = 0.70	
Equipment Used:	Pump Intake Depth, ft:	Purge Start Time: 11:30

Well Purging Procedure(s): Volume Purge Low-Flow Micropurge

Stabilization Information

Water Meter Used: | Calibrated Today? Y N

	Time	Depth to Water (ft)	Purge Rate* ( )	Volume Purged ( )	Temp (°C)	Spec. Cond. (µS/cm)	pH	ORP** (mV)	D.O.** (mg/L)	Turbidity** (NTU)
1	11:30	27.65		0.5 0.0	12.88	599	7.42	192.5	11.10	
2	11:36			1.0 0.5	9.13	600	7.05	190.9	12.8	
3	11:42			1.5 1.0	9.21	595	7.04	185.9	12.5	
4	11:48			2.0 1.5	9.22	590	7.04	184.3	12.32	
5	11:54			2.0	9.19	591	7.05	184.1	12.40	
6	12:00			2.5	9.19	591	7.05	184.0	12.22	
7										
8										
9										
10										

* Purge Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes) | ** If required by sampling plan

Stabilization Criteria (difference in final three well volumes or final turbidity result)	±0.1°C	±5%	±0.1	±10 mV	±0.5 mg/L	±5% if >10 NTU
Stabilization Criteria in units (conductivity and turbidity)						
Actual differences or turbidity in final 3 well volumes						

Stabilized: Y N	Purge Rate (GPM): 0.082	Comments/Observations:
Purge Stop Time: 12:00	Purged Dry: Y N	
Duration, min: 30	Final Depth to Water (ft.):	
Total Volume Purged (gal): 2.5	No. of Well Volumes Purged = Total Volume Purged / Well Volume = 3.57	

Sample Collection

Sample Date:	Color:	Odor:
Sample Time: 12:05	Phases:	Sampling Method:
Field Filtered?: Y N	Filter Method:	Parameters Filtered:

ID	Quantity	Vendor	Sample Parameter	Material	Type	Volume	Pres.

Duplicate Collected Here? Y | Duplicate ID:

Appendix D

Laboratory Analytical Reports

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

September 24, 2024

Aaron Volker
Braun Intertec Corp.
3900 Roosevelt Rd.
Suite 113
Saint Cloud, MN 56301

RE: Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Dear Aaron Volker:

Enclosed are the analytical results for sample(s) received by the laboratory on August 30, 2024. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Minneapolis

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brenna Bloome
brenna.bloome@pacelabs.com
(612)607-1700
Project Manager

Enclosures

cc: Cooper Ling

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Pace Analytical Services, LLC - Minneapolis MN
1700 Elm Street SE, Minneapolis, MN 55414
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
DoD Certification via A2LA #: 2926.01
EPA Region 8 Tribal Water Systems+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
GMP+ Certification #: GMP050884
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
ISO/IEC 17025 Certification via A2LA #: 2926.01
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: AI-03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Approval: via MN 027-053-137
Minnesota Petrofund Registration #: 1240
Mississippi Certification #: MN00064
Missouri Certification #: 10100
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification (A2LA) #: R-036
North Dakota Certification (MN) #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification (1700) #: CL101
Oklahoma Certification #: 9507
Oregon Primary Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Vermont Certification #: VT-027053137
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DEP Certification #: 382
West Virginia DW Certification #: 9952 C
Wisconsin Certification #: 999407970
Wyoming UST Certification via A2LA #: 2926.01
USDA Permit #: P330-19-00208

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10706310001	**1950**	Water	08/29/24 10:08	08/30/24 11:40
10706310002	**1965**	Water	08/29/24 10:30	08/30/24 11:40
10706310003	**2011**	Water	08/29/24 10:45	08/30/24 11:40
10706310004	**2053**	Water	08/29/24 11:00	08/30/24 11:40
10706310005	**1881**	Water	08/29/24 11:40	08/30/24 11:40
10706310006	**4959**	Water	08/29/24 12:15	08/30/24 11:40
10706310007	**2317**	Water	08/29/24 12:50	08/30/24 11:40
10706310008	**5276**	Water	08/29/24 13:30	08/30/24 11:40
10706310009	**Trip Blank**	Water	08/29/24 07:00	08/30/24 11:40

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10706310001	**1950**	EPA 1633 DRAFT	NBH	64	PASI-M
10706310002	**1965**	EPA 1633 DRAFT	NBH	64	PASI-M
10706310003	**2011**	EPA 1633 DRAFT	NBH	64	PASI-M
10706310004	**2053**	EPA 1633 DRAFT	NBH	64	PASI-M
10706310005	**1881**	EPA 1633 DRAFT	NBH	64	PASI-M
10706310006	**4959**	EPA 1633 DRAFT	NBH	64	PASI-M
10706310007	**2317**	EPA 1633 DRAFT	NBH	64	PASI-M
10706310008	**5276**	EPA 1633 DRAFT	NBH	64	PASI-M
10706310009	**Trip Blank**	EPA 1633 DRAFT	NBH	64	PASI-M

PASI-M = Pace Analytical Services - Minneapolis

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

PROJECT NARRATIVE

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Method: **EPA 1633 DRAFT**
Description: EPA 1633 DRAFT Water
Client: Braun Intertec Corporation
Date: September 24, 2024

General Information:
9 samples were analyzed for EPA 1633 DRAFT by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 1633 DRAFT with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 1950 **Lab ID: 10706310001** Collected: 08/29/24 10:08 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.5	0.87	1	09/18/24 08:16	09/20/24 03:53	763051-92-9	
3:3 FTCA	ND	ng/L	5.6	2.6	1	09/18/24 08:16	09/20/24 03:53	356-02-5	
4:2 FTS	ND	ng/L	4.5	0.54	1	09/18/24 08:16	09/20/24 03:53	757124-72-4	
5:3 FTCA	ND	ng/L	27.9	5.4	1	09/18/24 08:16	09/20/24 03:53	914637-49-3	
6:2 FTS	ND	ng/L	4.5	1.1	1	09/18/24 08:16	09/20/24 03:53	27619-97-2	
7:3 FTCA	ND	ng/L	27.9	5.8	1	09/18/24 08:16	09/20/24 03:53	812-70-4	
8:2 FTS	ND	ng/L	4.5	1.2	1	09/18/24 08:16	09/20/24 03:53	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.5	0.92	1	09/18/24 08:16	09/20/24 03:53	756426-58-1	
ADONA	ND	ng/L	4.5	0.65	1	09/18/24 08:16	09/20/24 03:53	919005-14-4	
HFPO-DA	ND	ng/L	4.5	0.87	1	09/18/24 08:16	09/20/24 03:53	13252-13-6	
NEtFOSAA	ND	ng/L	1.1	0.39	1	09/18/24 08:16	09/20/24 03:53	2991-50-6	
NEtFOSA	ND	ng/L	1.1	0.29	1	09/18/24 08:16	09/20/24 03:53	4151-50-2	
NEtFOSE	ND	ng/L	11.2	3.6	1	09/18/24 08:16	09/20/24 03:53	1691-99-2	
NFDHA	ND	ng/L	2.2	0.63	1	09/18/24 08:16	09/20/24 03:53	151772-58-6	
NMeFOSAA	ND	ng/L	1.1	0.36	1	09/18/24 08:16	09/20/24 03:53	2355-31-9	
NMeFOSA	ND	ng/L	1.1	0.30	1	09/18/24 08:16	09/20/24 03:53	31506-32-8	
NMeFOSE	ND	ng/L	11.2	3.0	1	09/18/24 08:16	09/20/24 03:53	24448-09-7	
PFBS	**4.3**	ng/L	1.1	0.36	1	09/18/24 08:16	09/20/24 03:53	375-73-5	
PFDA	ND	ng/L	1.1	0.20	1	09/18/24 08:16	09/20/24 03:53	335-76-2	
PFHxA	**1.3**	ng/L	1.1	0.17	1	09/18/24 08:16	09/20/24 03:53	307-24-4	
PFBA	**19.4**	ng/L	4.5	0.68	1	09/18/24 08:16	09/20/24 03:53	375-22-4	
PFDS	ND	ng/L	1.1	0.30	1	09/18/24 08:16	09/20/24 03:53	335-77-3	
PFDoS	ND	ng/L	1.1	0.31	1	09/18/24 08:16	09/20/24 03:53	79780-39-5	
PFEESA	ND	ng/L	2.2	0.36	1	09/18/24 08:16	09/20/24 03:53	113507-82-7	
PFHpS	ND	ng/L	1.1	0.27	1	09/18/24 08:16	09/20/24 03:53	375-92-8	
PFMBA	ND	ng/L	2.2	0.35	1	09/18/24 08:16	09/20/24 03:53	863090-89-5	
PFMPA	ND	ng/L	2.2	0.54	1	09/18/24 08:16	09/20/24 03:53	377-73-1	
PFNS	ND	ng/L	1.1	0.27	1	09/18/24 08:16	09/20/24 03:53	68259-12-1	
PFOSA	ND	ng/L	1.1	0.27	1	09/18/24 08:16	09/20/24 03:53	754-91-6	
PFPeA	ND	ng/L	2.2	0.33	1	09/18/24 08:16	09/20/24 03:53	2706-90-3	
PFPeS	ND	ng/L	1.1	0.20	1	09/18/24 08:16	09/20/24 03:53	2706-91-4	
PFDoA	ND	ng/L	1.1	0.25	1	09/18/24 08:16	09/20/24 03:53	307-55-1	
PFHpA	ND	ng/L	1.1	0.24	1	09/18/24 08:16	09/20/24 03:53	375-85-9	
PFHxS	ND	ng/L	1.1	0.29	1	09/18/24 08:16	09/20/24 03:53	355-46-4	
PFNA	ND	ng/L	1.1	0.26	1	09/18/24 08:16	09/20/24 03:53	375-95-1	
PFOS	ND	ng/L	1.1	0.20	1	09/18/24 08:16	09/20/24 03:53	1763-23-1	
PFOA	ND	ng/L	1.1	0.38	1	09/18/24 08:16	09/20/24 03:53	335-67-1	
PFTeDA	ND	ng/L	1.1	0.32	1	09/18/24 08:16	09/20/24 03:53	376-06-7	
PFTrDA	ND	ng/L	1.1	0.22	1	09/18/24 08:16	09/20/24 03:53	72629-94-8	
PFUnA	ND	ng/L	1.1	0.28	1	09/18/24 08:16	09/20/24 03:53	2058-94-8	
Surrogates									
13C2-PFDoA (S)	87	%.	10-130		1	09/18/24 08:16	09/20/24 03:53		
13C3HFPO-DA (S)	92	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		
13C3-PFBS (S)	103	%.	40-135		1	09/18/24 08:16	09/20/24 03:53		
13C3-PFHxS (S)	98	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 1950 **Lab ID: 10706310001** Collected: 08/29/24 10:08 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	68	%.	5-130		1	09/18/24 08:16	09/20/24 03:53		
13C4-PFHpA (S)	94	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		
13C5-PFHxA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		
13C5-PFPeA (S)	88	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		
13C6-PFDA (S)	87	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		
13C8-PFOA (S)	94	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		
13C8-PFOS (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		
13C8-PFOSA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		
13C9-PFNA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 03:53		
d3-MeFOSAA (S)	75	%.	40-170		1	09/18/24 08:16	09/20/24 03:53		
d3-NMeFOSA (S)	80	%.	10-130		1	09/18/24 08:16	09/20/24 03:53		
d5-EtFOSAA (S)	76	%.	25-135		1	09/18/24 08:16	09/20/24 03:53		
d5-NEtFOSA (S)	80	%.	10-130		1	09/18/24 08:16	09/20/24 03:53		
d7-NMeFOSE (S)	82	%.	10-130		1	09/18/24 08:16	09/20/24 03:53		
d9-NEtFOSE (S)	85	%.	10-130		1	09/18/24 08:16	09/20/24 03:53		
13C2-PFTA (S)	76	%.	10-130		1	09/18/24 08:16	09/20/24 03:53		
13C7-PFUdA (S)	85	%.	30-130		1	09/18/24 08:16	09/20/24 03:53		
13C24:2FTS (S)	92	%.	40-200		1	09/18/24 08:16	09/20/24 03:53		
13C26:2FTS (S)	87	%.	40-200		1	09/18/24 08:16	09/20/24 03:53		
13C28:2FTS (S)	86	%.	40-300		1	09/18/24 08:16	09/20/24 03:53		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 1965 **Lab ID: 10706310002** Collected: 08/29/24 10:30 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.1	0.79	1	09/18/24 08:16	09/20/24 04:09	763051-92-9	
3:3 FTCA	ND	ng/L	5.1	2.4	1	09/18/24 08:16	09/20/24 04:09	356-02-5	
4:2 FTS	ND	ng/L	4.1	0.49	1	09/18/24 08:16	09/20/24 04:09	757124-72-4	
5:3 FTCA	ND	ng/L	25.4	4.9	1	09/18/24 08:16	09/20/24 04:09	914637-49-3	
6:2 FTS	ND	ng/L	4.1	0.99	1	09/18/24 08:16	09/20/24 04:09	27619-97-2	
7:3 FTCA	ND	ng/L	25.4	5.3	1	09/18/24 08:16	09/20/24 04:09	812-70-4	
8:2 FTS	ND	ng/L	4.1	1.1	1	09/18/24 08:16	09/20/24 04:09	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.1	0.84	1	09/18/24 08:16	09/20/24 04:09	756426-58-1	
ADONA	ND	ng/L	4.1	0.60	1	09/18/24 08:16	09/20/24 04:09	919005-14-4	
HFPO-DA	ND	ng/L	4.1	0.79	1	09/18/24 08:16	09/20/24 04:09	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.35	1	09/18/24 08:16	09/20/24 04:09	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 04:09	4151-50-2	
NEtFOSE	ND	ng/L	10.2	3.3	1	09/18/24 08:16	09/20/24 04:09	1691-99-2	
NFDHA	ND	ng/L	2.0	0.57	1	09/18/24 08:16	09/20/24 04:09	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.32	1	09/18/24 08:16	09/20/24 04:09	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 04:09	31506-32-8	
NMeFOSE	ND	ng/L	10.2	2.7	1	09/18/24 08:16	09/20/24 04:09	24448-09-7	
PFBS	**6.0**	ng/L	1.0	0.33	1	09/18/24 08:16	09/20/24 04:09	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 04:09	335-76-2	
PFHxA	**4.6**	ng/L	1.0	0.15	1	09/18/24 08:16	09/20/24 04:09	307-24-4	
PFBA	**15.2**	ng/L	4.1	0.62	1	09/18/24 08:16	09/20/24 04:09	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 04:09	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	09/18/24 08:16	09/20/24 04:09	79780-39-5	
PFEESA	ND	ng/L	2.0	0.33	1	09/18/24 08:16	09/20/24 04:09	113507-82-7	
PFHpS	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 04:09	375-92-8	
PFMBA	ND	ng/L	2.0	0.32	1	09/18/24 08:16	09/20/24 04:09	863090-89-5	
PFMPA	ND	ng/L	2.0	0.49	1	09/18/24 08:16	09/20/24 04:09	377-73-1	
PFNS	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 04:09	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 04:09	754-91-6	
PFPeA	**5.1**	ng/L	2.0	0.30	1	09/18/24 08:16	09/20/24 04:09	2706-90-3	
PFPeS	ND	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 04:09	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	09/18/24 08:16	09/20/24 04:09	307-55-1	
PFHpA	**1.4**	ng/L	1.0	0.22	1	09/18/24 08:16	09/20/24 04:09	375-85-9	
PFHxS	**1.4**	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 04:09	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 04:09	375-95-1	
PFOS	ND	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 04:09	1763-23-1	
PFOA	ND	ng/L	1.0	0.35	1	09/18/24 08:16	09/20/24 04:09	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	09/18/24 08:16	09/20/24 04:09	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	09/18/24 08:16	09/20/24 04:09	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 04:09	2058-94-8	
Surrogates									
13C2-PFDoA (S)	70	%.	10-130		1	09/18/24 08:16	09/20/24 04:09		
13C3HFPO-DA (S)	95	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		
13C3-PFBS (S)	104	%.	40-135		1	09/18/24 08:16	09/20/24 04:09		
13C3-PFHxS (S)	97	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 1965 **Lab ID: 10706310002** Collected: 08/29/24 10:30 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	67	%.	5-130		1	09/18/24 08:16	09/20/24 04:09		
13C4-PFHpA (S)	94	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		
13C5-PFHxA (S)	92	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		
13C5-PFPeA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		
13C6-PFDA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		
13C8-PFOA (S)	93	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		
13C8-PFOS (S)	90	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		
13C8-PFOSA (S)	82	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		
13C9-PFNA (S)	92	%.	40-130		1	09/18/24 08:16	09/20/24 04:09		
d3-MeFOSAA (S)	71	%.	40-170		1	09/18/24 08:16	09/20/24 04:09		
d3-NMeFOSA (S)	66	%.	10-130		1	09/18/24 08:16	09/20/24 04:09		
d5-EtFOSAA (S)	65	%.	25-135		1	09/18/24 08:16	09/20/24 04:09		
d5-NEtFOSA (S)	65	%.	10-130		1	09/18/24 08:16	09/20/24 04:09		
d7-NMeFOSE (S)	65	%.	10-130		1	09/18/24 08:16	09/20/24 04:09		
d9-NEtFOSE (S)	69	%.	10-130		1	09/18/24 08:16	09/20/24 04:09		
13C2-PFTA (S)	64	%.	10-130		1	09/18/24 08:16	09/20/24 04:09		
13C7-PFUdA (S)	78	%.	30-130		1	09/18/24 08:16	09/20/24 04:09		
13C24:2FTS (S)	91	%.	40-200		1	09/18/24 08:16	09/20/24 04:09		
13C26:2FTS (S)	87	%.	40-200		1	09/18/24 08:16	09/20/24 04:09		
13C28:2FTS (S)	77	%.	40-300		1	09/18/24 08:16	09/20/24 04:09		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 2011 **Lab ID: 10706310003** Collected: 08/29/24 10:45 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.2	0.83	1	09/18/24 08:16	09/20/24 04:24	763051-92-9	
3:3 FTCA	ND	ng/L	5.3	2.5	1	09/18/24 08:16	09/20/24 04:24	356-02-5	
4:2 FTS	ND	ng/L	4.2	0.51	1	09/18/24 08:16	09/20/24 04:24	757124-72-4	
5:3 FTCA	ND	ng/L	26.5	5.1	1	09/18/24 08:16	09/20/24 04:24	914637-49-3	
6:2 FTS	ND	ng/L	4.2	1.0	1	09/18/24 08:16	09/20/24 04:24	27619-97-2	
7:3 FTCA	ND	ng/L	26.5	5.5	1	09/18/24 08:16	09/20/24 04:24	812-70-4	
8:2 FTS	ND	ng/L	4.2	1.1	1	09/18/24 08:16	09/20/24 04:24	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.2	0.87	1	09/18/24 08:16	09/20/24 04:24	756426-58-1	
ADONA	ND	ng/L	4.2	0.62	1	09/18/24 08:16	09/20/24 04:24	919005-14-4	
HFPO-DA	ND	ng/L	4.2	0.83	1	09/18/24 08:16	09/20/24 04:24	13252-13-6	
NEtFOSAA	ND	ng/L	1.1	0.37	1	09/18/24 08:16	09/20/24 04:24	2991-50-6	
NEtFOSA	ND	ng/L	1.1	0.27	1	09/18/24 08:16	09/20/24 04:24	4151-50-2	
NEtFOSE	ND	ng/L	10.6	3.4	1	09/18/24 08:16	09/20/24 04:24	1691-99-2	
NFDHA	ND	ng/L	2.1	0.60	1	09/18/24 08:16	09/20/24 04:24	151772-58-6	
NMeFOSAA	ND	ng/L	1.1	0.34	1	09/18/24 08:16	09/20/24 04:24	2355-31-9	
NMeFOSA	ND	ng/L	1.1	0.28	1	09/18/24 08:16	09/20/24 04:24	31506-32-8	
NMeFOSE	ND	ng/L	10.6	2.8	1	09/18/24 08:16	09/20/24 04:24	24448-09-7	
PFBS	**4.1**	ng/L	1.1	0.34	1	09/18/24 08:16	09/20/24 04:24	375-73-5	
PFDA	ND	ng/L	1.1	0.19	1	09/18/24 08:16	09/20/24 04:24	335-76-2	
PFHxA	**1.1**	ng/L	1.1	0.16	1	09/18/24 08:16	09/20/24 04:24	307-24-4	
PFBA	**20.6**	ng/L	4.2	0.65	1	09/18/24 08:16	09/20/24 04:24	375-22-4	
PFDS	ND	ng/L	1.1	0.28	1	09/18/24 08:16	09/20/24 04:24	335-77-3	
PFDoS	ND	ng/L	1.1	0.29	1	09/18/24 08:16	09/20/24 04:24	79780-39-5	
PFEESA	ND	ng/L	2.1	0.34	1	09/18/24 08:16	09/20/24 04:24	113507-82-7	
PFHpS	ND	ng/L	1.1	0.25	1	09/18/24 08:16	09/20/24 04:24	375-92-8	
PFMBA	ND	ng/L	2.1	0.34	1	09/18/24 08:16	09/20/24 04:24	863090-89-5	
PFMPA	ND	ng/L	2.1	0.51	1	09/18/24 08:16	09/20/24 04:24	377-73-1	
PFNS	ND	ng/L	1.1	0.26	1	09/18/24 08:16	09/20/24 04:24	68259-12-1	
PFOSA	ND	ng/L	1.1	0.25	1	09/18/24 08:16	09/20/24 04:24	754-91-6	
PFPeA	ND	ng/L	2.1	0.32	1	09/18/24 08:16	09/20/24 04:24	2706-90-3	
PFPeS	ND	ng/L	1.1	0.19	1	09/18/24 08:16	09/20/24 04:24	2706-91-4	
PFDoA	ND	ng/L	1.1	0.24	1	09/18/24 08:16	09/20/24 04:24	307-55-1	
PFHpA	ND	ng/L	1.1	0.23	1	09/18/24 08:16	09/20/24 04:24	375-85-9	
PFHxS	ND	ng/L	1.1	0.27	1	09/18/24 08:16	09/20/24 04:24	355-46-4	
PFNA	ND	ng/L	1.1	0.25	1	09/18/24 08:16	09/20/24 04:24	375-95-1	
PFOS	ND	ng/L	1.1	0.19	1	09/18/24 08:16	09/20/24 04:24	1763-23-1	
PFOA	ND	ng/L	1.1	0.36	1	09/18/24 08:16	09/20/24 04:24	335-67-1	
PFTeDA	ND	ng/L	1.1	0.30	1	09/18/24 08:16	09/20/24 04:24	376-06-7	
PFTrDA	ND	ng/L	1.1	0.21	1	09/18/24 08:16	09/20/24 04:24	72629-94-8	
PFUnA	ND	ng/L	1.1	0.27	1	09/18/24 08:16	09/20/24 04:24	2058-94-8	
Surrogates									
13C2-PFDoA (S)	70	%.	10-130		1	09/18/24 08:16	09/20/24 04:24		
13C3HFPO-DA (S)	88	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		
13C3-PFBS (S)	100	%.	40-135		1	09/18/24 08:16	09/20/24 04:24		
13C3-PFHxS (S)	93	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 2011 **Lab ID: 10706310003** Collected: 08/29/24 10:45 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	73	%.	5-130		1	09/18/24 08:16	09/20/24 04:24		
13C4-PFHpA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		
13C5-PFHxA (S)	90	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		
13C5-PFPeA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		
13C6-PFDA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		
13C8-PFOA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		
13C8-PFOS (S)	93	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		
13C8-PFOSA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		
13C9-PFNA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 04:24		
d3-MeFOSAA (S)	75	%.	40-170		1	09/18/24 08:16	09/20/24 04:24		
d3-NMeFOSA (S)	71	%.	10-130		1	09/18/24 08:16	09/20/24 04:24		
d5-EtFOSAA (S)	73	%.	25-135		1	09/18/24 08:16	09/20/24 04:24		
d5-NEtFOSA (S)	72	%.	10-130		1	09/18/24 08:16	09/20/24 04:24		
d7-NMeFOSE (S)	68	%.	10-130		1	09/18/24 08:16	09/20/24 04:24		
d9-NEtFOSE (S)	70	%.	10-130		1	09/18/24 08:16	09/20/24 04:24		
13C2-PFTA (S)	64	%.	10-130		1	09/18/24 08:16	09/20/24 04:24		
13C7-PFUdA (S)	82	%.	30-130		1	09/18/24 08:16	09/20/24 04:24		
13C24:2FTS (S)	91	%.	40-200		1	09/18/24 08:16	09/20/24 04:24		
13C26:2FTS (S)	90	%.	40-200		1	09/18/24 08:16	09/20/24 04:24		
13C28:2FTS (S)	85	%.	40-300		1	09/18/24 08:16	09/20/24 04:24		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 2053 **Lab ID: 10706310004** Collected: 08/29/24 11:00 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.1	0.80	1	09/18/24 08:16	09/20/24 04:40	763051-92-9	
3:3 FTCA	ND	ng/L	5.1	2.4	1	09/18/24 08:16	09/20/24 04:40	356-02-5	
4:2 FTS	ND	ng/L	4.1	0.50	1	09/18/24 08:16	09/20/24 04:40	757124-72-4	
5:3 FTCA	ND	ng/L	25.7	5.0	1	09/18/24 08:16	09/20/24 04:40	914637-49-3	
6:2 FTS	ND	ng/L	4.1	1.0	1	09/18/24 08:16	09/20/24 04:40	27619-97-2	
7:3 FTCA	ND	ng/L	25.7	5.4	1	09/18/24 08:16	09/20/24 04:40	812-70-4	
8:2 FTS	ND	ng/L	4.1	1.1	1	09/18/24 08:16	09/20/24 04:40	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.1	0.85	1	09/18/24 08:16	09/20/24 04:40	756426-58-1	
ADONA	ND	ng/L	4.1	0.60	1	09/18/24 08:16	09/20/24 04:40	919005-14-4	
HFPO-DA	ND	ng/L	4.1	0.80	1	09/18/24 08:16	09/20/24 04:40	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.36	1	09/18/24 08:16	09/20/24 04:40	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 04:40	4151-50-2	
NEtFOSE	ND	ng/L	10.3	3.3	1	09/18/24 08:16	09/20/24 04:40	1691-99-2	
NFDHA	ND	ng/L	2.1	0.58	1	09/18/24 08:16	09/20/24 04:40	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.33	1	09/18/24 08:16	09/20/24 04:40	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 04:40	31506-32-8	
NMeFOSE	ND	ng/L	10.3	2.7	1	09/18/24 08:16	09/20/24 04:40	24448-09-7	
PFBS	ND	ng/L	1.0	0.33	1	09/18/24 08:16	09/20/24 04:40	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 04:40	335-76-2	
PFHxA	ND	ng/L	1.0	0.16	1	09/18/24 08:16	09/20/24 04:40	307-24-4	
PFBA	**6.7**	ng/L	4.1	0.63	1	09/18/24 08:16	09/20/24 04:40	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 04:40	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	09/18/24 08:16	09/20/24 04:40	79780-39-5	
PFEESA	ND	ng/L	2.1	0.33	1	09/18/24 08:16	09/20/24 04:40	113507-82-7	
PFHpS	ND	ng/L	1.0	0.25	1	09/18/24 08:16	09/20/24 04:40	375-92-8	
PFMBA	ND	ng/L	2.1	0.33	1	09/18/24 08:16	09/20/24 04:40	863090-89-5	
PFMPA	ND	ng/L	2.1	0.50	1	09/18/24 08:16	09/20/24 04:40	377-73-1	
PFNS	ND	ng/L	1.0	0.25	1	09/18/24 08:16	09/20/24 04:40	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 04:40	754-91-6	
PFPeA	ND	ng/L	2.1	0.31	1	09/18/24 08:16	09/20/24 04:40	2706-90-3	
PFPeS	ND	ng/L	1.0	0.19	1	09/18/24 08:16	09/20/24 04:40	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	09/18/24 08:16	09/20/24 04:40	307-55-1	
PFHpA	ND	ng/L	1.0	0.22	1	09/18/24 08:16	09/20/24 04:40	375-85-9	
PFHxS	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 04:40	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 04:40	375-95-1	
PFOS	ND	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 04:40	1763-23-1	
PFOA	ND	ng/L	1.0	0.35	1	09/18/24 08:16	09/20/24 04:40	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	09/18/24 08:16	09/20/24 04:40	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	09/18/24 08:16	09/20/24 04:40	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 04:40	2058-94-8	
Surrogates									
13C2-PFDoA (S)	80	%.	10-130		1	09/18/24 08:16	09/20/24 04:40		
13C3HFPO-DA (S)	87	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		
13C3-PFBS (S)	98	%.	40-135		1	09/18/24 08:16	09/20/24 04:40		
13C3-PFHxS (S)	94	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 2053 **Lab ID: 10706310004** Collected: 08/29/24 11:00 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	67	%.	5-130		1	09/18/24 08:16	09/20/24 04:40		
13C4-PFHpA (S)	90	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		
13C5-PFHxA (S)	90	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		
13C5-PFPeA (S)	88	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		
13C6-PFDA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		
13C8-PFOA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		
13C8-PFOS (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		
13C8-PFOSA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		
13C9-PFNA (S)	90	%.	40-130		1	09/18/24 08:16	09/20/24 04:40		
d3-MeFOSAA (S)	70	%.	40-170		1	09/18/24 08:16	09/20/24 04:40		
d3-NMeFOSA (S)	69	%.	10-130		1	09/18/24 08:16	09/20/24 04:40		
d5-EtFOSAA (S)	72	%.	25-135		1	09/18/24 08:16	09/20/24 04:40		
d5-NEtFOSA (S)	69	%.	10-130		1	09/18/24 08:16	09/20/24 04:40		
d7-NMeFOSE (S)	70	%.	10-130		1	09/18/24 08:16	09/20/24 04:40		
d9-NEtFOSE (S)	72	%.	10-130		1	09/18/24 08:16	09/20/24 04:40		
13C2-PFTA (S)	72	%.	10-130		1	09/18/24 08:16	09/20/24 04:40		
13C7-PFUdA (S)	85	%.	30-130		1	09/18/24 08:16	09/20/24 04:40		
13C24:2FTS (S)	91	%.	40-200		1	09/18/24 08:16	09/20/24 04:40		
13C26:2FTS (S)	90	%.	40-200		1	09/18/24 08:16	09/20/24 04:40		
13C28:2FTS (S)	80	%.	40-300		1	09/18/24 08:16	09/20/24 04:40		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 1881 **Lab ID: 10706310005** Collected: 08/29/24 11:40 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.1	0.79	1	09/18/24 08:16	09/20/24 04:56	763051-92-9	
3:3 FTCA	ND	ng/L	5.1	2.4	1	09/18/24 08:16	09/20/24 04:56	356-02-5	
4:2 FTS	ND	ng/L	4.1	0.49	1	09/18/24 08:16	09/20/24 04:56	757124-72-4	
5:3 FTCA	ND	ng/L	25.5	4.9	1	09/18/24 08:16	09/20/24 04:56	914637-49-3	
6:2 FTS	ND	ng/L	4.1	0.99	1	09/18/24 08:16	09/20/24 04:56	27619-97-2	
7:3 FTCA	ND	ng/L	25.5	5.3	1	09/18/24 08:16	09/20/24 04:56	812-70-4	
8:2 FTS	ND	ng/L	4.1	1.1	1	09/18/24 08:16	09/20/24 04:56	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.1	0.84	1	09/18/24 08:16	09/20/24 04:56	756426-58-1	
ADONA	ND	ng/L	4.1	0.60	1	09/18/24 08:16	09/20/24 04:56	919005-14-4	
HFPO-DA	ND	ng/L	4.1	0.79	1	09/18/24 08:16	09/20/24 04:56	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.35	1	09/18/24 08:16	09/20/24 04:56	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 04:56	4151-50-2	
NEtFOSE	ND	ng/L	10.2	3.3	1	09/18/24 08:16	09/20/24 04:56	1691-99-2	
NFDHA	ND	ng/L	2.0	0.58	1	09/18/24 08:16	09/20/24 04:56	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.32	1	09/18/24 08:16	09/20/24 04:56	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 04:56	31506-32-8	
NMeFOSE	ND	ng/L	10.2	2.7	1	09/18/24 08:16	09/20/24 04:56	24448-09-7	
PFBS	**4.3**	ng/L	1.0	0.33	1	09/18/24 08:16	09/20/24 04:56	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 04:56	335-76-2	
PFHxA	**4.1**	ng/L	1.0	0.15	1	09/18/24 08:16	09/20/24 04:56	307-24-4	
PFBA	**15.8**	ng/L	4.1	0.62	1	09/18/24 08:16	09/20/24 04:56	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 04:56	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	09/18/24 08:16	09/20/24 04:56	79780-39-5	
PFEESA	ND	ng/L	2.0	0.33	1	09/18/24 08:16	09/20/24 04:56	113507-82-7	
PFHpS	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 04:56	375-92-8	
PFMBA	ND	ng/L	2.0	0.32	1	09/18/24 08:16	09/20/24 04:56	863090-89-5	
PFMPA	ND	ng/L	2.0	0.49	1	09/18/24 08:16	09/20/24 04:56	377-73-1	
PFNS	ND	ng/L	1.0	0.25	1	09/18/24 08:16	09/20/24 04:56	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 04:56	754-91-6	
PFPeA	**4.5**	ng/L	2.0	0.30	1	09/18/24 08:16	09/20/24 04:56	2706-90-3	
PFPeS	ND	ng/L	1.0	0.19	1	09/18/24 08:16	09/20/24 04:56	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	09/18/24 08:16	09/20/24 04:56	307-55-1	
PFHpA	**2.0**	ng/L	1.0	0.22	1	09/18/24 08:16	09/20/24 04:56	375-85-9	
PFHxS	**1.4**	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 04:56	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 04:56	375-95-1	
PFOS	ND	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 04:56	1763-23-1	
PFOA	**1.2**	ng/L	1.0	0.35	1	09/18/24 08:16	09/20/24 04:56	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	09/18/24 08:16	09/20/24 04:56	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	09/18/24 08:16	09/20/24 04:56	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 04:56	2058-94-8	
Surrogates									
13C2-PFDoA (S)	75	%.	10-130		1	09/18/24 08:16	09/20/24 04:56		
13C3HFPO-DA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		
13C3-PFBS (S)	100	%.	40-135		1	09/18/24 08:16	09/20/24 04:56		
13C3-PFHxS (S)	94	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 1881 **Lab ID: 10706310005** Collected: 08/29/24 11:40 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	69	%.	5-130		1	09/18/24 08:16	09/20/24 04:56		
13C4-PFHpA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		
13C5-PFHxA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		
13C5-PFPeA (S)	87	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		
13C6-PFDA (S)	87	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		
13C8-PFOA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		
13C8-PFOS (S)	94	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		
13C8-PFOSA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		
13C9-PFNA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 04:56		
d3-MeFOSAA (S)	72	%.	40-170		1	09/18/24 08:16	09/20/24 04:56		
d3-NMeFOSA (S)	70	%.	10-130		1	09/18/24 08:16	09/20/24 04:56		
d5-EtFOSAA (S)	70	%.	25-135		1	09/18/24 08:16	09/20/24 04:56		
d5-NEtFOSA (S)	69	%.	10-130		1	09/18/24 08:16	09/20/24 04:56		
d7-NMeFOSE (S)	66	%.	10-130		1	09/18/24 08:16	09/20/24 04:56		
d9-NEtFOSE (S)	66	%.	10-130		1	09/18/24 08:16	09/20/24 04:56		
13C2-PFTA (S)	69	%.	10-130		1	09/18/24 08:16	09/20/24 04:56		
13C7-PFUdA (S)	79	%.	30-130		1	09/18/24 08:16	09/20/24 04:56		
13C24:2FTS (S)	88	%.	40-200		1	09/18/24 08:16	09/20/24 04:56		
13C26:2FTS (S)	87	%.	40-200		1	09/18/24 08:16	09/20/24 04:56		
13C28:2FTS (S)	84	%.	40-300		1	09/18/24 08:16	09/20/24 04:56		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 4959 **Lab ID: 10706310006** Collected: 08/29/24 12:15 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.0	0.79	1	09/18/24 08:16	09/20/24 05:11	763051-92-9	
3:3 FTCA	ND	ng/L	5.0	2.4	1	09/18/24 08:16	09/20/24 05:11	356-02-5	
4:2 FTS	ND	ng/L	4.0	0.49	1	09/18/24 08:16	09/20/24 05:11	757124-72-4	
5:3 FTCA	ND	ng/L	25.2	4.9	1	09/18/24 08:16	09/20/24 05:11	914637-49-3	
6:2 FTS	ND	ng/L	4.0	0.98	1	09/18/24 08:16	09/20/24 05:11	27619-97-2	
7:3 FTCA	ND	ng/L	25.2	5.3	1	09/18/24 08:16	09/20/24 05:11	812-70-4	
8:2 FTS	ND	ng/L	4.0	1.1	1	09/18/24 08:16	09/20/24 05:11	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.0	0.83	1	09/18/24 08:16	09/20/24 05:11	756426-58-1	
ADONA	ND	ng/L	4.0	0.59	1	09/18/24 08:16	09/20/24 05:11	919005-14-4	
HFPO-DA	ND	ng/L	4.0	0.79	1	09/18/24 08:16	09/20/24 05:11	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.35	1	09/18/24 08:16	09/20/24 05:11	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 05:11	4151-50-2	
NEtFOSE	ND	ng/L	10.1	3.2	1	09/18/24 08:16	09/20/24 05:11	1691-99-2	
NFDHA	ND	ng/L	2.0	0.57	1	09/18/24 08:16	09/20/24 05:11	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.32	1	09/18/24 08:16	09/20/24 05:11	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 05:11	31506-32-8	
NMeFOSE	ND	ng/L	10.1	2.7	1	09/18/24 08:16	09/20/24 05:11	24448-09-7	
PFBS	**10.2**	ng/L	1.0	0.32	1	09/18/24 08:16	09/20/24 05:11	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 05:11	335-76-2	
PFHxA	**23.0**	ng/L	1.0	0.15	1	09/18/24 08:16	09/20/24 05:11	307-24-4	
PFBA	**32.2**	ng/L	4.0	0.62	1	09/18/24 08:16	09/20/24 05:11	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 05:11	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	09/18/24 08:16	09/20/24 05:11	79780-39-5	
PFEESA	ND	ng/L	2.0	0.32	1	09/18/24 08:16	09/20/24 05:11	113507-82-7	
PFHpS	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 05:11	375-92-8	
PFMBA	ND	ng/L	2.0	0.32	1	09/18/24 08:16	09/20/24 05:11	863090-89-5	
PFMPA	ND	ng/L	2.0	0.49	1	09/18/24 08:16	09/20/24 05:11	377-73-1	
PFNS	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 05:11	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 05:11	754-91-6	
PFPeA	**23.7**	ng/L	2.0	0.30	1	09/18/24 08:16	09/20/24 05:11	2706-90-3	
PFPeS	**1.0**	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 05:11	2706-91-4	
PFDoA	ND	ng/L	1.0	0.22	1	09/18/24 08:16	09/20/24 05:11	307-55-1	
PFHpA	**20.0**	ng/L	1.0	0.21	1	09/18/24 08:16	09/20/24 05:11	375-85-9	
PFHxS	**18.4**	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 05:11	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 05:11	375-95-1	
PFOS	**6.0**	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 05:11	1763-23-1	
PFOA	**60.2**	ng/L	1.0	0.35	1	09/18/24 08:16	09/20/24 05:11	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	09/18/24 08:16	09/20/24 05:11	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	09/18/24 08:16	09/20/24 05:11	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 05:11	2058-94-8	
Surrogates									
13C2-PFDoA (S)	71	%.	10-130		1	09/18/24 08:16	09/20/24 05:11		
13C3HFPO-DA (S)	93	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		
13C3-PFBS (S)	101	%.	40-135		1	09/18/24 08:16	09/20/24 05:11		
13C3-PFHxS (S)	93	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 4959 **Lab ID: 10706310006** Collected: 08/29/24 12:15 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	83	%.	5-130		1	09/18/24 08:16	09/20/24 05:11		
13C4-PFHpA (S)	95	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		
13C5-PFHxA (S)	96	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		
13C5-PFPeA (S)	93	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		
13C6-PFDA (S)	87	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		
13C8-PFOA (S)	93	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		
13C8-PFOS (S)	94	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		
13C8-PFOSA (S)	87	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		
13C9-PFNA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 05:11		
d3-MeFOSAA (S)	73	%.	40-170		1	09/18/24 08:16	09/20/24 05:11		
d3-NMeFOSA (S)	64	%.	10-130		1	09/18/24 08:16	09/20/24 05:11		
d5-EtFOSAA (S)	72	%.	25-135		1	09/18/24 08:16	09/20/24 05:11		
d5-NEtFOSA (S)	60	%.	10-130		1	09/18/24 08:16	09/20/24 05:11		
d7-NMeFOSE (S)	68	%.	10-130		1	09/18/24 08:16	09/20/24 05:11		
d9-NEtFOSE (S)	69	%.	10-130		1	09/18/24 08:16	09/20/24 05:11		
13C2-PFTA (S)	65	%.	10-130		1	09/18/24 08:16	09/20/24 05:11		
13C7-PFUdA (S)	81	%.	30-130		1	09/18/24 08:16	09/20/24 05:11		
13C24:2FTS (S)	91	%.	40-200		1	09/18/24 08:16	09/20/24 05:11		
13C26:2FTS (S)	91	%.	40-200		1	09/18/24 08:16	09/20/24 05:11		
13C28:2FTS (S)	80	%.	40-300		1	09/18/24 08:16	09/20/24 05:11		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 2317 **Lab ID: 10706310007** Collected: 08/29/24 12:50 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.2	0.81	1	09/18/24 08:16	09/20/24 05:58	763051-92-9	
3:3 FTCA	ND	ng/L	5.2	2.4	1	09/18/24 08:16	09/20/24 05:58	356-02-5	
4:2 FTS	ND	ng/L	4.2	0.50	1	09/18/24 08:16	09/20/24 05:58	757124-72-4	
5:3 FTCA	ND	ng/L	26.0	5.0	1	09/18/24 08:16	09/20/24 05:58	914637-49-3	
6:2 FTS	ND	ng/L	4.2	1.0	1	09/18/24 08:16	09/20/24 05:58	27619-97-2	
7:3 FTCA	ND	ng/L	26.0	5.4	1	09/18/24 08:16	09/20/24 05:58	812-70-4	
8:2 FTS	ND	ng/L	4.2	1.1	1	09/18/24 08:16	09/20/24 05:58	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.2	0.86	1	09/18/24 08:16	09/20/24 05:58	756426-58-1	
ADONA	ND	ng/L	4.2	0.61	1	09/18/24 08:16	09/20/24 05:58	919005-14-4	
HFPO-DA	ND	ng/L	4.2	0.81	1	09/18/24 08:16	09/20/24 05:58	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.36	1	09/18/24 08:16	09/20/24 05:58	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 05:58	4151-50-2	
NEtFOSE	ND	ng/L	10.4	3.3	1	09/18/24 08:16	09/20/24 05:58	1691-99-2	
NFDHA	ND	ng/L	2.1	0.59	1	09/18/24 08:16	09/20/24 05:58	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.33	1	09/18/24 08:16	09/20/24 05:58	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.28	1	09/18/24 08:16	09/20/24 05:58	31506-32-8	
NMeFOSE	ND	ng/L	10.4	2.8	1	09/18/24 08:16	09/20/24 05:58	24448-09-7	
PFBS	**12.2**	ng/L	1.0	0.33	1	09/18/24 08:16	09/20/24 05:58	375-73-5	
PFDA	ND	ng/L	1.0	0.19	1	09/18/24 08:16	09/20/24 05:58	335-76-2	
PFHxA	**21.4**	ng/L	1.0	0.16	1	09/18/24 08:16	09/20/24 05:58	307-24-4	
PFBA	**25.1**	ng/L	4.2	0.64	1	09/18/24 08:16	09/20/24 05:58	375-22-4	
PFDS	ND	ng/L	1.0	0.28	1	09/18/24 08:16	09/20/24 05:58	335-77-3	
PFDoS	ND	ng/L	1.0	0.29	1	09/18/24 08:16	09/20/24 05:58	79780-39-5	
PFEESA	ND	ng/L	2.1	0.33	1	09/18/24 08:16	09/20/24 05:58	113507-82-7	
PFHpS	ND	ng/L	1.0	0.25	1	09/18/24 08:16	09/20/24 05:58	375-92-8	
PFMBA	ND	ng/L	2.1	0.33	1	09/18/24 08:16	09/20/24 05:58	863090-89-5	
PFMPA	ND	ng/L	2.1	0.50	1	09/18/24 08:16	09/20/24 05:58	377-73-1	
PFNS	ND	ng/L	1.0	0.25	1	09/18/24 08:16	09/20/24 05:58	68259-12-1	
PFOSA	ND	ng/L	1.0	0.25	1	09/18/24 08:16	09/20/24 05:58	754-91-6	
PFPeA	**20.6**	ng/L	2.1	0.31	1	09/18/24 08:16	09/20/24 05:58	2706-90-3	
PFPeS	**1.1**	ng/L	1.0	0.19	1	09/18/24 08:16	09/20/24 05:58	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	09/18/24 08:16	09/20/24 05:58	307-55-1	
PFHpA	**19.2**	ng/L	1.0	0.22	1	09/18/24 08:16	09/20/24 05:58	375-85-9	
PFHxS	**16.2**	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 05:58	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 05:58	375-95-1	
PFOS	**4.5**	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 05:58	1763-23-1	
PFOA	**57.8**	ng/L	1.0	0.36	1	09/18/24 08:16	09/20/24 05:58	335-67-1	
PFTeDA	ND	ng/L	1.0	0.30	1	09/18/24 08:16	09/20/24 05:58	376-06-7	
PFTrDA	ND	ng/L	1.0	0.21	1	09/18/24 08:16	09/20/24 05:58	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 05:58	2058-94-8	
Surrogates									
13C2-PFDoA (S)	84	%.	10-130		1	09/18/24 08:16	09/20/24 05:58		
13C3HFPO-DA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		
13C3-PFBS (S)	97	%.	40-135		1	09/18/24 08:16	09/20/24 05:58		
13C3-PFHxS (S)	93	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 2317 **Lab ID: 10706310007** Collected: 08/29/24 12:50 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	82	%.	5-130		1	09/18/24 08:16	09/20/24 05:58		
13C4-PFHpA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		
13C5-PFHxA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		
13C5-PFPeA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		
13C6-PFDA (S)	86	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		
13C8-PFOA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		
13C8-PFOS (S)	95	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		
13C8-PFOSA (S)	90	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		
13C9-PFNA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 05:58		
d3-MeFOSAA (S)	79	%.	40-170		1	09/18/24 08:16	09/20/24 05:58		
d3-NMeFOSA (S)	74	%.	10-130		1	09/18/24 08:16	09/20/24 05:58		
d5-EtFOSAA (S)	80	%.	25-135		1	09/18/24 08:16	09/20/24 05:58		
d5-NEtFOSA (S)	77	%.	10-130		1	09/18/24 08:16	09/20/24 05:58		
d7-NMeFOSE (S)	81	%.	10-130		1	09/18/24 08:16	09/20/24 05:58		
d9-NEtFOSE (S)	85	%.	10-130		1	09/18/24 08:16	09/20/24 05:58		
13C2-PFTA (S)	79	%.	10-130		1	09/18/24 08:16	09/20/24 05:58		
13C7-PFUdA (S)	85	%.	30-130		1	09/18/24 08:16	09/20/24 05:58		
13C24:2FTS (S)	87	%.	40-200		1	09/18/24 08:16	09/20/24 05:58		
13C26:2FTS (S)	85	%.	40-200		1	09/18/24 08:16	09/20/24 05:58		
13C28:2FTS (S)	82	%.	40-300		1	09/18/24 08:16	09/20/24 05:58		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 5276 **Lab ID: 10706310008** Collected: 08/29/24 13:30 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.0	0.78	1	09/18/24 08:16	09/20/24 06:14	763051-92-9	
3:3 FTCA	ND	ng/L	5.0	2.3	1	09/18/24 08:16	09/20/24 06:14	356-02-5	
4:2 FTS	ND	ng/L	4.0	0.48	1	09/18/24 08:16	09/20/24 06:14	757124-72-4	
5:3 FTCA	ND	ng/L	25.1	4.9	1	09/18/24 08:16	09/20/24 06:14	914637-49-3	
6:2 FTS	ND	ng/L	4.0	0.98	1	09/18/24 08:16	09/20/24 06:14	27619-97-2	
7:3 FTCA	ND	ng/L	25.1	5.3	1	09/18/24 08:16	09/20/24 06:14	812-70-4	
8:2 FTS	ND	ng/L	4.0	1.1	1	09/18/24 08:16	09/20/24 06:14	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.0	0.83	1	09/18/24 08:16	09/20/24 06:14	756426-58-1	
ADONA	ND	ng/L	4.0	0.59	1	09/18/24 08:16	09/20/24 06:14	919005-14-4	
HFPO-DA	ND	ng/L	4.0	0.78	1	09/18/24 08:16	09/20/24 06:14	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.35	1	09/18/24 08:16	09/20/24 06:14	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 06:14	4151-50-2	
NEtFOSE	ND	ng/L	10.1	3.2	1	09/18/24 08:16	09/20/24 06:14	1691-99-2	
NFDHA	ND	ng/L	2.0	0.57	1	09/18/24 08:16	09/20/24 06:14	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.32	1	09/18/24 08:16	09/20/24 06:14	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 06:14	31506-32-8	
NMeFOSE	ND	ng/L	10.1	2.7	1	09/18/24 08:16	09/20/24 06:14	24448-09-7	
PFBS	**11.1**	ng/L	1.0	0.32	1	09/18/24 08:16	09/20/24 06:14	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 06:14	335-76-2	
PFHxA	**22.1**	ng/L	1.0	0.15	1	09/18/24 08:16	09/20/24 06:14	307-24-4	
PFBA	**20.0**	ng/L	4.0	0.62	1	09/18/24 08:16	09/20/24 06:14	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	09/18/24 08:16	09/20/24 06:14	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	09/18/24 08:16	09/20/24 06:14	79780-39-5	
PFEESA	ND	ng/L	2.0	0.32	1	09/18/24 08:16	09/20/24 06:14	113507-82-7	
PFHpS	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 06:14	375-92-8	
PFMBA	ND	ng/L	2.0	0.32	1	09/18/24 08:16	09/20/24 06:14	863090-89-5	
PFMPA	ND	ng/L	2.0	0.49	1	09/18/24 08:16	09/20/24 06:14	377-73-1	
PFNS	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 06:14	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	09/18/24 08:16	09/20/24 06:14	754-91-6	
PFPeA	**19.6**	ng/L	2.0	0.30	1	09/18/24 08:16	09/20/24 06:14	2706-90-3	
PFPeS	**1.2**	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 06:14	2706-91-4	
PFDoA	ND	ng/L	1.0	0.22	1	09/18/24 08:16	09/20/24 06:14	307-55-1	
PFHpA	**23.5**	ng/L	1.0	0.21	1	09/18/24 08:16	09/20/24 06:14	375-85-9	
PFHxS	**17.7**	ng/L	1.0	0.26	1	09/18/24 08:16	09/20/24 06:14	355-46-4	
PFNA	ND	ng/L	1.0	0.23	1	09/18/24 08:16	09/20/24 06:14	375-95-1	
PFOS	**3.6**	ng/L	1.0	0.18	1	09/18/24 08:16	09/20/24 06:14	1763-23-1	
PFOA	**61.2**	ng/L	1.0	0.34	1	09/18/24 08:16	09/20/24 06:14	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	09/18/24 08:16	09/20/24 06:14	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	09/18/24 08:16	09/20/24 06:14	72629-94-8	
PFUnA	ND	ng/L	1.0	0.25	1	09/18/24 08:16	09/20/24 06:14	2058-94-8	
Surrogates									
13C2-PFDoA (S)	84	%.	10-130		1	09/18/24 08:16	09/20/24 06:14		
13C3HFPO-DA (S)	92	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		
13C3-PFBS (S)	101	%.	40-135		1	09/18/24 08:16	09/20/24 06:14		
13C3-PFHxS (S)	98	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: 5276 **Lab ID: 10706310008** Collected: 08/29/24 13:30 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	77	%.	5-130		1	09/18/24 08:16	09/20/24 06:14		
13C4-PFHpA (S)	90	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		
13C5-PFHxA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		
13C5-PFPeA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		
13C6-PFDA (S)	87	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		
13C8-PFOA (S)	95	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		
13C8-PFOS (S)	92	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		
13C8-PFOSA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		
13C9-PFNA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 06:14		
d3-MeFOSAA (S)	79	%.	40-170		1	09/18/24 08:16	09/20/24 06:14		
d3-NMeFOSA (S)	73	%.	10-130		1	09/18/24 08:16	09/20/24 06:14		
d5-EtFOSAA (S)	79	%.	25-135		1	09/18/24 08:16	09/20/24 06:14		
d5-NEtFOSA (S)	72	%.	10-130		1	09/18/24 08:16	09/20/24 06:14		
d7-NMeFOSE (S)	80	%.	10-130		1	09/18/24 08:16	09/20/24 06:14		
d9-NEtFOSE (S)	83	%.	10-130		1	09/18/24 08:16	09/20/24 06:14		
13C2-PFTA (S)	83	%.	10-130		1	09/18/24 08:16	09/20/24 06:14		
13C7-PFUdA (S)	85	%.	30-130		1	09/18/24 08:16	09/20/24 06:14		
13C24:2FTS (S)	87	%.	40-200		1	09/18/24 08:16	09/20/24 06:14		
13C26:2FTS (S)	91	%.	40-200		1	09/18/24 08:16	09/20/24 06:14		
13C28:2FTS (S)	85	%.	40-300		1	09/18/24 08:16	09/20/24 06:14		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: Trip Blank **Lab ID: 10706310009** Collected: 08/29/24 07:00 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	3.9	0.76	1	09/18/24 08:16	09/20/24 06:29	763051-92-9	
3:3 FTCA	ND	ng/L	4.9	2.3	1	09/18/24 08:16	09/20/24 06:29	356-02-5	
4:2 FTS	ND	ng/L	3.9	0.47	1	09/18/24 08:16	09/20/24 06:29	757124-72-4	
5:3 FTCA	ND	ng/L	24.4	4.7	1	09/18/24 08:16	09/20/24 06:29	914637-49-3	
6:2 FTS	ND	ng/L	3.9	0.95	1	09/18/24 08:16	09/20/24 06:29	27619-97-2	
7:3 FTCA	ND	ng/L	24.4	5.1	1	09/18/24 08:16	09/20/24 06:29	812-70-4	
8:2 FTS	ND	ng/L	3.9	1.0	1	09/18/24 08:16	09/20/24 06:29	39108-34-4	
9Cl-PF3ONS	ND	ng/L	3.9	0.80	1	09/18/24 08:16	09/20/24 06:29	756426-58-1	
ADONA	ND	ng/L	3.9	0.57	1	09/18/24 08:16	09/20/24 06:29	919005-14-4	
HFPO-DA	ND	ng/L	3.9	0.76	1	09/18/24 08:16	09/20/24 06:29	13252-13-6	
NEtFOSAA	ND	ng/L	0.97	0.34	1	09/18/24 08:16	09/20/24 06:29	2991-50-6	
NEtFOSA	ND	ng/L	0.97	0.25	1	09/18/24 08:16	09/20/24 06:29	4151-50-2	
NEtFOSE	ND	ng/L	9.7	3.1	1	09/18/24 08:16	09/20/24 06:29	1691-99-2	
NFDHA	ND	ng/L	1.9	0.55	1	09/18/24 08:16	09/20/24 06:29	151772-58-6	
NMeFOSAA	ND	ng/L	0.97	0.31	1	09/18/24 08:16	09/20/24 06:29	2355-31-9	
NMeFOSA	ND	ng/L	0.97	0.26	1	09/18/24 08:16	09/20/24 06:29	31506-32-8	
NMeFOSE	ND	ng/L	9.7	2.6	1	09/18/24 08:16	09/20/24 06:29	24448-09-7	
PFBS	ND	ng/L	0.97	0.31	1	09/18/24 08:16	09/20/24 06:29	375-73-5	
PFDA	ND	ng/L	0.97	0.17	1	09/18/24 08:16	09/20/24 06:29	335-76-2	
PFHxA	ND	ng/L	0.97	0.15	1	09/18/24 08:16	09/20/24 06:29	307-24-4	
PFBA	ND	ng/L	3.9	0.60	1	09/18/24 08:16	09/20/24 06:29	375-22-4	
PFDS	ND	ng/L	0.97	0.26	1	09/18/24 08:16	09/20/24 06:29	335-77-3	
PFDoS	ND	ng/L	0.97	0.27	1	09/18/24 08:16	09/20/24 06:29	79780-39-5	
PFEESA	ND	ng/L	1.9	0.31	1	09/18/24 08:16	09/20/24 06:29	113507-82-7	
PFHpS	ND	ng/L	0.97	0.23	1	09/18/24 08:16	09/20/24 06:29	375-92-8	
PFMBA	ND	ng/L	1.9	0.31	1	09/18/24 08:16	09/20/24 06:29	863090-89-5	
PFMPA	ND	ng/L	1.9	0.47	1	09/18/24 08:16	09/20/24 06:29	377-73-1	
PFNS	ND	ng/L	0.97	0.23	1	09/18/24 08:16	09/20/24 06:29	68259-12-1	
PFOSA	ND	ng/L	0.97	0.23	1	09/18/24 08:16	09/20/24 06:29	754-91-6	
PFPeA	ND	ng/L	1.9	0.29	1	09/18/24 08:16	09/20/24 06:29	2706-90-3	
PFPeS	ND	ng/L	0.97	0.18	1	09/18/24 08:16	09/20/24 06:29	2706-91-4	
PFDoA	ND	ng/L	0.97	0.22	1	09/18/24 08:16	09/20/24 06:29	307-55-1	
PFHpA	ND	ng/L	0.97	0.21	1	09/18/24 08:16	09/20/24 06:29	375-85-9	
PFHxS	ND	ng/L	0.97	0.25	1	09/18/24 08:16	09/20/24 06:29	355-46-4	
PFNA	ND	ng/L	0.97	0.23	1	09/18/24 08:16	09/20/24 06:29	375-95-1	
PFOS	ND	ng/L	0.97	0.17	1	09/18/24 08:16	09/20/24 06:29	1763-23-1	
PFOA	ND	ng/L	0.97	0.33	1	09/18/24 08:16	09/20/24 06:29	335-67-1	
PFTeDA	ND	ng/L	0.97	0.28	1	09/18/24 08:16	09/20/24 06:29	376-06-7	
PFTrDA	ND	ng/L	0.97	0.19	1	09/18/24 08:16	09/20/24 06:29	72629-94-8	
PFUnA	ND	ng/L	0.97	0.25	1	09/18/24 08:16	09/20/24 06:29	2058-94-8	
Surrogates									
13C2-PFDoA (S)	88	%.	10-130		1	09/18/24 08:16	09/20/24 06:29		
13C3HFPO-DA (S)	94	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		
13C3-PFBS (S)	99	%.	40-135		1	09/18/24 08:16	09/20/24 06:29		
13C3-PFHxS (S)	95	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Sample: Trip Blank **Lab ID: 10706310009** Collected: 08/29/24 07:00 Received: 08/30/24 11:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	91	%.	5-130		1	09/18/24 08:16	09/20/24 06:29		
13C4-PFHpA (S)	93	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		
13C5-PFHxA (S)	91	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		
13C5-PFPeA (S)	88	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		
13C6-PFDA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		
13C8-PFOA (S)	92	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		
13C8-PFOS (S)	92	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		
13C8-PFOSA (S)	83	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		
13C9-PFNA (S)	89	%.	40-130		1	09/18/24 08:16	09/20/24 06:29		
d3-MeFOSAA (S)	77	%.	40-170		1	09/18/24 08:16	09/20/24 06:29		
d3-NMeFOSA (S)	74	%.	10-130		1	09/18/24 08:16	09/20/24 06:29		
d5-EtFOSAA (S)	77	%.	25-135		1	09/18/24 08:16	09/20/24 06:29		
d5-NEtFOSA (S)	77	%.	10-130		1	09/18/24 08:16	09/20/24 06:29		
d7-NMeFOSE (S)	83	%.	10-130		1	09/18/24 08:16	09/20/24 06:29		
d9-NEtFOSE (S)	85	%.	10-130		1	09/18/24 08:16	09/20/24 06:29		
13C2-PFTA (S)	82	%.	10-130		1	09/18/24 08:16	09/20/24 06:29		
13C7-PFUdA (S)	88	%.	30-130		1	09/18/24 08:16	09/20/24 06:29		
13C24:2FTS (S)	91	%.	40-200		1	09/18/24 08:16	09/20/24 06:29		
13C26:2FTS (S)	93	%.	40-200		1	09/18/24 08:16	09/20/24 06:29		
13C28:2FTS (S)	87	%.	40-300		1	09/18/24 08:16	09/20/24 06:29		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

QC Batch: 968295
QC Batch Method: EPA 1633 DRAFT
Analysis Method: EPA 1633 DRAFT
Analysis Description: 1633 W
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10706310001, 10706310002, 10706310003, 10706310004, 10706310005, 10706310006, 10706310007, 10706310008, 10706310009

METHOD BLANK: 5059992
Matrix: Water
Associated Lab Samples: 10706310001, 10706310002, 10706310003, 10706310004, 10706310005, 10706310006, 10706310007, 10706310008, 10706310009

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
11Cl-PF3OUdS	ng/L	ND	3.9	0.76	09/20/24 01:48	
3:3 FTCA	ng/L	ND	4.9	2.3	09/20/24 01:48	
4:2 FTS	ng/L	ND	3.9	0.47	09/20/24 01:48	
5:3 FTCA	ng/L	ND	24.4	4.7	09/20/24 01:48	
6:2 FTS	ng/L	ND	3.9	0.95	09/20/24 01:48	
7:3 FTCA	ng/L	ND	24.4	5.1	09/20/24 01:48	
8:2 FTS	ng/L	ND	3.9	1.0	09/20/24 01:48	
9Cl-PF3ONS	ng/L	ND	3.9	0.80	09/20/24 01:48	
ADONA	ng/L	ND	3.9	0.57	09/20/24 01:48	
HFPO-DA	ng/L	ND	3.9	0.76	09/20/24 01:48	
NEtFOSA	ng/L	ND	0.98	0.25	09/20/24 01:48	
NEtFOSAA	ng/L	ND	0.98	0.34	09/20/24 01:48	
NEtFOSE	ng/L	ND	9.8	3.1	09/20/24 01:48	
NFDHA	ng/L	ND	2.0	0.55	09/20/24 01:48	
NMeFOSA	ng/L	ND	0.98	0.26	09/20/24 01:48	
NMeFOSAA	ng/L	ND	0.98	0.31	09/20/24 01:48	
NMeFOSE	ng/L	ND	9.8	2.6	09/20/24 01:48	
PFBA	ng/L	ND	3.9	0.60	09/20/24 01:48	
PFBS	ng/L	ND	0.98	0.31	09/20/24 01:48	
PFDA	ng/L	ND	0.98	0.17	09/20/24 01:48	
PFDoA	ng/L	ND	0.98	0.22	09/20/24 01:48	
PFDoS	ng/L	ND	0.98	0.27	09/20/24 01:48	
PFDS	ng/L	ND	0.98	0.26	09/20/24 01:48	
PFEESA	ng/L	ND	2.0	0.31	09/20/24 01:48	
PFHpA	ng/L	ND	0.98	0.21	09/20/24 01:48	
PFHpS	ng/L	ND	0.98	0.23	09/20/24 01:48	
PFHxA	ng/L	ND	0.98	0.15	09/20/24 01:48	
PFHxS	ng/L	ND	0.98	0.25	09/20/24 01:48	
PFMBA	ng/L	ND	2.0	0.31	09/20/24 01:48	
PFMPA	ng/L	ND	2.0	0.47	09/20/24 01:48	
PFNA	ng/L	ND	0.98	0.23	09/20/24 01:48	
PFNS	ng/L	ND	0.98	0.24	09/20/24 01:48	
PFOA	ng/L	ND	0.98	0.33	09/20/24 01:48	
PFOS	ng/L	ND	0.98	0.17	09/20/24 01:48	
PFOSA	ng/L	ND	0.98	0.23	09/20/24 01:48	
PFPeA	ng/L	ND	2.0	0.29	09/20/24 01:48	
PFPeS	ng/L	ND	0.98	0.18	09/20/24 01:48	
PFTeDA	ng/L	ND	0.98	0.28	09/20/24 01:48	
PFTrDA	ng/L	ND	0.98	0.19	09/20/24 01:48	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

METHOD BLANK: 5059992 Matrix: Water

Associated Lab Samples: 10706310001, 10706310002, 10706310003, 10706310004, 10706310005, 10706310006, 10706310007, 10706310008, 10706310009

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
PFUnA	ng/L	ND	0.98	0.25	09/20/24 01:48	
13C2-PFDoA (S)	%.	86	10-130		09/20/24 01:48	
13C2-PFTA (S)	%.	80	10-130		09/20/24 01:48	
13C24:2FTS (S)	%.	90	40-200		09/20/24 01:48	
13C26:2FTS (S)	%.	88	40-200		09/20/24 01:48	
13C28:2FTS (S)	%.	83	40-300		09/20/24 01:48	
13C3-PFBS (S)	%.	103	40-135		09/20/24 01:48	
13C3-PFHxS (S)	%.	97	40-130		09/20/24 01:48	
13C3HFPO-DA (S)	%.	98	40-130		09/20/24 01:48	
13C4-PFBA (S)	%.	96	5-130		09/20/24 01:48	
13C4-PFHpA (S)	%.	96	40-130		09/20/24 01:48	
13C5-PFHxA (S)	%.	96	40-130		09/20/24 01:48	
13C5-PFPeA (S)	%.	94	40-130		09/20/24 01:48	
13C6-PFDA (S)	%.	94	40-130		09/20/24 01:48	
13C7-PFUdA (S)	%.	91	30-130		09/20/24 01:48	
13C8-PFOA (S)	%.	95	40-130		09/20/24 01:48	
13C8-PFOS (S)	%.	103	40-130		09/20/24 01:48	
13C8-PFOSA (S)	%.	89	40-130		09/20/24 01:48	
13C9-PFNA (S)	%.	92	40-130		09/20/24 01:48	
d3-MeFOSAA (S)	%.	84	40-170		09/20/24 01:48	
d3-NMeFOSA (S)	%.	69	10-130		09/20/24 01:48	
d5-EtFOSAA (S)	%.	80	25-135		09/20/24 01:48	
d5-NEtFOSA (S)	%.	76	10-130		09/20/24 01:48	
d7-NMeFOSE (S)	%.	86	10-130		09/20/24 01:48	
d9-NEtFOSE (S)	%.	91	10-130		09/20/24 01:48	

LABORATORY CONTROL SAMPLE & LCSD: 5059993 5059994

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
11Cl-PF3OUdS	ng/L	87.1	79.3	86.0	91	94	55-160	8	30	
3:3 FTCA	ng/L	115	109	109	94	90	65-130	0	30	
4:2 FTS	ng/L	86.5	84.1	87.6	97	97	70-145	4	30	
5:3 FTCA	ng/L	577	559	575	97	95	70-135	3	30	
6:2 FTS	ng/L	87.6	86.6	94.0	99	102	65-155	8	30	
7:3 FTCA	ng/L	577	549	562	95	93	50-145	2	30	
8:2 FTS	ng/L	88.8	87.4	93.4	98	100	60-150	7	30	
9Cl-PF3ONS	ng/L	86.5	85.0	92.8	98	102	70-155	9	30	
ADONA	ng/L	87.1	87.5	92.4	100	101	65-145	5	30	
HFPO-DA	ng/L	92.3	90.3	91.5	98	95	70-140	1	30	
NEtFOSA	ng/L	23.1	20.7	20.8	90	86	65-145	1	30	
NEtFOSAA	ng/L	23.1	22.0	21.4	95	88	70-145	3	30	
NEtFOSE	ng/L	231	221	240	96	99	70-135	8	30	
NFDHA	ng/L	46.1	45.5	48.6	99	100	50-150	6	30	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

LABORATORY CONTROL SAMPLE & LCSD: 5059993 5059994

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
NMeFOSA	ng/L	23.1	20.3	21.5	88	89	60-150	6	30	
NMeFOSAA	ng/L	23.1	22.2	22.3	96	92	50-140	1	30	
NMeFOSE	ng/L	231	216	236	94	98	70-145	9	30	
PFBA	ng/L	92.3	89.0	91.8	96	95	70-140	3	30	
PFBS	ng/L	20.5	19.5	20.0	95	93	60-145	2	30	
PFDA	ng/L	23.1	22.6	22.6	98	94	70-140	0	30	
PFDoA	ng/L	23.1	21.4	22.4	93	93	70-140	5	30	
PFDoS	ng/L	22.4	17.9	18.6	80	79	50-145	4	30	
PFDS	ng/L	22.3	19.8	19.4	89	83	60-145	2	30	
PFEESA	ng/L	41.1	39.2	41.3	95	96	70-140	5	30	
PFHpA	ng/L	23.1	22.3	23.5	97	97	70-150	5	30	
PFHpS	ng/L	22	20.9	20.7	95	90	70-150	1	30	
PFHxA	ng/L	23.1	22.1	23.8	96	99	70-145	7	30	
PFHxS	ng/L	21.1	20.3	20.8	96	94	65-145	2	30	
PFMBA	ng/L	46.1	44.4	45.6	96	94	60-150	3	30	
PFMPA	ng/L	46.1	41.9	43.5	91	90	55-140	4	30	
PFNA	ng/L	23.1	21.7	23.4	94	97	70-150	8	30	
PFNS	ng/L	22.2	20.3	20.9	91	90	65-145	3	30	
PFOA	ng/L	23.1	22.4	22.9	97	95	70-150	2	30	
PFOS	ng/L	21.4	20.5	20.4	96	91	55-150	1	30	
PFOSA	ng/L	23.1	22.4	22.7	97	94	70-145	2	30	
PFPeA	ng/L	46.1	44.9	45.8	97	95	65-135	2	30	
PFPeS	ng/L	21.7	21.2	21.5	98	95	65-140	1	30	
PFTeDA	ng/L	23.1	22.7	23.2	98	96	60-140	2	30	
PFTrDA	ng/L	23.1	20.7	22.3	90	92	65-140	7	30	
PFUnA	ng/L	23.1	22.2	22.3	96	92	70-145	1	30	
13C2-PFDoA (S)	%.				87	80	10-130			
13C2-PFTA (S)	%.				79	77	10-130			
13C24:2FTS (S)	%.				90	88	40-200			
13C26:2FTS (S)	%.				90	86	40-200			
13C28:2FTS (S)	%.				90	85	40-300			
13C3-PFBS (S)	%.				103	101	40-135			
13C3-PFHxS (S)	%.				101	99	40-130			
13C3HFPO-DA (S)	%.				95	85	40-130			
13C4-PFBA (S)	%.				95	92	5-130			
13C4-PFHpA (S)	%.				97	89	40-130			
13C5-PFHxA (S)	%.				97	90	40-130			
13C5-PFPeA (S)	%.				92	87	40-130			
13C6-PFDA (S)	%.				93	89	40-130			
13C7-PFUdA (S)	%.				89	90	30-130			
13C8-PFOA (S)	%.				94	95	40-130			
13C8-PFOS (S)	%.				99	95	40-130			
13C8-PFOSA (S)	%.				89	83	40-130			
13C9-PFNA (S)	%.				91	90	40-130			
d3-MeFOSAA (S)	%.				83	74	40-170			
d3-NMeFOSA (S)	%.				83	74	10-130			
d5-EtFOSAA (S)	%.				78	75	25-135			

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

LABORATORY CONTROL SAMPLE & LCSD: 5059993 5059994

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
d5-NEtFOSA (S)	%.				85	77	10-130			
d7-NMeFOSE (S)	%.				92	84	10-130			
d9-NEtFOSE (S)	%.				94	86	10-130			

LABORATORY CONTROL SAMPLE: 5059995

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
11Cl-PF3OUdS	ng/L	7.5	6.5	86	55-160	
3:3 FTCA	ng/L	10	9.7	97	65-130	
4:2 FTS	ng/L	7.5	6.2	83	70-145	
5:3 FTCA	ng/L	49.8	48.6	98	70-135	
6:2 FTS	ng/L	7.6	6.8	90	65-155	
7:3 FTCA	ng/L	49.8	45.4	91	50-145	
8:2 FTS	ng/L	7.7	6.9	90	60-150	
9Cl-PF3ONS	ng/L	7.5	6.2	83	70-155	
ADONA	ng/L	7.5	6.4	85	65-145	
HFPO-DA	ng/L	8	8.0	100	70-140	
NEtFOSA	ng/L	2	1.9	94	65-145	
NEtFOSAA	ng/L	2	1.6	83	70-145	
NEtFOSE	ng/L	19.9	17.7	89	70-135	
NFDHA	ng/L	4	3.7	92	50-150	
NMeFOSA	ng/L	2	1.8	88	60-150	
NMeFOSAA	ng/L	2	1.7	86	50-140	
NMeFOSE	ng/L	19.9	16.9	85	70-145	
PFBA	ng/L	8	7.6	95	70-140	
PFBS	ng/L	1.8	1.6	88	60-145	
PFDA	ng/L	2	1.9	95	70-140	
PFDoA	ng/L	2	1.8	92	70-140	
PFDoS	ng/L	1.9	1.5	80	50-145	
PFDS	ng/L	1.9	1.7	88	60-145	
PFEESA	ng/L	3.5	3.1	88	70-140	
PFHpA	ng/L	2	1.7	84	70-150	
PFHpS	ng/L	1.9	1.7	89	70-150	
PFHxA	ng/L	2	1.8	89	70-145	
PFHxS	ng/L	1.8	1.7	93	65-145	
PFMBA	ng/L	4	3.5	87	60-150	
PFMPA	ng/L	4	3.6	90	55-140	
PFNA	ng/L	2	1.6	81	70-150	
PFNS	ng/L	1.9	1.6	83	65-145	
PFOA	ng/L	2	1.8	88	70-150	
PFOS	ng/L	1.8	1.8	98	55-150	
PFOSA	ng/L	2	1.6	81	70-145	
PFPeA	ng/L	4	3.6	90	65-135	
PFPeS	ng/L	1.9	1.9	100	65-140	
PFTeDA	ng/L	2	1.7	84	60-140	

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REPORT OF LABORATORY ANALYSIS

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1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

LABORATORY CONTROL SAMPLE: 5059995

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PFTrDA	ng/L	2	1.6	81	65-140	
PFUnA	ng/L	2	1.7	84	70-145	
13C2-PFDoA (S)	%.			79	10-130	
13C2-PFTA (S)	%.			72	10-130	
13C24:2FTS (S)	%.			84	40-200	
13C26:2FTS (S)	%.			84	40-200	
13C28:2FTS (S)	%.			81	40-300	
13C3-PFBS (S)	%.			97	40-135	
13C3-PFHxS (S)	%.			90	40-130	
13C3HFPO-DA (S)	%.			92	40-130	
13C4-PFBA (S)	%.			90	5-130	
13C4-PFHpA (S)	%.			92	40-130	
13C5-PFHxA (S)	%.			91	40-130	
13C5-PFPeA (S)	%.			87	40-130	
13C6-PFDA (S)	%.			84	40-130	
13C7-PFUdA (S)	%.			86	30-130	
13C8-PFOA (S)	%.			90	40-130	
13C8-PFOS (S)	%.			89	40-130	
13C8-PFOSA (S)	%.			84	40-130	
13C9-PFNA (S)	%.			87	40-130	
d3-MeFOSAA (S)	%.			75	40-170	
d3-NMeFOSA (S)	%.			69	10-130	
d5-EtFOSAA (S)	%.			77	25-135	
d5-NEtFOSA (S)	%.			71	10-130	
d7-NMeFOSE (S)	%.			81	10-130	
d9-NEtFOSE (S)	%.			88	10-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: B2305038.02 Jonny Rooter
Pace Project No.: 10706310

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10706310001	**1950**	EPA 1633 DRAFT	968295	EPA 1633 DRAFT	969245
10706310002	**1965**	EPA 1633 DRAFT	968295	EPA 1633 DRAFT	969245
10706310003	**2011**	EPA 1633 DRAFT	968295	EPA 1633 DRAFT	969245
10706310004	**2053**	EPA 1633 DRAFT	968295	EPA 1633 DRAFT	969245
10706310005	**1881**	EPA 1633 DRAFT	968295	EPA 1633 DRAFT	969245
10706310006	**4959**	EPA 1633 DRAFT	968295	EPA 1633 DRAFT	969245
10706310007	**2317**	EPA 1633 DRAFT	968295	EPA 1633 DRAFT	969245
10706310008	**5276**	EPA 1633 DRAFT	968295	EPA 1633 DRAFT	969245
10706310009	**Trip Blank**	EPA 1633 DRAFT	968295	EPA 1633 DRAFT	969245

BRAUN INTERTEC

Braun Intertec EDGE Chain-of-Custody Form

Chain-of-custody form is a legal document. Please complete all applicable fields.

WO#: 10706310

10706310

Lab Work Order Sticker

PROJECT INFORMATION

Project No.:	B2305038.02	MPCA Site ID:	----
Project Name:	Jonny Rooter Sewer and Drain	MPCA Task Code:	----
Project Manager:	Aaron Volker	MDH Program Code:	----
PM Email:	AVolker@braunintertec.com	MPCA WO No.:	----
PM Phone No.:	320.980.6461	Template/Profile:	34251
CC Name & Email:	Cling@braunintertec.com	Prelogin/Bottle Order:	----

LABORATORY

Lab Name:	Pace Analytical	Turn-Around Time:	☒ Standard ☐ RUSH
Lab Address:	1700 Elm Street SE	Date Requested:	
	Minneapolis, MN 55414	Deliverable(s):	☒ Level II ☐ Level III ☐ Level IV
EPA Lab ID:	MN00064	Send lab data file to:	☒ Braun Intertec ☐ MPCA
Potential Hazard?	☒ No ☐ Yes	Billing Rate:	☒ Standard ☐ MPCA
If yes, specify in Comments field.			☐ Petrofund ☐ Other:

SAMPLE & ANALYSIS INFORMATION

SAMPLE TYPES
Sample = Sample
QC-FR = Duplicate
QC-FB = Field blank
QC-EB = Equipment blank
QC-TB = Trip blank
S-IDW = Inv. derived waste
QC-BLANK for LUI for QC-FB, QC-EB, QC-TB, S-IDW.

SAMPLING METHODS
SOILBORI = Subsurface soil from boring
SHALLSOIL = Surface soil
WELL-SUBMERS = Submersible pump
WELL-NONSUBMERS = Nonsubmersible pump
WELL-BAIL = Bailer
SW-GAS = Any soil vapor, indoor, or outdoor air
OTHER = Any other sampling method(s)
QC-BLANK = QC-FB, QC-EB, QC-TB, S-IDW

LAB MATRICES
SD = Soil, sediment, solid
NW = Nonpotable water
DW = Drinking water
AR = Air, gas, vapor
BL = Biological material
TS = Tissue
OT = Other
FB, EB, TB must have Lab Matrix

FIELD MATRICES
Soil-Sub = Subsurface soil
Soil-Surf = Surface soil
Wtr-Ground = Groundwater
Wtr-Drink = Drinking water
Gas-Soil = Soil gas/vapor
Air-Indoor = Indoor air
Air-Ambnt = Outdoor air
QC-BLANK for FB, EB, TB, IDW

List preservative used for each analysis; if n/a write "None". If soil and water samples have different preservatives for the same analysis, use two columns.

Field-filtered, Y or N

LUI	Sample Name	Sample Type	Start Date mm/dd/yyyy	Start Time 24-hr hh:mm	Depth Start	Depth End	Depth Units	End Date mm/dd/yyyy	End Time 24-hr hh:mm	Sampling Method	Lab Matrix	Field Matrix	AIS	Comments	# of Cont.	Preserv	Analysis	FF	PFAS by method 1633	Lab Sample No.	#
																None		N			
----	1950	Sample	--	--	-	-	-	8/29/2024	10:08	Other	NW	Wtr-Drink	N		3				X		1
----	1965	Sample	--	--	-	-	-	8/29/2024	10:30	Other	NW	Wtr-Drink	N		3				X		2
----	2011	Sample	--	--	-	-	-	8/29/2024	10:45	Other	NW	Wtr-Drink	N		3				X		3
----	2053	Sample	--	--	-	-	-	8/29/2024	11:00	Other	NW	Wtr-Drink	N		3				X		4
----	1881	Sample	--	--	-	-	-	8/29/2024	11:40	Other	NW	Wtr-Drink	N		3				X		5
----	4959	Sample	--	--	-	-	-	8/29/2024	12:15	Other	NW	Wtr-Drink	N		3				X		6
----	2317	Sample	--	--	-	-	-	8/29/2024	12:50	Other	NW	Wtr-Drink	N		3				X		7
----	5276	Sample	--	--	-	-	-	8/29/2024	13:30	Other	NW	Wtr-Drink	N		3				X		8
----	Trip Blank	QC-TB	--	--	-	-	-	8/29/2024	7:00	QC-BLANK	NW	QC-BLANK	N		1				1		9
																					10

Sampler's Name: Cooper Ling	Relinquished by (name): Cooper Ling	Company: Braun	Date/Time: 8/29/2024 15:00	Received By:	Company: Pace	Date/Time: 8/30/24 1000	Comments: Lab supplied trip blank	No. of Coolers/Boxes: 1
Sampler's Phone: 612.723.4778	Relinquished by:	Company: Pace	Date/Time: 8/30/24 1000	Received By:	Company: Pace	Date/Time: 8/30/24 1020		
Sampler's Signature:	Relinquished by:	Company: Pace	Date/Time: 8/30/24 1140	Received By: Melissa/Pace	Company: Pace	Date/Time: 8/30/24 1140		Page 1 of 1

Temp° 4.1

ENV-FRM-MIN4-0150 v17_Sample Condition Upon Receipt

CLIENT NAME: Braun Intertec | **PROJECT #:** WO#: 10706310 | PM: BGB | Due Date: 09/11/24 | CLIENT: Braun-BLM

COURIER: ☐ Client ☐ Commercial ☐ FedEx ☒ Pace ☐ SpeeDee ☐ UPS ☐ USPS

TRACKING NUMBER: _____ ☐ See Exceptions form ENV-FRM-MIN4-0142

Custody Seal on Cooler/Box Present: ☐ YES ☒ NO **Seals Intact:** ☐ YES ☒ NO **Biological Tissue Frozen:** ☐ YES ☐ NO ☒ N/A

Packing Material: ☐ Bubble Bags ☒ Bubble Wrap ☐ None ☐ Other **Temp Blank:** ☒ YES ☐ NO **Type of Ice:** ☐ Blue ☐ Dry ☒ Wet ☐ Melted ☐ None

Thermometer: ☐ T1 (0461) ☐ T2 (0436) ☒ T3 (0459) ☐ T4 (0402) ☐ T5 (0178) ☐ T6 (0235) ☐ T7 (0042) ☐ T8 (0775) ☐ T9 (0727) ☐ 01339252 (1710)

Did Samples Originate in West Virginia: ☐ YES ☒ NO	**Were All Container Temps taken:** ☐ YES ☐ NO ☒ N/A
Correction Factor: -0.1 **Cooler Temp Read w/Temp Blank:** 4.2 °C **Cooler Temp Corrected w/Temp Blank:** 4.1 °C	**Average Corrected Temp (no Temp Blank Only):** _____ °C
NOTE: *Temp should be above freezing to 6°C.*	☐ See Exceptions Form ENV-FRM-MIN4-0142 ☐ 1 Container
USDA Regulated Soil: ☒ N/A ☐ Water Sample/Other (describe): _____	**Initials & Date of Person Examining Contents:** MMM 8/31/24
Did Samples originate from one of the following states (check maps) – AL, AR, AZ, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX, or VA: ☐ YES ☐ NO	Did samples originate from a foreign source (international, including Hawaii and Puerto Rico): ☐ YES ☐ NO
NOTE: If YES to either question, fill out a Regulated Soil Checklist (ENV-FRM-MIN4-0154) and include with SCUR/COC paperwork.	

LOCATION (check one): ☐ DULUTH ☒ MINNEAPOLIS ☐ VIRGINIA	YES	NO	N/A	COMMENT(S)
Chain of Custody Present and Filled Out?	☒	☐		1.
Chain of Custody Relinquished?	☒	☐		2.
Sampler Name and/or Signature on COC?	☒	☐	☐	3.
Samples Arrived within Hold Time?	☒	☐		4. If Fecal: ☐ <8 hrs ☐ >8 hr, <24 hr ☐ No
Short Hold Time Analysis (<72 hr)?	☐	☒		5. ☐ BOD / cBOD ☐ Fecal coliform ☐ Hex Chrom ☐ HPC ☐ Nitrate ☐ Nitrite ☐ Ortho Phos ☐ Total coliform/*E. coli* ☐ Other: _____
Rush Turn Around Time Requested?	☐	☒		6.
Sufficient Sample Volume?	☒	☐		7.
Correct Containers Used?	☒	☐	☐	8.
– Pace Containers Used?	☐	☒		
Containers Intact?	☒	☐		9.
Field Filtered Volume Received for Dissolved Tests?	☐	☐	☒	10. Is sediment visible in the dissolved container: ☐ YES ☐ NO
Is sufficient information available to reconcile the samples to the COC? **NOTE:** If ID/Date/Time don't match fill out section 11. Matrix: ☐ Oil ☐ Soil ☒ Water ☐ Other	☒	☐		11. **If NO, write ID/Date/Time of container below:** Sample #COC - Time on CoC 10:00 Time on containers 10:06 ☐ See Exceptions form ENV-FRM-MIN4-0142
All containers needing acid/base preservation have been checked?	☐	☐	☒	12. Sample #:
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, < 2 pH, NaOH > 9 Sulfide, NaOH > 10 Cyanide)	☐	☐	☒	☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC, Oil & Grease, DRO/8015 (water) and Dioxins/PFAS	☐	☐	☒	Positive for Residual Chlorine: ☐ YES ☐ NO
NOTE: If adding preservation to the container, **verify with the PM first.** Clients may require adding preservative to the field and equipment blanks when this occurs.				**pH Paper Lot #** (Residual Chlorine / 0-6 Roll / 0-6 Strip / 0-14 Strip) ☐ See Exceptions form ENV-FRM-MIN4-0142
Headspace in Methyl Mercury Container?	☐	☐	☒	13.
Extra labels present on soil VOA or WIDRO containers?	☐	☐	☒	14.
Headspace in VOA Vials (greater than 6mm)?	☐	☐	☒	☐ See Exceptions form ENV-FRM-MIN4-0140
Trip Blanks Present?	☐	☐	☒	15.
Trip Blank Custody Seals Present?	☐	☐	☒	Pace Trip Blank Lot # (if purchased): _____

CLIENT NOTIFICATION / RESOLUTION **FIELD DATA REQUIRED:** ☐ YES ☐ NO

Person Contacted: _____ Date & Time: _____

Comments / Resolution: _____

Project Manager Review: Brenna Bloome **Date:** 09/03/2024

NOTE: *When there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEQ Certification Office (i.e., out of hold, incorrect preservative, out of temp, incorrect containers).*

Labeled By: MMM **Line:** 3

Service Center Transfer Checklist

Service Center: MPLS ☐ BLM ☒ AZ ☐ MT ☐

Client: Braun Intertec

Destination Lab:

MPLS ☒ Duluth ☐ National ☐ Other ☐

Received w/ Custody Seal? Yes ☐ No ☒

Custody Seal Intact? Yes ☐ No ☒

Temperature °C:

Temp Read	Corr. Factor	Corr. Temp
0.7	SUB 0.7	0.0

IR Gun: G87A9205200775 (T8) ☒ Samples on ice, in cool down

Rush ☐ **Short Hold** ☐ **N/A** ☒

Containers Intact? Yes ☒ No ☐

Repacked and Re-Iced? Yes ☐ No ☒

Notes:

No Temp Blank Section

Read Temp	Corr. Temp	Avg. Temp

8/30/24
AF1

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

August 05, 2024

Aaron Volker
Braun Intertec Corp.
3900 Roosevelt Rd.
Suite 113
Saint Cloud, MN 56301

RE: Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Dear Aaron Volker:

Enclosed are the analytical results for sample(s) received by the laboratory on July 11, 2024. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Minneapolis

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brenna Bloome
brenna.bloome@pacelabs.com
(612)607-1700
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Pace Analytical Services, LLC - Minneapolis MN
1700 Elm Street SE, Minneapolis, MN 55414
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
DoD Certification via A2LA #: 2926.01
EPA Region 8 Tribal Water Systems+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
GMP+ Certification #: GMP050884
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
ISO/IEC 17025 Certification via A2LA #: 2926.01
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: AI-03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Approval: via MN 027-053-137
Minnesota Petrofund Registration #: 1240
Mississippi Certification #: MN00064
Missouri Certification #: 10100
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification (A2LA) #: R-036
North Dakota Certification (MN) #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification (1700) #: CL101
Oklahoma Certification #: 9507
Oregon Primary Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Vermont Certification #: VT-027053137
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DEP Certification #: 382
West Virginia DW Certification #: 9952 C
Wisconsin Certification #: 999407970
Wyoming UST Certification via A2LA #: 2926.01
USDA Permit #: P330-19-00208

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10699627001	**MW-1**	Water	07/10/24 11:30	07/11/24 11:20
10699627002	**MW-2**	Water	07/10/24 16:20	07/11/24 11:20
10699627003	**MW-3**	Water	07/10/24 14:15	07/11/24 11:20
10699627004	**MW-4**	Water	07/10/24 12:50	07/11/24 11:20
10699627005	**TRIP BLANK**	Water	07/10/24 07:00	07/11/24 11:20

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1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10699627001	**MW-1**	EPA 1633 DRAFT	NBH	64	PASI-M
10699627002	**MW-2**	EPA 1633 DRAFT	NBH	64	PASI-M
10699627003	**MW-3**	EPA 1633 DRAFT	NBH	64	PASI-M
10699627004	**MW-4**	EPA 1633 DRAFT	NBH	64	PASI-M
10699627005	**TRIP BLANK**	EPA 1633 DRAFT	NBH	64	PASI-M

PASI-M = Pace Analytical Services - Minneapolis

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

PROJECT NARRATIVE

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Method: **EPA 1633 DRAFT**
Description: EPA 1633 DRAFT Water
Client: Braun Intertec Corporation
Date: August 05, 2024

General Information:
5 samples were analyzed for EPA 1633 DRAFT by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 1633 DRAFT with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

QC Batch: 957830

S3: Surrogate recovery exceeded laboratory control limits. Analyte presence below reporting limits in associated sample.

- BLANK (Lab ID: 5007068)
  - 13C3-PFBS (S)
  - 13C3-PFHxS (S)
  - 13C3HFPO-DA (S)
  - 13C5-PFPeA (S)
  - 13C6-PFDA (S)
  - 13C9-PFNA (S)

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

PROJECT NARRATIVE

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Method: **EPA 1633 DRAFT**
Description: EPA 1633 DRAFT Water
Client: Braun Intertec Corporation
Date: August 05, 2024

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: MW-1 **Lab ID: 10699627001** Collected: 07/10/24 11:30 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.2	0.81	1	07/31/24 08:40	08/01/24 20:43	763051-92-9	
3:3 FTCA	ND	ng/L	5.2	2.4	1	07/31/24 08:40	08/01/24 20:43	356-02-5	
4:2 FTS	ND	ng/L	4.2	0.50	1	07/31/24 08:40	08/01/24 20:43	757124-72-4	
5:3 FTCA	ND	ng/L	25.9	5.0	1	07/31/24 08:40	08/01/24 20:43	914637-49-3	
6:2 FTS	ND	ng/L	4.2	1.0	1	07/31/24 08:40	08/01/24 20:43	27619-97-2	
7:3 FTCA	ND	ng/L	25.9	5.4	1	07/31/24 08:40	08/01/24 20:43	812-70-4	
8:2 FTS	ND	ng/L	4.2	1.1	1	07/31/24 08:40	08/01/24 20:43	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.2	0.85	1	07/31/24 08:40	08/01/24 20:43	756426-58-1	
ADONA	ND	ng/L	4.2	0.61	1	07/31/24 08:40	08/01/24 20:43	919005-14-4	
HFPO-DA	ND	ng/L	4.2	0.81	1	07/31/24 08:40	08/01/24 20:43	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.36	1	07/31/24 08:40	08/01/24 20:43	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.27	1	07/31/24 08:40	08/01/24 20:43	4151-50-2	
NEtFOSE	ND	ng/L	10.4	3.3	1	07/31/24 08:40	08/01/24 20:43	1691-99-2	
NFDHA	ND	ng/L	2.1	0.59	1	07/31/24 08:40	08/01/24 20:43	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.33	1	07/31/24 08:40	08/01/24 20:43	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.28	1	07/31/24 08:40	08/01/24 20:43	31506-32-8	
NMeFOSE	ND	ng/L	10.4	2.8	1	07/31/24 08:40	08/01/24 20:43	24448-09-7	
PFBS	**7.1**	ng/L	1.0	0.33	1	07/31/24 08:40	08/01/24 20:43	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	07/31/24 08:40	08/01/24 20:43	335-76-2	
PFHxA	**9.7**	ng/L	1.0	0.16	1	07/31/24 08:40	08/01/24 20:43	307-24-4	
PFBA	**22.4**	ng/L	4.2	0.64	1	07/31/24 08:40	08/01/24 20:43	375-22-4	
PFDS	ND	ng/L	1.0	0.28	1	07/31/24 08:40	08/01/24 20:43	335-77-3	
PFDoS	ND	ng/L	1.0	0.29	1	07/31/24 08:40	08/01/24 20:43	79780-39-5	
PFEESA	ND	ng/L	2.1	0.33	1	07/31/24 08:40	08/01/24 20:43	113507-82-7	
PFHpS	ND	ng/L	1.0	0.25	1	07/31/24 08:40	08/01/24 20:43	375-92-8	
PFMBA	ND	ng/L	2.1	0.33	1	07/31/24 08:40	08/01/24 20:43	863090-89-5	
PFMPA	ND	ng/L	2.1	0.50	1	07/31/24 08:40	08/01/24 20:43	377-73-1	
PFNS	ND	ng/L	1.0	0.25	1	07/31/24 08:40	08/01/24 20:43	68259-12-1	
PFOSA	ND	ng/L	1.0	0.25	1	07/31/24 08:40	08/01/24 20:43	754-91-6	
PFPeA	**9.9**	ng/L	2.1	0.31	1	07/31/24 08:40	08/01/24 20:43	2706-90-3	
PFPeS	ND	ng/L	1.0	0.19	1	07/31/24 08:40	08/01/24 20:43	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	07/31/24 08:40	08/01/24 20:43	307-55-1	
PFHpA	**8.1**	ng/L	1.0	0.22	1	07/31/24 08:40	08/01/24 20:43	375-85-9	
PFHxS	**7.5**	ng/L	1.0	0.27	1	07/31/24 08:40	08/01/24 20:43	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 20:43	375-95-1	
PFOS	**1.7**	ng/L	1.0	0.18	1	07/31/24 08:40	08/01/24 20:43	1763-23-1	
PFOA	**9.9**	ng/L	1.0	0.35	1	07/31/24 08:40	08/01/24 20:43	335-67-1	
PFTeDA	ND	ng/L	1.0	0.30	1	07/31/24 08:40	08/01/24 20:43	376-06-7	
PFTrDA	ND	ng/L	1.0	0.21	1	07/31/24 08:40	08/01/24 20:43	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	07/31/24 08:40	08/01/24 20:43	2058-94-8	
Surrogates									
13C2-PFDoA (S)	85	%.	10-130		1	07/31/24 08:40	08/01/24 20:43		
13C3HFPO-DA (S)	99	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		
13C3-PFBS (S)	96	%.	40-135		1	07/31/24 08:40	08/01/24 20:43		
13C3-PFHxS (S)	96	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: MW-1 **Lab ID: 10699627001** Collected: 07/10/24 11:30 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	88	%.	5-130		1	07/31/24 08:40	08/01/24 20:43		
13C4-PFHpA (S)	90	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		
13C5-PFHxA (S)	90	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		
13C5-PFPeA (S)	89	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		
13C6-PFDA (S)	91	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		
13C8-PFOA (S)	88	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		
13C8-PFOS (S)	95	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		
13C8-PFOSA (S)	84	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		
13C9-PFNA (S)	91	%.	40-130		1	07/31/24 08:40	08/01/24 20:43		
d3-MeFOSAA (S)	78	%.	40-170		1	07/31/24 08:40	08/01/24 20:43		
d3-NMeFOSA (S)	75	%.	10-130		1	07/31/24 08:40	08/01/24 20:43		
d5-EtFOSAA (S)	78	%.	25-135		1	07/31/24 08:40	08/01/24 20:43		
d5-NEtFOSA (S)	77	%.	10-130		1	07/31/24 08:40	08/01/24 20:43		
d7-NMeFOSE (S)	72	%.	10-130		1	07/31/24 08:40	08/01/24 20:43		
d9-NEtFOSE (S)	77	%.	10-130		1	07/31/24 08:40	08/01/24 20:43		
13C2-PFTA (S)	83	%.	10-130		1	07/31/24 08:40	08/01/24 20:43		
13C7-PFUdA (S)	89	%.	30-130		1	07/31/24 08:40	08/01/24 20:43		
13C24:2FTS (S)	78	%.	40-200		1	07/31/24 08:40	08/01/24 20:43		
13C26:2FTS (S)	102	%.	40-200		1	07/31/24 08:40	08/01/24 20:43		
13C28:2FTS (S)	76	%.	40-300		1	07/31/24 08:40	08/01/24 20:43		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: MW-2 **Lab ID: 10699627002** Collected: 07/10/24 16:20 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.1	0.79	1	07/31/24 08:40	08/01/24 20:59	763051-92-9	
3:3 FTCA	ND	ng/L	5.1	2.4	1	07/31/24 08:40	08/01/24 20:59	356-02-5	
4:2 FTS	ND	ng/L	4.1	0.49	1	07/31/24 08:40	08/01/24 20:59	757124-72-4	
5:3 FTCA	ND	ng/L	25.5	4.9	1	07/31/24 08:40	08/01/24 20:59	914637-49-3	
6:2 FTS	ND	ng/L	4.1	0.99	1	07/31/24 08:40	08/01/24 20:59	27619-97-2	
7:3 FTCA	ND	ng/L	25.5	5.3	1	07/31/24 08:40	08/01/24 20:59	812-70-4	
8:2 FTS	ND	ng/L	4.1	1.1	1	07/31/24 08:40	08/01/24 20:59	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.1	0.84	1	07/31/24 08:40	08/01/24 20:59	756426-58-1	
ADONA	ND	ng/L	4.1	0.60	1	07/31/24 08:40	08/01/24 20:59	919005-14-4	
HFPO-DA	ND	ng/L	4.1	0.79	1	07/31/24 08:40	08/01/24 20:59	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.35	1	07/31/24 08:40	08/01/24 20:59	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	07/31/24 08:40	08/01/24 20:59	4151-50-2	
NEtFOSE	ND	ng/L	10.2	3.3	1	07/31/24 08:40	08/01/24 20:59	1691-99-2	
NFDHA	ND	ng/L	2.0	0.58	1	07/31/24 08:40	08/01/24 20:59	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.32	1	07/31/24 08:40	08/01/24 20:59	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	07/31/24 08:40	08/01/24 20:59	31506-32-8	
NMeFOSE	ND	ng/L	10.2	2.7	1	07/31/24 08:40	08/01/24 20:59	24448-09-7	
PFBS	**10.1**	ng/L	1.0	0.33	1	07/31/24 08:40	08/01/24 20:59	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	07/31/24 08:40	08/01/24 20:59	335-76-2	
PFHxA	**28.6**	ng/L	1.0	0.15	1	07/31/24 08:40	08/01/24 20:59	307-24-4	
PFBA	**43.8**	ng/L	4.1	0.62	1	07/31/24 08:40	08/01/24 20:59	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	07/31/24 08:40	08/01/24 20:59	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	07/31/24 08:40	08/01/24 20:59	79780-39-5	
PFEESA	ND	ng/L	2.0	0.33	1	07/31/24 08:40	08/01/24 20:59	113507-82-7	
PFHpS	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 20:59	375-92-8	
PFMBA	ND	ng/L	2.0	0.32	1	07/31/24 08:40	08/01/24 20:59	863090-89-5	
PFMPA	ND	ng/L	2.0	0.49	1	07/31/24 08:40	08/01/24 20:59	377-73-1	
PFNS	ND	ng/L	1.0	0.25	1	07/31/24 08:40	08/01/24 20:59	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 20:59	754-91-6	
PFPeA	**35.3**	ng/L	2.0	0.30	1	07/31/24 08:40	08/01/24 20:59	2706-90-3	
PFPeS	ND	ng/L	1.0	0.19	1	07/31/24 08:40	08/01/24 20:59	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	07/31/24 08:40	08/01/24 20:59	307-55-1	
PFHpA	**13.4**	ng/L	1.0	0.22	1	07/31/24 08:40	08/01/24 20:59	375-85-9	
PFHxS	**7.6**	ng/L	1.0	0.26	1	07/31/24 08:40	08/01/24 20:59	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 20:59	375-95-1	
PFOS	**3.4**	ng/L	1.0	0.18	1	07/31/24 08:40	08/01/24 20:59	1763-23-1	
PFOA	**16.7**	ng/L	1.0	0.35	1	07/31/24 08:40	08/01/24 20:59	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	07/31/24 08:40	08/01/24 20:59	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	07/31/24 08:40	08/01/24 20:59	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	07/31/24 08:40	08/01/24 20:59	2058-94-8	
Surrogates									
13C2-PFDoA (S)	76	%.	10-130		1	07/31/24 08:40	08/01/24 20:59		
13C3HFPO-DA (S)	95	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		
13C3-PFBS (S)	90	%.	40-135		1	07/31/24 08:40	08/01/24 20:59		
13C3-PFHxS (S)	89	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: MW-2 **Lab ID: 10699627002** Collected: 07/10/24 16:20 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	88	%.	5-130		1	07/31/24 08:40	08/01/24 20:59		
13C4-PFHpA (S)	88	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		
13C5-PFHxA (S)	87	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		
13C5-PFPeA (S)	85	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		
13C6-PFDA (S)	87	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		
13C8-PFOA (S)	89	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		
13C8-PFOS (S)	92	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		
13C8-PFOSA (S)	82	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		
13C9-PFNA (S)	89	%.	40-130		1	07/31/24 08:40	08/01/24 20:59		
d3-MeFOSAA (S)	74	%.	40-170		1	07/31/24 08:40	08/01/24 20:59		
d3-NMeFOSA (S)	67	%.	10-130		1	07/31/24 08:40	08/01/24 20:59		
d5-EtFOSAA (S)	76	%.	25-135		1	07/31/24 08:40	08/01/24 20:59		
d5-NEtFOSA (S)	65	%.	10-130		1	07/31/24 08:40	08/01/24 20:59		
d7-NMeFOSE (S)	66	%.	10-130		1	07/31/24 08:40	08/01/24 20:59		
d9-NEtFOSE (S)	71	%.	10-130		1	07/31/24 08:40	08/01/24 20:59		
13C2-PFTA (S)	74	%.	10-130		1	07/31/24 08:40	08/01/24 20:59		
13C7-PFUdA (S)	82	%.	30-130		1	07/31/24 08:40	08/01/24 20:59		
13C24:2FTS (S)	74	%.	40-200		1	07/31/24 08:40	08/01/24 20:59		
13C26:2FTS (S)	109	%.	40-200		1	07/31/24 08:40	08/01/24 20:59		
13C28:2FTS (S)	69	%.	40-300		1	07/31/24 08:40	08/01/24 20:59		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: MW-3 **Lab ID: 10699627003** Collected: 07/10/24 14:15 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.1	0.80	1	07/31/24 08:40	08/01/24 21:14	763051-92-9	
3:3 FTCA	ND	ng/L	5.1	2.4	1	07/31/24 08:40	08/01/24 21:14	356-02-5	
4:2 FTS	ND	ng/L	4.1	0.49	1	07/31/24 08:40	08/01/24 21:14	757124-72-4	
5:3 FTCA	ND	ng/L	25.6	5.0	1	07/31/24 08:40	08/01/24 21:14	914637-49-3	
6:2 FTS	ND	ng/L	4.1	1.0	1	07/31/24 08:40	08/01/24 21:14	27619-97-2	
7:3 FTCA	ND	ng/L	25.6	5.4	1	07/31/24 08:40	08/01/24 21:14	812-70-4	
8:2 FTS	ND	ng/L	4.1	1.1	1	07/31/24 08:40	08/01/24 21:14	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.1	0.84	1	07/31/24 08:40	08/01/24 21:14	756426-58-1	
ADONA	ND	ng/L	4.1	0.60	1	07/31/24 08:40	08/01/24 21:14	919005-14-4	
HFPO-DA	ND	ng/L	4.1	0.80	1	07/31/24 08:40	08/01/24 21:14	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.36	1	07/31/24 08:40	08/01/24 21:14	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	07/31/24 08:40	08/01/24 21:14	4151-50-2	
NEtFOSE	ND	ng/L	10.3	3.3	1	07/31/24 08:40	08/01/24 21:14	1691-99-2	
NFDHA	ND	ng/L	2.1	0.58	1	07/31/24 08:40	08/01/24 21:14	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.33	1	07/31/24 08:40	08/01/24 21:14	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	07/31/24 08:40	08/01/24 21:14	31506-32-8	
NMeFOSE	ND	ng/L	10.3	2.7	1	07/31/24 08:40	08/01/24 21:14	24448-09-7	
PFBS	**15.2**	ng/L	1.0	0.33	1	07/31/24 08:40	08/01/24 21:14	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	07/31/24 08:40	08/01/24 21:14	335-76-2	
PFHxA	**11.5**	ng/L	1.0	0.15	1	07/31/24 08:40	08/01/24 21:14	307-24-4	
PFBA	**28.3**	ng/L	4.1	0.63	1	07/31/24 08:40	08/01/24 21:14	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	07/31/24 08:40	08/01/24 21:14	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	07/31/24 08:40	08/01/24 21:14	79780-39-5	
PFEESA	ND	ng/L	2.1	0.33	1	07/31/24 08:40	08/01/24 21:14	113507-82-7	
PFHpS	ND	ng/L	1.0	0.25	1	07/31/24 08:40	08/01/24 21:14	375-92-8	
PFMBA	ND	ng/L	2.1	0.33	1	07/31/24 08:40	08/01/24 21:14	863090-89-5	
PFMPA	ND	ng/L	2.1	0.50	1	07/31/24 08:40	08/01/24 21:14	377-73-1	
PFNS	ND	ng/L	1.0	0.25	1	07/31/24 08:40	08/01/24 21:14	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 21:14	754-91-6	
PFPeA	**12.9**	ng/L	2.1	0.31	1	07/31/24 08:40	08/01/24 21:14	2706-90-3	
PFPeS	ND	ng/L	1.0	0.19	1	07/31/24 08:40	08/01/24 21:14	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	07/31/24 08:40	08/01/24 21:14	307-55-1	
PFHpA	**9.0**	ng/L	1.0	0.22	1	07/31/24 08:40	08/01/24 21:14	375-85-9	
PFHxS	**8.3**	ng/L	1.0	0.27	1	07/31/24 08:40	08/01/24 21:14	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 21:14	375-95-1	
PFOS	**1.1**	ng/L	1.0	0.18	1	07/31/24 08:40	08/01/24 21:14	1763-23-1	
PFOA	**6.6**	ng/L	1.0	0.35	1	07/31/24 08:40	08/01/24 21:14	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	07/31/24 08:40	08/01/24 21:14	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	07/31/24 08:40	08/01/24 21:14	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	07/31/24 08:40	08/01/24 21:14	2058-94-8	
Surrogates									
13C2-PFDoA (S)	51	%.	10-130		1	07/31/24 08:40	08/01/24 21:14		
13C3HFPO-DA (S)	77	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		
13C3-PFBS (S)	72	%.	40-135		1	07/31/24 08:40	08/01/24 21:14		
13C3-PFHxS (S)	74	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: MW-3 **Lab ID: 10699627003** Collected: 07/10/24 14:15 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	73	%.	5-130		1	07/31/24 08:40	08/01/24 21:14		
13C4-PFHpA (S)	70	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		
13C5-PFHxA (S)	71	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		
13C5-PFPeA (S)	69	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		
13C6-PFDA (S)	67	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		
13C8-PFOA (S)	69	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		
13C8-PFOS (S)	68	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		
13C8-PFOSA (S)	57	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		
13C9-PFNA (S)	68	%.	40-130		1	07/31/24 08:40	08/01/24 21:14		
d3-MeFOSAA (S)	46	%.	40-170		1	07/31/24 08:40	08/01/24 21:14		
d3-NMeFOSA (S)	39	%.	10-130		1	07/31/24 08:40	08/01/24 21:14		
d5-EtFOSAA (S)	44	%.	25-135		1	07/31/24 08:40	08/01/24 21:14		
d5-NEtFOSA (S)	35	%.	10-130		1	07/31/24 08:40	08/01/24 21:14		
d7-NMeFOSE (S)	35	%.	10-130		1	07/31/24 08:40	08/01/24 21:14		
d9-NEtFOSE (S)	38	%.	10-130		1	07/31/24 08:40	08/01/24 21:14		
13C2-PFTA (S)	55	%.	10-130		1	07/31/24 08:40	08/01/24 21:14		
13C7-PFUdA (S)	56	%.	30-130		1	07/31/24 08:40	08/01/24 21:14		
13C24:2FTS (S)	66	%.	40-200		1	07/31/24 08:40	08/01/24 21:14		
13C26:2FTS (S)	78	%.	40-200		1	07/31/24 08:40	08/01/24 21:14		
13C28:2FTS (S)	50	%.	40-300		1	07/31/24 08:40	08/01/24 21:14		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: MW-4 **Lab ID: 10699627004** Collected: 07/10/24 12:50 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.1	0.79	1	07/31/24 08:40	08/01/24 21:30	763051-92-9	
3:3 FTCA	ND	ng/L	5.1	2.4	1	07/31/24 08:40	08/01/24 21:30	356-02-5	
4:2 FTS	ND	ng/L	4.1	0.49	1	07/31/24 08:40	08/01/24 21:30	757124-72-4	
5:3 FTCA	ND	ng/L	25.3	4.9	1	07/31/24 08:40	08/01/24 21:30	914637-49-3	
6:2 FTS	ND	ng/L	4.1	0.99	1	07/31/24 08:40	08/01/24 21:30	27619-97-2	
7:3 FTCA	ND	ng/L	25.3	5.3	1	07/31/24 08:40	08/01/24 21:30	812-70-4	
8:2 FTS	ND	ng/L	4.1	1.1	1	07/31/24 08:40	08/01/24 21:30	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.1	0.83	1	07/31/24 08:40	08/01/24 21:30	756426-58-1	
ADONA	ND	ng/L	4.1	0.59	1	07/31/24 08:40	08/01/24 21:30	919005-14-4	
HFPO-DA	ND	ng/L	4.1	0.79	1	07/31/24 08:40	08/01/24 21:30	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.35	1	07/31/24 08:40	08/01/24 21:30	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	07/31/24 08:40	08/01/24 21:30	4151-50-2	
NEtFOSE	ND	ng/L	10.1	3.3	1	07/31/24 08:40	08/01/24 21:30	1691-99-2	
NFDHA	ND	ng/L	2.0	0.57	1	07/31/24 08:40	08/01/24 21:30	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.32	1	07/31/24 08:40	08/01/24 21:30	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	07/31/24 08:40	08/01/24 21:30	31506-32-8	
NMeFOSE	ND	ng/L	10.1	2.7	1	07/31/24 08:40	08/01/24 21:30	24448-09-7	
PFBS	**6.0**	ng/L	1.0	0.32	1	07/31/24 08:40	08/01/24 21:30	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	07/31/24 08:40	08/01/24 21:30	335-76-2	
PFHxA	**11.5**	ng/L	1.0	0.15	1	07/31/24 08:40	08/01/24 21:30	307-24-4	
PFBA	**18.8**	ng/L	4.1	0.62	1	07/31/24 08:40	08/01/24 21:30	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	07/31/24 08:40	08/01/24 21:30	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	07/31/24 08:40	08/01/24 21:30	79780-39-5	
PFEESA	ND	ng/L	2.0	0.32	1	07/31/24 08:40	08/01/24 21:30	113507-82-7	
PFHpS	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 21:30	375-92-8	
PFMBA	ND	ng/L	2.0	0.32	1	07/31/24 08:40	08/01/24 21:30	863090-89-5	
PFMPA	ND	ng/L	2.0	0.49	1	07/31/24 08:40	08/01/24 21:30	377-73-1	
PFNS	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 21:30	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 21:30	754-91-6	
PFPeA	**9.7**	ng/L	2.0	0.30	1	07/31/24 08:40	08/01/24 21:30	2706-90-3	
PFPeS	ND	ng/L	1.0	0.18	1	07/31/24 08:40	08/01/24 21:30	2706-91-4	
PFDoA	ND	ng/L	1.0	0.22	1	07/31/24 08:40	08/01/24 21:30	307-55-1	
PFHpA	**8.3**	ng/L	1.0	0.22	1	07/31/24 08:40	08/01/24 21:30	375-85-9	
PFHxS	**6.1**	ng/L	1.0	0.26	1	07/31/24 08:40	08/01/24 21:30	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	07/31/24 08:40	08/01/24 21:30	375-95-1	
PFOS	**6.5**	ng/L	1.0	0.18	1	07/31/24 08:40	08/01/24 21:30	1763-23-1	
PFOA	**20.5**	ng/L	1.0	0.35	1	07/31/24 08:40	08/01/24 21:30	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	07/31/24 08:40	08/01/24 21:30	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	07/31/24 08:40	08/01/24 21:30	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	07/31/24 08:40	08/01/24 21:30	2058-94-8	
Surrogates									
13C2-PFDoA (S)	80	%.	10-130		1	07/31/24 08:40	08/01/24 21:30		
13C3HFPO-DA (S)	99	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		
13C3-PFBS (S)	94	%.	40-135		1	07/31/24 08:40	08/01/24 21:30		
13C3-PFHxS (S)	94	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: MW-4 **Lab ID: 10699627004** Collected: 07/10/24 12:50 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	88	%.	5-130		1	07/31/24 08:40	08/01/24 21:30		
13C4-PFHpA (S)	88	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		
13C5-PFHxA (S)	91	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		
13C5-PFPeA (S)	87	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		
13C6-PFDA (S)	90	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		
13C8-PFOA (S)	90	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		
13C8-PFOS (S)	96	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		
13C8-PFOSA (S)	85	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		
13C9-PFNA (S)	91	%.	40-130		1	07/31/24 08:40	08/01/24 21:30		
d3-MeFOSAA (S)	70	%.	40-170		1	07/31/24 08:40	08/01/24 21:30		
d3-NMeFOSA (S)	71	%.	10-130		1	07/31/24 08:40	08/01/24 21:30		
d5-EtFOSAA (S)	70	%.	25-135		1	07/31/24 08:40	08/01/24 21:30		
d5-NEtFOSA (S)	68	%.	10-130		1	07/31/24 08:40	08/01/24 21:30		
d7-NMeFOSE (S)	70	%.	10-130		1	07/31/24 08:40	08/01/24 21:30		
d9-NEtFOSE (S)	74	%.	10-130		1	07/31/24 08:40	08/01/24 21:30		
13C2-PFTA (S)	78	%.	10-130		1	07/31/24 08:40	08/01/24 21:30		
13C7-PFUdA (S)	85	%.	30-130		1	07/31/24 08:40	08/01/24 21:30		
13C24:2FTS (S)	81	%.	40-200		1	07/31/24 08:40	08/01/24 21:30		
13C26:2FTS (S)	90	%.	40-200		1	07/31/24 08:40	08/01/24 21:30		
13C28:2FTS (S)	71	%.	40-300		1	07/31/24 08:40	08/01/24 21:30		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: TRIP BLANK **Lab ID: 10699627005** Collected: 07/10/24 07:00 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.0	0.78	1	07/23/24 08:29	07/24/24 21:04	763051-92-9	
3:3 FTCA	ND	ng/L	5.0	2.3	1	07/23/24 08:29	07/24/24 21:04	356-02-5	
4:2 FTS	ND	ng/L	4.0	0.48	1	07/23/24 08:29	07/24/24 21:04	757124-72-4	
5:3 FTCA	ND	ng/L	24.9	4.8	1	07/23/24 08:29	07/24/24 21:04	914637-49-3	
6:2 FTS	ND	ng/L	4.0	0.97	1	07/23/24 08:29	07/24/24 21:04	27619-97-2	
7:3 FTCA	ND	ng/L	24.9	5.2	1	07/23/24 08:29	07/24/24 21:04	812-70-4	
8:2 FTS	ND	ng/L	4.0	1.0	1	07/23/24 08:29	07/24/24 21:04	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.0	0.82	1	07/23/24 08:29	07/24/24 21:04	756426-58-1	
ADONA	ND	ng/L	4.0	0.58	1	07/23/24 08:29	07/24/24 21:04	919005-14-4	
HFPO-DA	ND	ng/L	4.0	0.78	1	07/23/24 08:29	07/24/24 21:04	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.35	1	07/23/24 08:29	07/24/24 21:04	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	07/23/24 08:29	07/24/24 21:04	4151-50-2	
NEtFOSE	ND	ng/L	10	3.2	1	07/23/24 08:29	07/24/24 21:04	1691-99-2	
NFDHA	ND	ng/L	2.0	0.56	1	07/23/24 08:29	07/24/24 21:04	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.32	1	07/23/24 08:29	07/24/24 21:04	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	07/23/24 08:29	07/24/24 21:04	31506-32-8	
NMeFOSE	ND	ng/L	10	2.7	1	07/23/24 08:29	07/24/24 21:04	24448-09-7	
PFBS	ND	ng/L	1.0	0.32	1	07/23/24 08:29	07/24/24 21:04	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	07/23/24 08:29	07/24/24 21:04	335-76-2	
PFHxA	ND	ng/L	1.0	0.15	1	07/23/24 08:29	07/24/24 21:04	307-24-4	
PFBA	ND	ng/L	4.0	0.61	1	07/23/24 08:29	07/24/24 21:04	375-22-4	
PFDS	ND	ng/L	1.0	0.26	1	07/23/24 08:29	07/24/24 21:04	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	07/23/24 08:29	07/24/24 21:04	79780-39-5	
PFEESA	ND	ng/L	2.0	0.32	1	07/23/24 08:29	07/24/24 21:04	113507-82-7	
PFHpS	ND	ng/L	1.0	0.24	1	07/23/24 08:29	07/24/24 21:04	375-92-8	
PFMBA	ND	ng/L	2.0	0.32	1	07/23/24 08:29	07/24/24 21:04	863090-89-5	
PFMPA	ND	ng/L	2.0	0.48	1	07/23/24 08:29	07/24/24 21:04	377-73-1	
PFNS	ND	ng/L	1.0	0.24	1	07/23/24 08:29	07/24/24 21:04	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	07/23/24 08:29	07/24/24 21:04	754-91-6	
PFPeA	ND	ng/L	2.0	0.30	1	07/23/24 08:29	07/24/24 21:04	2706-90-3	
PFPeS	ND	ng/L	1.0	0.18	1	07/23/24 08:29	07/24/24 21:04	2706-91-4	
PFDoA	ND	ng/L	1.0	0.22	1	07/23/24 08:29	07/24/24 21:04	307-55-1	
PFHpA	ND	ng/L	1.0	0.21	1	07/23/24 08:29	07/24/24 21:04	375-85-9	
PFHxS	ND	ng/L	1.0	0.26	1	07/23/24 08:29	07/24/24 21:04	355-46-4	
PFNA	ND	ng/L	1.0	0.23	1	07/23/24 08:29	07/24/24 21:04	375-95-1	
PFOS	ND	ng/L	1.0	0.17	1	07/23/24 08:29	07/24/24 21:04	1763-23-1	
PFOA	ND	ng/L	1.0	0.34	1	07/23/24 08:29	07/24/24 21:04	335-67-1	
PFTeDA	ND	ng/L	1.0	0.28	1	07/23/24 08:29	07/24/24 21:04	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	07/23/24 08:29	07/24/24 21:04	72629-94-8	
PFUnA	ND	ng/L	1.0	0.25	1	07/23/24 08:29	07/24/24 21:04	2058-94-8	
Surrogates									
13C2-PFDoA (S)	85	%.	10-130		1	07/23/24 08:29	07/24/24 21:04		
13C3HFPO-DA (S)	100	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		
13C3-PFBS (S)	96	%.	40-135		1	07/23/24 08:29	07/24/24 21:04		
13C3-PFHxS (S)	95	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Sample: TRIP BLANK **Lab ID: 10699627005** Collected: 07/10/24 07:00 Received: 07/11/24 11:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	93	%.	5-130		1	07/23/24 08:29	07/24/24 21:04		
13C4-PFHpA (S)	89	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		
13C5-PFHxA (S)	91	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		
13C5-PFPeA (S)	93	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		
13C6-PFDA (S)	88	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		
13C8-PFOA (S)	94	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		
13C8-PFOS (S)	97	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		
13C8-PFOSA (S)	84	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		
13C9-PFNA (S)	89	%.	40-130		1	07/23/24 08:29	07/24/24 21:04		
d3-MeFOSAA (S)	86	%.	40-170		1	07/23/24 08:29	07/24/24 21:04		
d3-NMeFOSA (S)	71	%.	10-130		1	07/23/24 08:29	07/24/24 21:04		
d5-EtFOSAA (S)	90	%.	25-135		1	07/23/24 08:29	07/24/24 21:04		
d5-NEtFOSA (S)	70	%.	10-130		1	07/23/24 08:29	07/24/24 21:04		
d7-NMeFOSE (S)	77	%.	10-130		1	07/23/24 08:29	07/24/24 21:04		
d9-NEtFOSE (S)	79	%.	10-130		1	07/23/24 08:29	07/24/24 21:04		
13C2-PFTA (S)	86	%.	10-130		1	07/23/24 08:29	07/24/24 21:04		
13C7-PFUdA (S)	88	%.	30-130		1	07/23/24 08:29	07/24/24 21:04		
13C24:2FTS (S)	81	%.	40-200		1	07/23/24 08:29	07/24/24 21:04		
13C26:2FTS (S)	108	%.	40-200		1	07/23/24 08:29	07/24/24 21:04		
13C28:2FTS (S)	78	%.	40-300		1	07/23/24 08:29	07/24/24 21:04		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

QC Batch: 957830
QC Batch Method: EPA 1633 DRAFT
Analysis Method: EPA 1633 DRAFT
Analysis Description: 1633 W
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10699627005

METHOD BLANK: 5007068 Matrix: Water
Associated Lab Samples: 10699627005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
11Cl-PF3OUdS	ng/L	ND	4.0	0.77	07/24/24 14:34	
3:3 FTCA	ng/L	ND	5.0	2.3	07/24/24 14:34	
4:2 FTS	ng/L	ND	4.0	0.48	07/24/24 14:34	
5:3 FTCA	ng/L	ND	24.8	4.8	07/24/24 14:34	
6:2 FTS	ng/L	ND	4.0	0.97	07/24/24 14:34	
7:3 FTCA	ng/L	ND	24.8	5.2	07/24/24 14:34	
8:2 FTS	ng/L	ND	4.0	1.0	07/24/24 14:34	
9Cl-PF3ONS	ng/L	ND	4.0	0.82	07/24/24 14:34	
ADONA	ng/L	ND	4.0	0.58	07/24/24 14:34	
HFPO-DA	ng/L	ND	4.0	0.77	07/24/24 14:34	
NEtFOSA	ng/L	ND	0.99	0.26	07/24/24 14:34	
NEtFOSAA	ng/L	ND	0.99	0.35	07/24/24 14:34	
NEtFOSE	ng/L	ND	9.9	3.2	07/24/24 14:34	
NFDHA	ng/L	ND	2.0	0.56	07/24/24 14:34	
NMeFOSA	ng/L	ND	0.99	0.26	07/24/24 14:34	
NMeFOSAA	ng/L	ND	0.99	0.32	07/24/24 14:34	
NMeFOSE	ng/L	ND	9.9	2.7	07/24/24 14:34	
PFBA	ng/L	ND	4.0	0.61	07/24/24 14:34	
PFBS	ng/L	ND	0.99	0.32	07/24/24 14:34	
PFDA	ng/L	ND	0.99	0.18	07/24/24 14:34	
PFDoA	ng/L	ND	0.99	0.22	07/24/24 14:34	
PFDoS	ng/L	ND	0.99	0.28	07/24/24 14:34	
PFDS	ng/L	ND	0.99	0.26	07/24/24 14:34	
PFEESA	ng/L	ND	2.0	0.32	07/24/24 14:34	
PFHpA	ng/L	ND	0.99	0.21	07/24/24 14:34	
PFHpS	ng/L	ND	0.99	0.24	07/24/24 14:34	
PFHxA	ng/L	ND	0.99	0.15	07/24/24 14:34	
PFHxS	ng/L	ND	0.99	0.26	07/24/24 14:34	
PFMBA	ng/L	ND	2.0	0.31	07/24/24 14:34	
PFMPA	ng/L	ND	2.0	0.48	07/24/24 14:34	
PFNA	ng/L	ND	0.99	0.23	07/24/24 14:34	
PFNS	ng/L	ND	0.99	0.24	07/24/24 14:34	
PFOA	ng/L	ND	0.99	0.34	07/24/24 14:34	
PFOS	ng/L	ND	0.99	0.17	07/24/24 14:34	
PFOSA	ng/L	ND	0.99	0.24	07/24/24 14:34	
PFPeA	ng/L	ND	2.0	0.30	07/24/24 14:34	
PFPeS	ng/L	ND	0.99	0.18	07/24/24 14:34	
PFTeDA	ng/L	ND	0.99	0.28	07/24/24 14:34	
PFTrDA	ng/L	ND	0.99	0.20	07/24/24 14:34	
PFUnA	ng/L	ND	0.99	0.25	07/24/24 14:34	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

METHOD BLANK: 5007068 Matrix: Water
Associated Lab Samples: 10699627005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
13C2-PFDoA (S)	%.	127	10-130		07/24/24 14:34	
13C2-PFTA (S)	%.	123	10-130		07/24/24 14:34	
13C24:2FTS (S)	%.	126	40-200		07/24/24 14:34	
13C26:2FTS (S)	%.	152	40-200		07/24/24 14:34	
13C28:2FTS (S)	%.	108	40-300		07/24/24 14:34	
13C3-PFBS (S)	%.	144	40-135		07/24/24 14:34	S3
13C3-PFHxS (S)	%.	145	40-130		07/24/24 14:34	S3
13C3HFPO-DA (S)	%.	140	40-130		07/24/24 14:34	S3
13C4-PFBA (S)	%.	124	5-130		07/24/24 14:34	
13C4-PFHpA (S)	%.	125	40-130		07/24/24 14:34	
13C5-PFHxA (S)	%.	130	40-130		07/24/24 14:34	
13C5-PFPeA (S)	%.	131	40-130		07/24/24 14:34	S3
13C6-PFDA (S)	%.	131	40-130		07/24/24 14:34	S3
13C7-PFUdA (S)	%.	130	30-130		07/24/24 14:34	
13C8-PFOA (S)	%.	130	40-130		07/24/24 14:34	
13C8-PFOS (S)	%.	130	40-130		07/24/24 14:34	
13C8-PFOSA (S)	%.	117	40-130		07/24/24 14:34	
13C9-PFNA (S)	%.	131	40-130		07/24/24 14:34	S3
d3-MeFOSAA (S)	%.	121	40-170		07/24/24 14:34	
d3-NMeFOSA (S)	%.	112	10-130		07/24/24 14:34	
d5-EtFOSAA (S)	%.	126	25-135		07/24/24 14:34	
d5-NEtFOSA (S)	%.	111	10-130		07/24/24 14:34	
d7-NMeFOSE (S)	%.	109	10-130		07/24/24 14:34	
d9-NEtFOSE (S)	%.	117	10-130		07/24/24 14:34	

LABORATORY CONTROL SAMPLE & LCSD: 5007069 5007070

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
11Cl-PF3OUdS	ng/L	89.5	85.0	84.4	95	98	55-160	1	30	
3:3 FTCA	ng/L	119	105	102	88	89	65-130	3	30	
4:2 FTS	ng/L	88.9	91.1	88.9	102	104	70-145	2	30	
5:3 FTCA	ng/L	593	536	507	90	89	70-135	6	30	
6:2 FTS	ng/L	90.1	91.9	90.4	102	104	65-155	2	30	
7:3 FTCA	ng/L	593	533	499	90	87	50-145	7	30	
8:2 FTS	ng/L	91.3	94.5	93.0	104	106	60-150	2	30	
9Cl-PF3ONS	ng/L	88.9	86.1	84.7	97	99	70-155	2	30	
ADONA	ng/L	89.5	79.5	79.0	89	92	65-145	1	30	
HFPO-DA	ng/L	94.9	92.9	88.3	98	97	70-140	5	30	
NEtFOSA	ng/L	23.7	21.2	20.6	89	90	65-145	2	30	
NEtFOSAA	ng/L	23.7	22.0	22.1	93	97	70-145	0	30	
NEtFOSE	ng/L	237	221	218	93	95	70-135	1	30	
NFDHA	ng/L	47.4	47.8	46.7	101	102	50-150	2	30	
NMeFOSA	ng/L	23.7	22.2	22.1	93	97	60-150	0	30	
NMeFOSAA	ng/L	23.7	22.8	24.0	96	105	50-140	5	30	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

LABORATORY CONTROL SAMPLE & LCSD: 5007069 5007070

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
NMeFOSE	ng/L	237	232	229	98	100	70-145	1	30	
PFBA	ng/L	94.9	90.9	89.1	96	98	70-140	2	30	
PFBS	ng/L	21	20.4	19.4	97	96	60-145	5	30	
PFDA	ng/L	23.7	23.0	21.7	97	95	70-140	6	30	
PFDoA	ng/L	23.7	22.6	22.8	95	100	70-140	1	30	
PFDoS	ng/L	23	20.7	20.0	90	90	50-145	4	30	
PFDS	ng/L	22.9	22.0	20.9	96	95	60-145	5	30	
PFEESA	ng/L	42.2	43.1	42.5	102	105	70-140	1	30	
PFHpA	ng/L	23.7	23.1	22.6	97	99	70-150	2	30	
PFHpS	ng/L	22.6	21.7	21.5	96	99	70-150	1	30	
PFHxA	ng/L	23.7	22.5	21.5	95	94	70-145	5	30	
PFHxS	ng/L	21.7	20.0	19.7	92	95	65-145	1	30	
PFMBA	ng/L	47.4	46.7	45.8	98	100	60-150	2	30	
PFMPA	ng/L	47.4	45.3	45.4	96	99	55-140	0	30	
PFNA	ng/L	23.7	22.0	21.7	93	95	70-150	2	30	
PFNS	ng/L	22.8	22.3	22.2	98	101	65-145	0	30	
PFOA	ng/L	23.7	22.6	22.7	95	100	70-150	0	30	
PFOS	ng/L	22	21.3	20.6	97	97	55-150	3	30	
PFOSA	ng/L	23.7	22.7	22.2	96	97	70-145	2	30	
PFPeA	ng/L	47.4	46.3	44.6	98	98	65-135	4	30	
PFPeS	ng/L	22.3	20.9	21.4	94	100	65-140	2	30	
PFTeDA	ng/L	23.7	23.0	22.6	97	99	60-140	2	30	
PFTrDA	ng/L	23.7	23.1	23.4	97	103	65-140	1	30	
PFUnA	ng/L	23.7	23.1	23.1	98	101	70-145	0	30	
13C2-PFDoA (S)	%.				103	94	10-130			
13C2-PFTA (S)	%.				99	93	10-130			
13C24:2FTS (S)	%.				89	85	40-200			
13C26:2FTS (S)	%.				113	106	40-200			
13C28:2FTS (S)	%.				77	73	40-300			
13C3-PFBS (S)	%.				109	104	40-135			
13C3-PFHxS (S)	%.				109	102	40-130			
13C3HFPO-DA (S)	%.				110	102	40-130			
13C4-PFBA (S)	%.				103	98	5-130			
13C4-PFHpA (S)	%.				98	91	40-130			
13C5-PFHxA (S)	%.				103	98	40-130			
13C5-PFPeA (S)	%.				103	98	40-130			
13C6-PFDA (S)	%.				104	100	40-130			
13C7-PFUdA (S)	%.				104	96	30-130			
13C8-PFOA (S)	%.				102	98	40-130			
13C8-PFOS (S)	%.				103	98	40-130			
13C8-PFOSA (S)	%.				93	89	40-130			
13C9-PFNA (S)	%.				107	99	40-130			
d3-MeFOSAA (S)	%.				97	89	40-170			
d3-NMeFOSA (S)	%.				93	82	10-130			
d5-EtFOSAA (S)	%.				98	92	25-135			
d5-NEtFOSA (S)	%.				92	82	10-130			
d7-NMeFOSE (S)	%.				88	81	10-130			

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

LABORATORY CONTROL SAMPLE & LCSD: 5007069 5007070

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
d9-NEtFOSE (S)	%.				93	85	10-130			

LABORATORY CONTROL SAMPLE: 5007071

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
11Cl-PF3OUdS	ng/L	7.4	6.5	88	55-160	
3:3 FTCA	ng/L	9.8	10.4	106	65-130	
4:2 FTS	ng/L	7.4	7.3	99	70-145	
5:3 FTCA	ng/L	49.2	41.0	83	70-135	
6:2 FTS	ng/L	7.5	7.3	97	65-155	
7:3 FTCA	ng/L	49.2	41.5	84	50-145	
8:2 FTS	ng/L	7.6	7.6	101	60-150	
9Cl-PF3ONS	ng/L	7.4	6.5	87	70-155	
ADONA	ng/L	7.4	6.9	93	65-145	
HFPO-DA	ng/L	7.9	6.8	87	70-140	
NEtFOSA	ng/L	2	1.7	88	65-145	
NEtFOSAA	ng/L	2	1.9	94	70-145	
NEtFOSE	ng/L	19.7	17.4	88	70-135	
NFDHA	ng/L	3.9	4.1	104	50-150	
NMeFOSA	ng/L	2	1.8	93	60-150	
NMeFOSAA	ng/L	2	1.6	81	50-140	
NMeFOSE	ng/L	19.7	18.8	95	70-145	
PFBA	ng/L	7.9	8.2	103	70-140	
PFBS	ng/L	1.7	1.6	89	60-145	
PFDA	ng/L	2	1.7	85	70-140	
PFDoA	ng/L	2	1.9	96	70-140	
PFDoS	ng/L	1.9	1.9	99	50-145	
PFDS	ng/L	1.9	2.0	103	60-145	
PFEESA	ng/L	3.5	3.4	97	70-140	
PFHpA	ng/L	2	1.8	93	70-150	
PFHpS	ng/L	1.9	1.8	95	70-150	
PFHxA	ng/L	2	1.9	94	70-145	
PFHxS	ng/L	1.8	1.6	88	65-145	
PFMBA	ng/L	3.9	3.7	95	60-150	
PFMPA	ng/L	3.9	3.7	93	55-140	
PFNA	ng/L	2	2.0	99	70-150	
PFNS	ng/L	1.9	1.6	87	65-145	
PFOA	ng/L	2	1.9	95	70-150	
PFOS	ng/L	1.8	1.8	98	55-150	
PFOSA	ng/L	2	1.8	89	70-145	
PFPeA	ng/L	3.9	3.7	93	65-135	
PFPeS	ng/L	1.9	1.8	96	65-140	
PFTeDA	ng/L	2	1.9	95	60-140	
PFTrDA	ng/L	2	1.9	95	65-140	
PFUnA	ng/L	2	1.8	90	70-145	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

LABORATORY CONTROL SAMPLE: 5007071

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
13C2-PFDoA (S)	%.			92	10-130	
13C2-PFTA (S)	%.			91	10-130	
13C24:2FTS (S)	%.			84	40-200	
13C26:2FTS (S)	%.			110	40-200	
13C28:2FTS (S)	%.			74	40-300	
13C3-PFBS (S)	%.			99	40-135	
13C3-PFHxS (S)	%.			99	40-130	
13C3HFPO-DA (S)	%.			105	40-130	
13C4-PFBA (S)	%.			99	5-130	
13C4-PFHpA (S)	%.			98	40-130	
13C5-PFHxA (S)	%.			98	40-130	
13C5-PFPeA (S)	%.			100	40-130	
13C6-PFDA (S)	%.			98	40-130	
13C7-PFUdA (S)	%.			98	30-130	
13C8-PFOA (S)	%.			100	40-130	
13C8-PFOS (S)	%.			100	40-130	
13C8-PFOSA (S)	%.			88	40-130	
13C9-PFNA (S)	%.			96	40-130	
d3-MeFOSAA (S)	%.			90	40-170	
d3-NMeFOSA (S)	%.			79	10-130	
d5-EtFOSAA (S)	%.			88	25-135	
d5-NEtFOSA (S)	%.			71	10-130	
d7-NMeFOSE (S)	%.			79	10-130	
d9-NEtFOSE (S)	%.			82	10-130	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

QC Batch: 959086
QC Batch Method: EPA 1633 DRAFT
Analysis Method: EPA 1633 DRAFT
Analysis Description: 1633 W
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10699627001, 10699627002, 10699627003, 10699627004

METHOD BLANK: 5014347 Matrix: Water
Associated Lab Samples: 10699627001, 10699627002, 10699627003, 10699627004

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
11Cl-PF3OUdS	ng/L	ND	3.9	0.76	08/01/24 19:41	
3:3 FTCA	ng/L	ND	4.9	2.3	08/01/24 19:41	
4:2 FTS	ng/L	ND	3.9	0.47	08/01/24 19:41	
5:3 FTCA	ng/L	ND	24.4	4.7	08/01/24 19:41	
6:2 FTS	ng/L	ND	3.9	0.95	08/01/24 19:41	
7:3 FTCA	ng/L	ND	24.4	5.1	08/01/24 19:41	
8:2 FTS	ng/L	ND	3.9	1.0	08/01/24 19:41	
9Cl-PF3ONS	ng/L	ND	3.9	0.80	08/01/24 19:41	
ADONA	ng/L	ND	3.9	0.57	08/01/24 19:41	
HFPO-DA	ng/L	ND	3.9	0.76	08/01/24 19:41	
NEtFOSA	ng/L	ND	0.98	0.25	08/01/24 19:41	
NEtFOSAA	ng/L	ND	0.98	0.34	08/01/24 19:41	
NEtFOSE	ng/L	ND	9.8	3.1	08/01/24 19:41	
NFDHA	ng/L	ND	2.0	0.55	08/01/24 19:41	
NMeFOSA	ng/L	ND	0.98	0.26	08/01/24 19:41	
NMeFOSAA	ng/L	ND	0.98	0.31	08/01/24 19:41	
NMeFOSE	ng/L	ND	9.8	2.6	08/01/24 19:41	
PFBA	ng/L	ND	3.9	0.60	08/01/24 19:41	
PFBS	ng/L	ND	0.98	0.31	08/01/24 19:41	
PFDA	ng/L	ND	0.98	0.17	08/01/24 19:41	
PFDoA	ng/L	ND	0.98	0.22	08/01/24 19:41	
PFDoS	ng/L	ND	0.98	0.27	08/01/24 19:41	
PFDS	ng/L	ND	0.98	0.26	08/01/24 19:41	
PFEESA	ng/L	ND	2.0	0.31	08/01/24 19:41	
PFHpA	ng/L	ND	0.98	0.21	08/01/24 19:41	
PFHpS	ng/L	ND	0.98	0.23	08/01/24 19:41	
PFHxA	ng/L	ND	0.98	0.15	08/01/24 19:41	
PFHxS	ng/L	ND	0.98	0.25	08/01/24 19:41	
PFMBA	ng/L	ND	2.0	0.31	08/01/24 19:41	
PFMPA	ng/L	ND	2.0	0.47	08/01/24 19:41	
PFNA	ng/L	ND	0.98	0.23	08/01/24 19:41	
PFNS	ng/L	ND	0.98	0.24	08/01/24 19:41	
PFOA	ng/L	ND	0.98	0.33	08/01/24 19:41	
PFOS	ng/L	ND	0.98	0.17	08/01/24 19:41	
PFOSA	ng/L	ND	0.98	0.23	08/01/24 19:41	
PFPeA	ng/L	ND	2.0	0.29	08/01/24 19:41	
PFPeS	ng/L	ND	0.98	0.18	08/01/24 19:41	
PFTeDA	ng/L	ND	0.98	0.28	08/01/24 19:41	
PFTrDA	ng/L	ND	0.98	0.19	08/01/24 19:41	
PFUnA	ng/L	ND	0.98	0.25	08/01/24 19:41	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

METHOD BLANK: 5014347 Matrix: Water
Associated Lab Samples: 10699627001, 10699627002, 10699627003, 10699627004

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
13C2-PFDoA (S)	%.	83	10-130		08/01/24 19:41	
13C2-PFTA (S)	%.	81	10-130		08/01/24 19:41	
13C24:2FTS (S)	%.	71	40-200		08/01/24 19:41	
13C26:2FTS (S)	%.	98	40-200		08/01/24 19:41	
13C28:2FTS (S)	%.	72	40-300		08/01/24 19:41	
13C3-PFBS (S)	%.	88	40-135		08/01/24 19:41	
13C3-PFHxS (S)	%.	85	40-130		08/01/24 19:41	
13C3HFPO-DA (S)	%.	95	40-130		08/01/24 19:41	
13C4-PFBA (S)	%.	88	5-130		08/01/24 19:41	
13C4-PFHpA (S)	%.	86	40-130		08/01/24 19:41	
13C5-PFHxA (S)	%.	87	40-130		08/01/24 19:41	
13C5-PFPeA (S)	%.	85	40-130		08/01/24 19:41	
13C6-PFDA (S)	%.	85	40-130		08/01/24 19:41	
13C7-PFUdA (S)	%.	88	30-130		08/01/24 19:41	
13C8-PFOA (S)	%.	88	40-130		08/01/24 19:41	
13C8-PFOS (S)	%.	89	40-130		08/01/24 19:41	
13C8-PFOSA (S)	%.	81	40-130		08/01/24 19:41	
13C9-PFNA (S)	%.	89	40-130		08/01/24 19:41	
d3-MeFOSAA (S)	%.	89	40-170		08/01/24 19:41	
d3-NMeFOSA (S)	%.	75	10-130		08/01/24 19:41	
d5-EtFOSAA (S)	%.	93	25-135		08/01/24 19:41	
d5-NEtFOSA (S)	%.	74	10-130		08/01/24 19:41	
d7-NMeFOSE (S)	%.	73	10-130		08/01/24 19:41	
d9-NEtFOSE (S)	%.	78	10-130		08/01/24 19:41	

LABORATORY CONTROL SAMPLE & LCSD: 5014349 5014350

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
11Cl-PF3OUdS	ng/L	93.6	82.9	79.5	89	90	55-160	4	30	
3:3 FTCA	ng/L	124	111	106	90	90	65-130	5	30	
4:2 FTS	ng/L	92.9	92.1	86.0	99	98	70-145	7	30	
5:3 FTCA	ng/L	620	572	550	92	93	70-135	4	30	
6:2 FTS	ng/L	94.2	91.4	90.6	97	101	65-155	1	30	
7:3 FTCA	ng/L	620	538	531	87	90	50-145	1	30	
8:2 FTS	ng/L	95.4	93.4	90.1	98	100	60-150	4	30	
9Cl-PF3ONS	ng/L	92.9	82.8	80.6	89	91	70-155	3	30	
ADONA	ng/L	93.6	82.0	76.5	88	86	65-145	7	30	
HFPO-DA	ng/L	99.1	94.2	90.4	95	96	70-140	4	30	
NEtFOSA	ng/L	24.8	21.8	20.7	88	88	65-145	5	30	
NEtFOSAA	ng/L	24.8	20.6	20.5	83	87	70-145	0	30	
NEtFOSE	ng/L	248	225	217	91	92	70-135	4	30	
NFDHA	ng/L	49.6	48.9	48.2	99	102	50-150	2	30	
NMeFOSA	ng/L	24.8	22.2	22.1	90	94	60-150	0	30	
NMeFOSAA	ng/L	24.8	21.2	20.7	86	88	50-140	3	30	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

LABORATORY CONTROL SAMPLE & LCSD: 5014349 5014350

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
NMeFOSE	ng/L	248	238	226	96	96	70-145	5	30	
PFBA	ng/L	99.1	89.9	85.4	91	91	70-140	5	30	
PFBS	ng/L	22	20.2	19.1	92	91	60-145	5	30	
PFDA	ng/L	24.8	22.5	20.8	91	88	70-140	8	30	
PFDoA	ng/L	24.8	22.4	21.8	90	93	70-140	2	30	
PFDoS	ng/L	24	20.9	19.4	87	85	50-145	7	30	
PFDS	ng/L	23.9	20.8	19.5	87	86	60-145	7	30	
PFEESA	ng/L	44.1	43.0	42.0	97	100	70-140	2	30	
PFHpA	ng/L	24.8	22.8	21.7	92	92	70-150	5	30	
PFHpS	ng/L	23.6	20.8	20.1	88	90	70-150	3	30	
PFHxA	ng/L	24.8	22.9	21.8	93	93	70-145	5	30	
PFHxS	ng/L	22.7	19.7	19.4	87	90	65-145	2	30	
PFMBA	ng/L	49.6	46.5	44.4	94	94	60-150	5	30	
PFMPA	ng/L	49.6	45.0	42.9	91	91	55-140	5	30	
PFNA	ng/L	24.8	22.5	21.8	91	93	70-150	3	30	
PFNS	ng/L	23.9	20.9	19.7	88	87	65-145	6	30	
PFOA	ng/L	24.8	22.9	21.3	92	90	70-150	7	30	
PFOS	ng/L	23	20.2	20.1	88	92	55-150	0	30	
PFOSA	ng/L	24.8	22.8	21.3	92	91	70-145	7	30	
PFPeA	ng/L	49.6	45.5	43.2	92	92	65-135	5	30	
PFPeS	ng/L	23.3	21.6	20.8	93	94	65-140	4	30	
PFTeDA	ng/L	24.8	22.8	21.5	92	91	60-140	6	30	
PFTrDA	ng/L	24.8	23.6	22.1	95	94	65-140	7	30	
PFUnA	ng/L	24.8	24.0	22.3	97	95	70-145	7	30	
13C2-PFDoA (S)	%.				85	86	10-130			
13C2-PFTA (S)	%.				85	86	10-130			
13C24:2FTS (S)	%.				71	74	40-200			
13C26:2FTS (S)	%.				104	100	40-200			
13C28:2FTS (S)	%.				72	73	40-300			
13C3-PFBS (S)	%.				92	93	40-135			
13C3-PFHxS (S)	%.				91	91	40-130			
13C3HFPO-DA (S)	%.				96	96	40-130			
13C4-PFBA (S)	%.				90	89	5-130			
13C4-PFHpA (S)	%.				87	89	40-130			
13C5-PFHxA (S)	%.				88	88	40-130			
13C5-PFPeA (S)	%.				85	86	40-130			
13C6-PFDA (S)	%.				89	92	40-130			
13C7-PFUdA (S)	%.				84	88	30-130			
13C8-PFOA (S)	%.				87	91	40-130			
13C8-PFOS (S)	%.				94	90	40-130			
13C8-PFOSA (S)	%.				83	80	40-130			
13C9-PFNA (S)	%.				91	89	40-130			
d3-MeFOSAA (S)	%.				90	88	40-170			
d3-NMeFOSA (S)	%.				77	69	10-130			
d5-EtFOSAA (S)	%.				95	87	25-135			
d5-NEtFOSA (S)	%.				77	68	10-130			
d7-NMeFOSE (S)	%.				74	69	10-130			

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

LABORATORY CONTROL SAMPLE & LCSD: 5014349 5014350

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
d9-NEtFOSE (S)	%.				78	74	10-130			

LABORATORY CONTROL SAMPLE: 5014351

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
11Cl-PF3OUdS	ng/L	7.5	5.6	74	55-160	
3:3 FTCA	ng/L	9.9	8.9	90	65-130	
4:2 FTS	ng/L	7.4	6.5	88	70-145	
5:3 FTCA	ng/L	49.6	41.6	84	70-135	
6:2 FTS	ng/L	7.5	6.5	86	65-155	
7:3 FTCA	ng/L	49.6	40.5	82	50-145	
8:2 FTS	ng/L	7.6	6.6	87	60-150	
9Cl-PF3ONS	ng/L	7.4	5.9	79	70-155	
ADONA	ng/L	7.5	6.8	90	65-145	
HFPO-DA	ng/L	7.9	6.6	84	70-140	
NEtFOSA	ng/L	2	1.7	88	65-145	
NEtFOSAA	ng/L	2	1.8	92	70-145	
NEtFOSE	ng/L	19.8	16.1	81	70-135	
NFDHA	ng/L	4	3.7	92	50-150	
NMeFOSA	ng/L	2	1.6	79	60-150	
NMeFOSAA	ng/L	2	1.6	79	50-140	
NMeFOSE	ng/L	19.8	17.4	88	70-145	
PFBA	ng/L	7.9	6.8	86	70-140	
PFBS	ng/L	1.8	1.5	87	60-145	
PFDA	ng/L	2	1.6	82	70-140	
PFDoA	ng/L	2	1.7	86	70-140	
PFDoS	ng/L	1.9	1.7	88	50-145	
PFDS	ng/L	1.9	1.8	96	60-145	
PFEESA	ng/L	3.5	3.1	87	70-140	
PFHpA	ng/L	2	1.8	90	70-150	
PFHpS	ng/L	1.9	1.5	77	70-150	
PFHxA	ng/L	2	2.0	103	70-145	
PFHxS	ng/L	1.8	1.8	98	65-145	
PFMBA	ng/L	4	3.4	85	60-150	
PFMPA	ng/L	4	3.3	84	55-140	
PFNA	ng/L	2	1.7	83	70-150	
PFNS	ng/L	1.9	1.5	78	65-145	
PFOA	ng/L	2	2.1	105	70-150	
PFOS	ng/L	1.8	2.0	106	55-150	
PFOSA	ng/L	2	1.7	84	70-145	
PFPeA	ng/L	4	3.8	97	65-135	
PFPeS	ng/L	1.9	1.6	86	65-140	
PFTeDA	ng/L	2	1.6	81	60-140	
PFTrDA	ng/L	2	1.6	83	65-140	
PFUnA	ng/L	2	1.6	81	70-145	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

LABORATORY CONTROL SAMPLE: 5014351

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
13C2-PFDoA (S)	%.			81	10-130	
13C2-PFTA (S)	%.			78	10-130	
13C24:2FTS (S)	%.			71	40-200	
13C26:2FTS (S)	%.			106	40-200	
13C28:2FTS (S)	%.			75	40-300	
13C3-PFBS (S)	%.			89	40-135	
13C3-PFHxS (S)	%.			86	40-130	
13C3HFPO-DA (S)	%.			93	40-130	
13C4-PFBA (S)	%.			87	5-130	
13C4-PFHpA (S)	%.			84	40-130	
13C5-PFHxA (S)	%.			86	40-130	
13C5-PFPeA (S)	%.			83	40-130	
13C6-PFDA (S)	%.			87	40-130	
13C7-PFUdA (S)	%.			84	30-130	
13C8-PFOA (S)	%.			86	40-130	
13C8-PFOS (S)	%.			84	40-130	
13C8-PFOSA (S)	%.			74	40-130	
13C9-PFNA (S)	%.			87	40-130	
d3-MeFOSAA (S)	%.			80	40-170	
d3-NMeFOSA (S)	%.			69	10-130	
d5-EtFOSAA (S)	%.			83	25-135	
d5-NEtFOSA (S)	%.			66	10-130	
d7-NMeFOSE (S)	%.			67	10-130	
d9-NEtFOSE (S)	%.			72	10-130	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

S3	Surrogate recovery exceeded laboratory control limits. Analyte presence below reporting limits in associated sample.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: B2305038.02 Groundwater Invest
Pace Project No.: 10699627

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10699627001	**MW-1**	EPA 1633 DRAFT	959086	EPA 1633 DRAFT	960252
10699627002	**MW-2**	EPA 1633 DRAFT	959086	EPA 1633 DRAFT	960252
10699627003	**MW-3**	EPA 1633 DRAFT	959086	EPA 1633 DRAFT	960252
10699627004	**MW-4**	EPA 1633 DRAFT	959086	EPA 1633 DRAFT	960252
10699627005	**TRIP BLANK**	EPA 1633 DRAFT	957830	EPA 1633 DRAFT	958536

BRAUN INTERTEC

Braun Intertec EDGE Chain-of-Custody Form

Chain-of-custody form is a legal document. Please complete all applicable fields.

Lab Work Order Sticker

PROJECT INFORMATION

Project No.:	B2305038.02	MPCA Site ID:	----
Project Name:	Jonny Rooter Sewer and Drain	MPCA Task Code:	----
Project Manager:	Aaron Volker	MDH Program Code:	----
PM Email:	AVolker@braunintertec.com	MPCA WO No.:	EZ Order
PM Phone No.:	320.980.6461	Template/Profile:	3127966
CC Name & Email:	Cling@braunintertec.com	Prelogin/Bottle Order:	----

LABORATORY

Lab Name:	Pace Analytical	Turn-Around Time:	☒ Standard ☐ **RUSH**
Lab Address:	1700 Elm Street SE	Date Requested:	
	Minneapolis, MN 55414	Deliverable(s):	☒ Level II ☐ Level III ☐ Level IV
EPA Lab ID:	MN00064	Send lab data file to:	☒ Braun Intertec ☐ MPCA
Potential Hazard?	☒ No ☐ Yes	Billing Rate:	☒ Standard ☐ MPCA
If yes, specify in Comments field.			☐ Petrofund ☐ Other:

SAMPLE & ANALYSIS INFORMATION

SAMPLE TYPES
Sample = Sample
QC-FR = Duplicate
QC-FB = Field blank
QC-EB = Equipment blank
QC-TB = Trip blank
S-IDW = Inv. derived waste
QC-BLANK for LUI for QC-FB, QC-EB, QC-TB, S-IDW.

SAMPLING METHODS
SOILBORI = Subsurface soil from boring
SHALLSOIL = Surface soil
WELL-SUBMERS = Submersible pump
WELL-NONSUBMERS = Nonsubmersible pump
WELL-BAIL = Bailer
SW-GAS = Any soil vapor, indoor, or outdoor air
OTHER = Any other sampling method(s)
QC-BLANK = QC-FB, QC-EB, QC-TB, S-IDW

LAB MATRICES
SD = Soil, sediment, solid
NW = Nonpotable water
DW = Drinking water
AR = Air, gas, vapor
BL = Biological material
TS = Tissue
OT = Other
FB, EB, TB must have Lab Matrix

FIELD MATRICES
Soil-Sub = Subsurface soil
Soil-Surf = Surface soil
Wtr-Ground = Groundwater
Wtr-Drink = Drinking water
Gas-Soil = Soil gas/vapor
Air-Indoor = Indoor air
Air-Ambnt = Outdoor air
QC-BLANK for FB, EB, TB, IDW

List preservative used for each analysis; if n/a write "None". If soil and water samples have different preservatives for the same analysis, use two columns.

Field-filtered, Y or N

LUI	Sample Name	Sample Type	Start Date mm/dd/yyyy	Start Time 24-hr hh:mm	Depth Start	Depth End	Depth Units	End Date mm/dd/yyyy	End Time 24-hr hh:mm	Sampling Method	Lab Matrix	Field Matrix	AIS	Comments	# of Cont.	Analysis	PFAS by method 1633	Preserv	None	FF	N	Lab Sample No.	#
856812	MW-1	Sample	--	--	-	-	-	7/10/2024	16:20 11:30	WELL-NONSUB	NW	Wtr-Ground	N		3		X					01	1
856813	MW-2	Sample	--	--	-	-	-	7/10/2024	16:20	WELL-NONSUB	NW	Wtr-Ground	N		3		X					02	2
856814	MW-3	Sample	--	--	-	-	-	7/10/2024	14:15	WELL-NONSUB	NW	Wtr-Ground	N		3		X					03	3
856815	MW-4	Sample	--	--	-	-	-	7/10/2024	12:50	WELL-NONSUB	NW	Wtr-Ground	N		3		X					04	4
QC-Blank	Trip Blank	QC-TB	--	--	-	-	-	7/10/2024	7:00	QC-BLANK	NW	QC-BLANK	N		1		X					05	5
																							6
																							7
																							8
																							9
																							10

WO# : 10699627

10699627

Sampler's Name: Cooper Ling	Relinquished by (name): Cooper Ling	Company: Braun	Date/Time: 7/10/2024 17:00	Received By:	Company: Pace	Date/Time: 7/11/24 0930	Comments:	No. of Coolers/Boxes: 1	
Sampler's Phone: 612.723.4778	Relinquished by:	Company: Pace	Date/Time: 7/11/24 0945	Received By:	Company: Pace	Date/Time: 7/11/24 1015			
Sampler's Signature:	Relinquished by:	Company: Pace	Date/Time: 7/11/24 1120	Received By:	Company:	Date/Time: 7-11-24 1129		Page 1 of 1	

Temp. 3.7

Pace® Location Requested (City/State):
Pace Analytical Minnesota
1700 Elm Street, Suite 200
Minneapolis, MN 55414

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevant fields

LAB USE ONLY- Affix Workorder/Login Label Here

Scan QR Code for instructions

Company Name:	Braun Intertec Corporation	Contact/Report To:	Aaron Volker
Street Address:	3900 Roosevelt Rd., Suite 113 Saint Cloud, MN 56301	Phone #:	(320)202-7223
		E-Mail:	avolker@braunintertec.com
		Cc E-Mail:	
Customer Project #:			
Project Name:	B2305038.02 Groundwater Investigation	Invoice To:	Accounts Braun St.Cloud
		Invoice E-Mail:	bic_invoicecapture@concursolutions.com
Site Collection Info/Facility ID (as applicable):		Purchase Order # (if applicable):	
		Quote #:	
Time Zone Collected: [ ] AK [ ] PT [ ] MT [ ] CT [ ] ET		County / State origin of sample(s):	Minnesota

Data Deliverables:
[ ] Level II [ ] Level III [ ] Level IV
[ ] EQUIS
[ ] Other _____

Regulatory Program (DW, RCRA, etc.) as applicable: Reportable [ ] Yes [ ] No

Rush (Pre-approval required):
[ ] Same Day [ ] 1 Day [ ] 2 Day [ ] 3 Day [ ] Other _____

DW PWSID # or WW Permit # as applicable:

Date Results Requested:

Field Filtered (if applicable): [ ] Yes [ ] No

Analysis:

Specify Container Size **

Identify Container Preservative Type***

Analysis Requested

**Container Size: (1) 1L, (2) 500mL, (3) 250mL, (4) 125mL, (5) 100mL, (6) 40mL vial, (7) EnCore, (8) TerraCore, (9) 90mL, (10) Other

*** Preservative Types: (1) None, (2) HNO3, (3) H2SO4, (4) HCl, (5) NaOH, (6) Zn Acetate, (7) NaHSO4, (8) Sod. Thiosulfate, (9) Ascorbic Acid, (10) MeOH, (11) Other

Lab Use Only
Proj. Mgr: Brenna Bloome
AcctNum / Client ID:
Table #:
Profile / Template: 34251
Prelog / Bottle Ord. ID: EZ 3127966

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Waste Water (WW), Product (P), Soil/Solid (SS), Oil (OL), Wipe (WP), Tissue (TS), Bioassay (B), Vapor (V), Surface Water (SW),Sediment (SED), Sludge (SL), Caulk (CK), Leachate (LL), Biosolid (BS), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Composite Start Date	Composite Start Time	Collected or Composite End Date	Collected or Composite End Time	# Cont.	Res. Chlorine Results	Res. Chlorine Units	EPA 1633 DRAFT Water	Trip Blank - EPA 1633	Sample Comment	Preservation non-conformance identified for sample.

Additional Instructions from Pace®:

Collected By: (Printed Name)

Signature:

Customer Remarks / Special Conditions / Possible Hazards:

# Coolers:	Thermometer ID:	Correction Factor (°C):	Obs. Temp. (°C)	Corrected Temp. (°C)	On Ice:

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	Tracking Number:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	Delivered by: [ ] In- Person [ ] Courier
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	[ ] FedEX [ ] UPS [ ] Other
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	Page: 1 of 1

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace® Terms and Conditions found at https://www.pacelabs.com/resource-library/resource/pace-terms-and-conditions/

ENV-FRM-CORQ-0019_v02_110123 ©

ENV-FRM-MIN4-0150 v17_Sample Condition Upon Receipt

CLIENT NAME: Braun Interfec **PROJECT #:**

WO#: 10699627

PM: BGB **Due Date: 07/22/24**

CLIENT: Braun-BLM

COURIER: ☐ Client ☐ Commercial ☐ FedEx ☑ Pace ☐ SpeeDee ☐ UPS ☐ USPS

TRACKING NUMBER: _____ ☐ See Exceptions form ENV-FRM-MIN4-0142

Custody Seal on Cooler/Box Present: ☐ YES ☑ NO **Seals Intact:** ☐ YES ☑ NO **Biological Tissue Frozen:** ☐ YES ☐ NO ☑ N/A

Packing Material: ☐ Bubble Bags ☐ Bubble Wrap ☑ None ☐ Other **Temp Blank:** ☑ YES ☐ NO **Type of Ice:** ☐ Blue ☐ Dry ☑ Wet ☐ Melted ☐ None

Thermometer: ☐ T1 (0461) ☐ T2 (0436) ☑ T3 (0459) ☐ T4 (0402) ☐ T5 (0178) ☐ T6 (0235) ☐ T7 (0042) ☐ T8 (0775) ☐ T9 (0727) ☐ 01339252 (1710)

Did Samples Originate in West Virginia: ☐ YES ☑ NO	**Were All Container Temps taken:** ☐ YES ☐ NO ☑ N/A
Correction Factor: +0.3 **Cooler Temp Read w/Temp Blank:** 3.4 °C **Cooler Temp Corrected w/Temp Blank:** 3.7 °C	**Average Corrected Temp (no Temp Blank Only):** _____ °C
NOTE: *Temp should be above freezing to 6°C.*	☐ See Exceptions Form ENV-FRM-MIN4-0142 ☐ 1 Container
USDA Regulated Soil: ☑ N/A (Water Sample/Other (describe): _____	**Initials & Date of Person Examining Contents:** EC 7-11-24
Did Samples originate from one of the following states (check maps) – AL, AR, AZ, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX, or VA: ☐ YES ☐ NO	Did samples originate from a foreign source (international, including Hawaii and Puerto Rico): ☐ YES ☐ NO
NOTE: If YES to either question, fill out a Regulated Soil Checklist (ENV-FRM-MIN4-0154) and include with SCUR/COC paperwork.	

LOCATION (check one): ☐ DULUTH ☑ MINNEAPOLIS ☐ VIRGINIA	YES	NO	N/A	COMMENT(S)
Chain of Custody Present and Filled Out?	☑	☐		1.
Chain of Custody Relinquished?	☑	☐		2.
Sampler Name and/or Signature on COC?	☑	☐	☐	3.
Samples Arrived within Hold Time?	☑	☐		4. If Fecal: ☐ <8 hrs ☐ >8 hr, <24 hr ☐ No
Short Hold Time Analysis (<72 hr)?	☐	☑		5. ☐ BOD / cBOD ☐ Fecal coliform ☐ Hex Chrom ☐ HPC ☐ Nitrate ☐ Nitrite ☐ Ortho Phos ☐ Total coliform/*E. coli* ☐ Other: _____
Rush Turn Around Time Requested?	☐	☑		6.
Sufficient Sample Volume?	☑	☐		7.
Correct Containers Used? – Pace Containers Used?	☑ ☑	☐ ☐	☐	8.
Containers Intact?	☑	☐		9.
Field Filtered Volume Received for Dissolved Tests?	☐	☐	☑	10. Is sediment visible in the dissolved container: ☐ YES ☐ NO
Is sufficient information available to reconcile the samples to the COC? **NOTE:** If ID/Date/Time don't match fill out section 11. Matrix: ☐ Oil ☐ Soil ☑ Water ☐ Other	☑	☐		11. **If NO, write ID/Date/Time of container below:** ☐ See Exceptions form ENV-FRM-MIN4-0142
All containers needing acid/base preservation have been checked?	☐	☐	☑	12. Sample #:
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, < 2 pH, NaOH > 9 Sulfide, NaOH > 10 Cyanide)	☐	☐	☑	☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC, Oil & Grease, DRO/8015 (water) and Dioxins/PFAS	☐	☐	☑	Positive for Residual Chlorine: ☐ YES ☐ NO
NOTE: If adding preservation to the container, **verify with the PM first.** Clients may require adding preservative to the field and equipment blanks when this occurs.				**pH Paper Lot #**
				Residual Chlorine | 0-6 Roll | 0-6 Strip | 0-14 Strip
				☐ See Exceptions form ENV-FRM-MIN4-0142
Headspace in Methyl Mercury Container?	☐	☐	☑	13.
Extra labels present on soil VOA or WIDRO containers?	☐	☐	☑	14.
Headspace in VOA Vials (greater than 6mm)?	☐	☐	☑	☐ See Exceptions form ENV-FRM-MIN4-0140
Trip Blanks Present?	☐	☐	☑	15.
Trip Blank Custody Seals Present?	☐	☐	☑	Pace Trip Blank Lot # (if purchased): _____

CLIENT NOTIFICATION / RESOLUTION **FIELD DATA REQUIRED:** ☐ YES ☐ NO

Person Contacted: _____ Date & Time: _____

Comments / Resolution: _____

Project Manager Review: _____ **Date:** _____

NOTE: *When there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEQ Certification Office (i.e., out of hold, incorrect preservative, out of temp, incorrect containers).*

Labeled By: EC **Line:** 1

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

November 05, 2024

Aaron Volker
Braun Intertec Corp.
3900 Roosevelt Rd.
Suite 113
Saint Cloud, MN 56301

RE: Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Dear Aaron Volker:

Enclosed are the analytical results for sample(s) received by the laboratory on October 08, 2024. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Minneapolis

This report was revised on November 5th, 2024 to report sample MW-1 (10710908001) to the method detection limit.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Sydni Harrison
sydni.harrison@pacelabs.com
(612)607-1700
Project Manager

Enclosures

cc: Eric Crouser, Braun Intertec

Pace Analytical Services, LLC
1700 Elm Street
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CERTIFICATIONS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Pace Analytical Services, LLC - Minneapolis MN
1700 Elm Street SE, Minneapolis, MN 55414
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
DoD Certification via A2LA #: 2926.01
EPA Region 8 Tribal Water Systems+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
GMP+ Certification #: GMP050884
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
ISO/IEC 17025 Certification via A2LA #: 2926.01
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: AI-03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Approval: via MN 027-053-137
Minnesota Petrofund Registration #: 1240
Mississippi Certification #: MN00064
Missouri Certification #: 10100
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification (A2LA) #: R-036
North Dakota Certification (MN) #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification (1700) #: CL101
Oklahoma Certification #: 9507
Oregon Primary Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Vermont Certification #: VT-027053137
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DEP Certification #: 382
West Virginia DW Certification #: 9952 C
Wisconsin Certification #: 999407970
Wyoming UST Certification via A2LA #: 2926.01
USDA Permit #: P330-19-00208

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SAMPLE SUMMARY

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10710908001	**MW-1**	Water	10/04/24 10:48	10/08/24 11:18
10710908002	**MW-2**	Water	10/04/24 14:00	10/08/24 11:18
10710908003	**MW-3**	Water	10/04/24 13:15	10/08/24 11:18
10710908004	**MW-4**	Water	10/04/24 12:05	10/08/24 11:18
10710908005	**Trip Blank**	Water	10/04/24 07:00	10/08/24 11:18

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10710908001	**MW-1**	EPA 1633 DRAFT	NBH	64	PASI-M
10710908002	**MW-2**	EPA 1633 DRAFT	NBH	64	PASI-M
10710908003	**MW-3**	EPA 1633 DRAFT	NBH	64	PASI-M
10710908004	**MW-4**	EPA 1633 DRAFT	NBH	64	PASI-M
10710908005	**Trip Blank**	EPA 1633 DRAFT	NBH	64	PASI-M

PASI-M = Pace Analytical Services - Minneapolis

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Minneapolis, MN 55414
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PROJECT NARRATIVE

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Method: **EPA 1633 DRAFT**
Description: EPA 1633 DRAFT Water
Client: Braun Intertec Corporation
Date: November 05, 2024

General Information:
5 samples were analyzed for EPA 1633 DRAFT by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 1633 DRAFT with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: MW-1 **Lab ID: 10710908001** Collected: 10/04/24 10:48 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	**<15.6**	ng/L	80.0	15.6	1	10/28/24 08:39	10/28/24 21:58	763051-92-9	
3:3 FTCA	**<46.6**	ng/L	100	46.6	1	10/28/24 08:39	10/28/24 21:58	356-02-5	
4:2 FTS	**<9.6**	ng/L	80.0	9.6	1	10/28/24 08:39	10/28/24 21:58	757124-72-4	
5:3 FTCA	**<96.6**	ng/L	500	96.6	1	10/28/24 08:39	10/28/24 21:58	914637-49-3	
6:2 FTS	**<19.5**	ng/L	80.0	19.5	1	10/28/24 08:39	10/28/24 21:58	27619-97-2	
7:3 FTCA	**<105**	ng/L	500	105	1	10/28/24 08:39	10/28/24 21:58	812-70-4	
8:2 FTS	**<21.0**	ng/L	80.0	21.0	1	10/28/24 08:39	10/28/24 21:58	39108-34-4	
9Cl-PF3ONS	**<16.5**	ng/L	80.0	16.5	1	10/28/24 08:39	10/28/24 21:58	756426-58-1	
ADONA	**<11.7**	ng/L	80.0	11.7	1	10/28/24 08:39	10/28/24 21:58	919005-14-4	
HFPO-DA	**<15.6**	ng/L	80.0	15.6	1	10/28/24 08:39	10/28/24 21:58	13252-13-6	
NEtFOSAA	**<7.0**	ng/L	20.0	7.0	1	10/28/24 08:39	10/28/24 21:58	2991-50-6	
NEtFOSA	**<5.1**	ng/L	20.0	5.1	1	10/28/24 08:39	10/28/24 21:58	4151-50-2	
NEtFOSE	**<64.2**	ng/L	200	64.2	1	10/28/24 08:39	10/28/24 21:58	1691-99-2	
NFDHA	**<11.3**	ng/L	40.0	11.3	1	10/28/24 08:39	10/28/24 21:58	151772-58-6	
NMeFOSAA	**<6.4**	ng/L	20.0	6.4	1	10/28/24 08:39	10/28/24 21:58	2355-31-9	
NMeFOSA	**<5.3**	ng/L	20.0	5.3	1	10/28/24 08:39	10/28/24 21:58	31506-32-8	
NMeFOSE	**<53.4**	ng/L	200	53.4	1	10/28/24 08:39	10/28/24 21:58	24448-09-7	
PFBS	**8.8J**	ng/L	20.0	6.4	1	10/28/24 08:39	10/28/24 21:58	375-73-5	
PFDA	**<3.6**	ng/L	20.0	3.6	1	10/28/24 08:39	10/28/24 21:58	335-76-2	
PFHxA	**7.6J**	ng/L	20.0	3.0	1	10/28/24 08:39	10/28/24 21:58	307-24-4	
PFBA	**41.3J**	ng/L	80.0	12.3	1	10/28/24 08:39	10/28/24 21:58	375-22-4	
PFDS	**<5.3**	ng/L	20.0	5.3	1	10/28/24 08:39	10/28/24 21:58	335-77-3	
PFDoS	**<5.5**	ng/L	20.0	5.5	1	10/28/24 08:39	10/28/24 21:58	79780-39-5	
PFEESA	**<6.4**	ng/L	40.0	6.4	1	10/28/24 08:39	10/28/24 21:58	113507-82-7	
PFHpS	**<4.8**	ng/L	20.0	4.8	1	10/28/24 08:39	10/28/24 21:58	375-92-8	
PFMBA	**<6.3**	ng/L	40.0	6.3	1	10/28/24 08:39	10/28/24 21:58	863090-89-5	
PFMPA	**<9.7**	ng/L	40.0	9.7	1	10/28/24 08:39	10/28/24 21:58	377-73-1	
PFNS	**<4.8**	ng/L	20.0	4.8	1	10/28/24 08:39	10/28/24 21:58	68259-12-1	
PFOSA	**<4.8**	ng/L	20.0	4.8	1	10/28/24 08:39	10/28/24 21:58	754-91-6	
PFPeA	**9.1J**	ng/L	40.0	6.0	1	10/28/24 08:39	10/28/24 21:58	2706-90-3	
PFPeS	**<3.6**	ng/L	20.0	3.6	1	10/28/24 08:39	10/28/24 21:58	2706-91-4	
PFDoA	**<4.4**	ng/L	20.0	4.4	1	10/28/24 08:39	10/28/24 21:58	307-55-1	
PFHpA	**10.2J**	ng/L	20.0	4.3	1	10/28/24 08:39	10/28/24 21:58	375-85-9	
PFHxS	**7.5J**	ng/L	20.0	5.2	1	10/28/24 08:39	10/28/24 21:58	355-46-4	
PFNA	**<4.7**	ng/L	20.0	4.7	1	10/28/24 08:39	10/28/24 21:58	375-95-1	
PFOS	**<3.5**	ng/L	20.0	3.5	1	10/28/24 08:39	10/28/24 21:58	1763-23-1	
PFOA	**8.6J**	ng/L	20.0	6.8	1	10/28/24 08:39	10/28/24 21:58	335-67-1	
PFTeDA	**<5.7**	ng/L	20.0	5.7	1	10/28/24 08:39	10/28/24 21:58	376-06-7	
PFTrDA	**<4.0**	ng/L	20.0	4.0	1	10/28/24 08:39	10/28/24 21:58	72629-94-8	
PFUnA	**<5.1**	ng/L	20.0	5.1	1	10/28/24 08:39	10/28/24 21:58	2058-94-8	
Surrogates									
13C2-PFDoA (S)	86	%.	10-130		1	10/28/24 08:39	10/28/24 21:58		
13C3HFPO-DA (S)	90	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		
13C3-PFBS (S)	93	%.	40-135		1	10/28/24 08:39	10/28/24 21:58		
13C3-PFHxS (S)	93	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: MW-1 **Lab ID: 10710908001** Collected: 10/04/24 10:48 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	81	%.	5-130		1	10/28/24 08:39	10/28/24 21:58		
13C4-PFHpA (S)	85	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		
13C5-PFHxA (S)	83	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		
13C5-PFPeA (S)	87	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		
13C6-PFDA (S)	90	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		
13C8-PFOA (S)	91	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		
13C8-PFOS (S)	88	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		
13C8-PFOSA (S)	85	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		
13C9-PFNA (S)	86	%.	40-130		1	10/28/24 08:39	10/28/24 21:58		
d3-MeFOSAA (S)	80	%.	40-170		1	10/28/24 08:39	10/28/24 21:58		
d3-NMeFOSA (S)	77	%.	10-130		1	10/28/24 08:39	10/28/24 21:58		
d5-EtFOSAA (S)	82	%.	25-135		1	10/28/24 08:39	10/28/24 21:58		
d5-NEtFOSA (S)	85	%.	10-130		1	10/28/24 08:39	10/28/24 21:58		
d7-NMeFOSE (S)	82	%.	10-130		1	10/28/24 08:39	10/28/24 21:58		
d9-NEtFOSE (S)	85	%.	10-130		1	10/28/24 08:39	10/28/24 21:58		
13C2-PFTA (S)	78	%.	10-130		1	10/28/24 08:39	10/28/24 21:58		
13C7-PFUdA (S)	90	%.	30-130		1	10/28/24 08:39	10/28/24 21:58		
13C24:2FTS (S)	106	%.	40-200		1	10/28/24 08:39	10/28/24 21:58		
13C26:2FTS (S)	106	%.	40-200		1	10/28/24 08:39	10/28/24 21:58		
13C28:2FTS (S)	104	%.	40-300		1	10/28/24 08:39	10/28/24 21:58		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: MW-2 **Lab ID: 10710908002** Collected: 10/04/24 14:00 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.0	0.77	1	10/28/24 08:39	10/28/24 22:13	763051-92-9	
3:3 FTCA	ND	ng/L	5.0	2.3	1	10/28/24 08:39	10/28/24 22:13	356-02-5	
4:2 FTS	ND	ng/L	4.0	0.48	1	10/28/24 08:39	10/28/24 22:13	757124-72-4	
5:3 FTCA	ND	ng/L	24.8	4.8	1	10/28/24 08:39	10/28/24 22:13	914637-49-3	
6:2 FTS	ND	ng/L	4.0	0.97	1	10/28/24 08:39	10/28/24 22:13	27619-97-2	
7:3 FTCA	ND	ng/L	24.8	5.2	1	10/28/24 08:39	10/28/24 22:13	812-70-4	
8:2 FTS	ND	ng/L	4.0	1.0	1	10/28/24 08:39	10/28/24 22:13	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.0	0.82	1	10/28/24 08:39	10/28/24 22:13	756426-58-1	
ADONA	ND	ng/L	4.0	0.58	1	10/28/24 08:39	10/28/24 22:13	919005-14-4	
HFPO-DA	ND	ng/L	4.0	0.77	1	10/28/24 08:39	10/28/24 22:13	13252-13-6	
NEtFOSAA	ND	ng/L	0.99	0.35	1	10/28/24 08:39	10/28/24 22:13	2991-50-6	
NEtFOSA	ND	ng/L	0.99	0.25	1	10/28/24 08:39	10/28/24 22:13	4151-50-2	
NEtFOSE	ND	ng/L	9.9	3.2	1	10/28/24 08:39	10/28/24 22:13	1691-99-2	
NFDHA	ND	ng/L	2.0	0.56	1	10/28/24 08:39	10/28/24 22:13	151772-58-6	
NMeFOSAA	ND	ng/L	0.99	0.32	1	10/28/24 08:39	10/28/24 22:13	2355-31-9	
NMeFOSA	ND	ng/L	0.99	0.26	1	10/28/24 08:39	10/28/24 22:13	31506-32-8	
NMeFOSE	ND	ng/L	9.9	2.6	1	10/28/24 08:39	10/28/24 22:13	24448-09-7	
PFBS	**5.9**	ng/L	0.99	0.32	1	10/28/24 08:39	10/28/24 22:13	375-73-5	
PFDA	ND	ng/L	0.99	0.18	1	10/28/24 08:39	10/28/24 22:13	335-76-2	
PFHxA	**22.4**	ng/L	0.99	0.15	1	10/28/24 08:39	10/28/24 22:13	307-24-4	
PFBA	**31.4**	ng/L	4.0	0.61	1	10/28/24 08:39	10/28/24 22:13	375-22-4	
PFDS	ND	ng/L	0.99	0.26	1	10/28/24 08:39	10/28/24 22:13	335-77-3	
PFDoS	ND	ng/L	0.99	0.27	1	10/28/24 08:39	10/28/24 22:13	79780-39-5	
PFEESA	ND	ng/L	2.0	0.32	1	10/28/24 08:39	10/28/24 22:13	113507-82-7	
PFHpS	ND	ng/L	0.99	0.24	1	10/28/24 08:39	10/28/24 22:13	375-92-8	
PFMBA	ND	ng/L	2.0	0.31	1	10/28/24 08:39	10/28/24 22:13	863090-89-5	
PFMPA	ND	ng/L	2.0	0.48	1	10/28/24 08:39	10/28/24 22:13	377-73-1	
PFNS	ND	ng/L	0.99	0.24	1	10/28/24 08:39	10/28/24 22:13	68259-12-1	
PFOSA	ND	ng/L	0.99	0.24	1	10/28/24 08:39	10/28/24 22:13	754-91-6	
PFPeA	**26.0**	ng/L	2.0	0.30	1	10/28/24 08:39	10/28/24 22:13	2706-90-3	
PFPeS	ND	ng/L	0.99	0.18	1	10/28/24 08:39	10/28/24 22:13	2706-91-4	
PFDoA	ND	ng/L	0.99	0.22	1	10/28/24 08:39	10/28/24 22:13	307-55-1	
PFHpA	**9.7**	ng/L	0.99	0.21	1	10/28/24 08:39	10/28/24 22:13	375-85-9	
PFHxS	**6.2**	ng/L	0.99	0.26	1	10/28/24 08:39	10/28/24 22:13	355-46-4	
PFNA	ND	ng/L	0.99	0.23	1	10/28/24 08:39	10/28/24 22:13	375-95-1	
PFOS	**3.3**	ng/L	0.99	0.17	1	10/28/24 08:39	10/28/24 22:13	1763-23-1	
PFOA	**13.0**	ng/L	0.99	0.34	1	10/28/24 08:39	10/28/24 22:13	335-67-1	
PFTeDA	ND	ng/L	0.99	0.28	1	10/28/24 08:39	10/28/24 22:13	376-06-7	
PFTrDA	ND	ng/L	0.99	0.20	1	10/28/24 08:39	10/28/24 22:13	72629-94-8	
PFUnA	ND	ng/L	0.99	0.25	1	10/28/24 08:39	10/28/24 22:13	2058-94-8	
Surrogates									
13C2-PFDoA (S)	84	%.	10-130		1	10/28/24 08:39	10/28/24 22:13		
13C3HFPO-DA (S)	93	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		
13C3-PFBS (S)	95	%.	40-135		1	10/28/24 08:39	10/28/24 22:13		
13C3-PFHxS (S)	93	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: MW-2 **Lab ID: 10710908002** Collected: 10/04/24 14:00 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	64	%.	5-130		1	10/28/24 08:39	10/28/24 22:13		
13C4-PFHpA (S)	90	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		
13C5-PFHxA (S)	86	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		
13C5-PFPeA (S)	88	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		
13C6-PFDA (S)	92	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		
13C8-PFOA (S)	93	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		
13C8-PFOS (S)	94	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		
13C8-PFOSA (S)	87	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		
13C9-PFNA (S)	85	%.	40-130		1	10/28/24 08:39	10/28/24 22:13		
d3-MeFOSAA (S)	75	%.	40-170		1	10/28/24 08:39	10/28/24 22:13		
d3-NMeFOSA (S)	76	%.	10-130		1	10/28/24 08:39	10/28/24 22:13		
d5-EtFOSAA (S)	78	%.	25-135		1	10/28/24 08:39	10/28/24 22:13		
d5-NEtFOSA (S)	75	%.	10-130		1	10/28/24 08:39	10/28/24 22:13		
d7-NMeFOSE (S)	81	%.	10-130		1	10/28/24 08:39	10/28/24 22:13		
d9-NEtFOSE (S)	83	%.	10-130		1	10/28/24 08:39	10/28/24 22:13		
13C2-PFTA (S)	80	%.	10-130		1	10/28/24 08:39	10/28/24 22:13		
13C7-PFUdA (S)	86	%.	30-130		1	10/28/24 08:39	10/28/24 22:13		
13C24:2FTS (S)	92	%.	40-200		1	10/28/24 08:39	10/28/24 22:13		
13C26:2FTS (S)	98	%.	40-200		1	10/28/24 08:39	10/28/24 22:13		
13C28:2FTS (S)	101	%.	40-300		1	10/28/24 08:39	10/28/24 22:13		

Pace Analytical Services, LLC
1700 Elm Street
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ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: MW-3 **Lab ID: 10710908003** Collected: 10/04/24 13:15 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.1	0.80	1	10/28/24 08:39	10/28/24 22:29	763051-92-9	
3:3 FTCA	ND	ng/L	5.1	2.4	1	10/28/24 08:39	10/28/24 22:29	356-02-5	
4:2 FTS	ND	ng/L	4.1	0.50	1	10/28/24 08:39	10/28/24 22:29	757124-72-4	
5:3 FTCA	ND	ng/L	25.7	5.0	1	10/28/24 08:39	10/28/24 22:29	914637-49-3	
6:2 FTS	ND	ng/L	4.1	1.0	1	10/28/24 08:39	10/28/24 22:29	27619-97-2	
7:3 FTCA	ND	ng/L	25.7	5.4	1	10/28/24 08:39	10/28/24 22:29	812-70-4	
8:2 FTS	ND	ng/L	4.1	1.1	1	10/28/24 08:39	10/28/24 22:29	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.1	0.85	1	10/28/24 08:39	10/28/24 22:29	756426-58-1	
ADONA	ND	ng/L	4.1	0.60	1	10/28/24 08:39	10/28/24 22:29	919005-14-4	
HFPO-DA	ND	ng/L	4.1	0.80	1	10/28/24 08:39	10/28/24 22:29	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.36	1	10/28/24 08:39	10/28/24 22:29	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	10/28/24 08:39	10/28/24 22:29	4151-50-2	
NEtFOSE	ND	ng/L	10.3	3.3	1	10/28/24 08:39	10/28/24 22:29	1691-99-2	
NFDHA	ND	ng/L	2.1	0.58	1	10/28/24 08:39	10/28/24 22:29	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.33	1	10/28/24 08:39	10/28/24 22:29	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	10/28/24 08:39	10/28/24 22:29	31506-32-8	
NMeFOSE	ND	ng/L	10.3	2.7	1	10/28/24 08:39	10/28/24 22:29	24448-09-7	
PFBS	**11.9**	ng/L	1.0	0.33	1	10/28/24 08:39	10/28/24 22:29	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	10/28/24 08:39	10/28/24 22:29	335-76-2	
PFHxA	**8.3**	ng/L	1.0	0.16	1	10/28/24 08:39	10/28/24 22:29	307-24-4	
PFBA	**18.4**	ng/L	4.1	0.63	1	10/28/24 08:39	10/28/24 22:29	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	10/28/24 08:39	10/28/24 22:29	335-77-3	
PFDoS	ND	ng/L	1.0	0.29	1	10/28/24 08:39	10/28/24 22:29	79780-39-5	
PFEESA	ND	ng/L	2.1	0.33	1	10/28/24 08:39	10/28/24 22:29	113507-82-7	
PFHpS	ND	ng/L	1.0	0.25	1	10/28/24 08:39	10/28/24 22:29	375-92-8	
PFMBA	ND	ng/L	2.1	0.33	1	10/28/24 08:39	10/28/24 22:29	863090-89-5	
PFMPA	ND	ng/L	2.1	0.50	1	10/28/24 08:39	10/28/24 22:29	377-73-1	
PFNS	ND	ng/L	1.0	0.25	1	10/28/24 08:39	10/28/24 22:29	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	10/28/24 08:39	10/28/24 22:29	754-91-6	
PFPeA	**11.8**	ng/L	2.1	0.31	1	10/28/24 08:39	10/28/24 22:29	2706-90-3	
PFPeS	ND	ng/L	1.0	0.19	1	10/28/24 08:39	10/28/24 22:29	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	10/28/24 08:39	10/28/24 22:29	307-55-1	
PFHpA	**5.6**	ng/L	1.0	0.22	1	10/28/24 08:39	10/28/24 22:29	375-85-9	
PFHxS	**5.3**	ng/L	1.0	0.27	1	10/28/24 08:39	10/28/24 22:29	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	10/28/24 08:39	10/28/24 22:29	375-95-1	
PFOS	**1.1**	ng/L	1.0	0.18	1	10/28/24 08:39	10/28/24 22:29	1763-23-1	
PFOA	**6.2**	ng/L	1.0	0.35	1	10/28/24 08:39	10/28/24 22:29	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	10/28/24 08:39	10/28/24 22:29	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	10/28/24 08:39	10/28/24 22:29	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	10/28/24 08:39	10/28/24 22:29	2058-94-8	
Surrogates									
13C2-PFDoA (S)	83	%.	10-130		1	10/28/24 08:39	10/28/24 22:29		
13C3HFPO-DA (S)	92	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		
13C3-PFBS (S)	95	%.	40-135		1	10/28/24 08:39	10/28/24 22:29		
13C3-PFHxS (S)	94	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: MW-3 **Lab ID: 10710908003** Collected: 10/04/24 13:15 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	60	%.	5-130		1	10/28/24 08:39	10/28/24 22:29		
13C4-PFHpA (S)	90	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		
13C5-PFHxA (S)	85	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		
13C5-PFPeA (S)	89	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		
13C6-PFDA (S)	94	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		
13C8-PFOA (S)	93	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		
13C8-PFOS (S)	90	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		
13C8-PFOSA (S)	87	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		
13C9-PFNA (S)	87	%.	40-130		1	10/28/24 08:39	10/28/24 22:29		
d3-MeFOSAA (S)	73	%.	40-170		1	10/28/24 08:39	10/28/24 22:29		
d3-NMeFOSA (S)	73	%.	10-130		1	10/28/24 08:39	10/28/24 22:29		
d5-EtFOSAA (S)	71	%.	25-135		1	10/28/24 08:39	10/28/24 22:29		
d5-NEtFOSA (S)	78	%.	10-130		1	10/28/24 08:39	10/28/24 22:29		
d7-NMeFOSE (S)	80	%.	10-130		1	10/28/24 08:39	10/28/24 22:29		
d9-NEtFOSE (S)	83	%.	10-130		1	10/28/24 08:39	10/28/24 22:29		
13C2-PFTA (S)	83	%.	10-130		1	10/28/24 08:39	10/28/24 22:29		
13C7-PFUdA (S)	85	%.	30-130		1	10/28/24 08:39	10/28/24 22:29		
13C24:2FTS (S)	94	%.	40-200		1	10/28/24 08:39	10/28/24 22:29		
13C26:2FTS (S)	104	%.	40-200		1	10/28/24 08:39	10/28/24 22:29		
13C28:2FTS (S)	110	%.	40-300		1	10/28/24 08:39	10/28/24 22:29		

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
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ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: MW-4 **Lab ID: 10710908004** Collected: 10/04/24 12:05 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.1	0.80	1	10/28/24 08:39	10/28/24 22:44	763051-92-9	
3:3 FTCA	ND	ng/L	5.1	2.4	1	10/28/24 08:39	10/28/24 22:44	356-02-5	
4:2 FTS	ND	ng/L	4.1	0.49	1	10/28/24 08:39	10/28/24 22:44	757124-72-4	
5:3 FTCA	ND	ng/L	25.6	4.9	1	10/28/24 08:39	10/28/24 22:44	914637-49-3	
6:2 FTS	ND	ng/L	4.1	1.0	1	10/28/24 08:39	10/28/24 22:44	27619-97-2	
7:3 FTCA	ND	ng/L	25.6	5.4	1	10/28/24 08:39	10/28/24 22:44	812-70-4	
8:2 FTS	ND	ng/L	4.1	1.1	1	10/28/24 08:39	10/28/24 22:44	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.1	0.84	1	10/28/24 08:39	10/28/24 22:44	756426-58-1	
ADONA	ND	ng/L	4.1	0.60	1	10/28/24 08:39	10/28/24 22:44	919005-14-4	
HFPO-DA	ND	ng/L	4.1	0.80	1	10/28/24 08:39	10/28/24 22:44	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.36	1	10/28/24 08:39	10/28/24 22:44	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.26	1	10/28/24 08:39	10/28/24 22:44	4151-50-2	
NEtFOSE	ND	ng/L	10.2	3.3	1	10/28/24 08:39	10/28/24 22:44	1691-99-2	
NFDHA	ND	ng/L	2.0	0.58	1	10/28/24 08:39	10/28/24 22:44	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.33	1	10/28/24 08:39	10/28/24 22:44	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.27	1	10/28/24 08:39	10/28/24 22:44	31506-32-8	
NMeFOSE	ND	ng/L	10.2	2.7	1	10/28/24 08:39	10/28/24 22:44	24448-09-7	
PFBS	**4.9**	ng/L	1.0	0.33	1	10/28/24 08:39	10/28/24 22:44	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	10/28/24 08:39	10/28/24 22:44	335-76-2	
PFHxA	**9.6**	ng/L	1.0	0.15	1	10/28/24 08:39	10/28/24 22:44	307-24-4	
PFBA	**16.1**	ng/L	4.1	0.63	1	10/28/24 08:39	10/28/24 22:44	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	10/28/24 08:39	10/28/24 22:44	335-77-3	
PFDoS	ND	ng/L	1.0	0.28	1	10/28/24 08:39	10/28/24 22:44	79780-39-5	
PFEESA	ND	ng/L	2.0	0.33	1	10/28/24 08:39	10/28/24 22:44	113507-82-7	
PFHpS	ND	ng/L	1.0	0.24	1	10/28/24 08:39	10/28/24 22:44	375-92-8	
PFMBA	ND	ng/L	2.0	0.32	1	10/28/24 08:39	10/28/24 22:44	863090-89-5	
PFMPA	ND	ng/L	2.0	0.49	1	10/28/24 08:39	10/28/24 22:44	377-73-1	
PFNS	ND	ng/L	1.0	0.25	1	10/28/24 08:39	10/28/24 22:44	68259-12-1	
PFOSA	ND	ng/L	1.0	0.24	1	10/28/24 08:39	10/28/24 22:44	754-91-6	
PFPeA	**7.8**	ng/L	2.0	0.31	1	10/28/24 08:39	10/28/24 22:44	2706-90-3	
PFPeS	ND	ng/L	1.0	0.19	1	10/28/24 08:39	10/28/24 22:44	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	10/28/24 08:39	10/28/24 22:44	307-55-1	
PFHpA	**6.1**	ng/L	1.0	0.22	1	10/28/24 08:39	10/28/24 22:44	375-85-9	
PFHxS	**5.1**	ng/L	1.0	0.27	1	10/28/24 08:39	10/28/24 22:44	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	10/28/24 08:39	10/28/24 22:44	375-95-1	
PFOS	**7.6**	ng/L	1.0	0.18	1	10/28/24 08:39	10/28/24 22:44	1763-23-1	
PFOA	**17.7**	ng/L	1.0	0.35	1	10/28/24 08:39	10/28/24 22:44	335-67-1	
PFTeDA	ND	ng/L	1.0	0.29	1	10/28/24 08:39	10/28/24 22:44	376-06-7	
PFTrDA	ND	ng/L	1.0	0.20	1	10/28/24 08:39	10/28/24 22:44	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	10/28/24 08:39	10/28/24 22:44	2058-94-8	
Surrogates									
13C2-PFDoA (S)	78	%.	10-130		1	10/28/24 08:39	10/28/24 22:44		
13C3HFPO-DA (S)	86	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		
13C3-PFBS (S)	98	%.	40-135		1	10/28/24 08:39	10/28/24 22:44		
13C3-PFHxS (S)	95	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: MW-4 **Lab ID: 10710908004** Collected: 10/04/24 12:05 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	69	%.	5-130		1	10/28/24 08:39	10/28/24 22:44		
13C4-PFHpA (S)	86	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		
13C5-PFHxA (S)	83	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		
13C5-PFPeA (S)	85	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		
13C6-PFDA (S)	92	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		
13C8-PFOA (S)	89	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		
13C8-PFOS (S)	93	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		
13C8-PFOSA (S)	93	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		
13C9-PFNA (S)	90	%.	40-130		1	10/28/24 08:39	10/28/24 22:44		
d3-MeFOSAA (S)	84	%.	40-170		1	10/28/24 08:39	10/28/24 22:44		
d3-NMeFOSA (S)	71	%.	10-130		1	10/28/24 08:39	10/28/24 22:44		
d5-EtFOSAA (S)	77	%.	25-135		1	10/28/24 08:39	10/28/24 22:44		
d5-NEtFOSA (S)	74	%.	10-130		1	10/28/24 08:39	10/28/24 22:44		
d7-NMeFOSE (S)	79	%.	10-130		1	10/28/24 08:39	10/28/24 22:44		
d9-NEtFOSE (S)	79	%.	10-130		1	10/28/24 08:39	10/28/24 22:44		
13C2-PFTA (S)	78	%.	10-130		1	10/28/24 08:39	10/28/24 22:44		
13C7-PFUdA (S)	84	%.	30-130		1	10/28/24 08:39	10/28/24 22:44		
13C24:2FTS (S)	96	%.	40-200		1	10/28/24 08:39	10/28/24 22:44		
13C26:2FTS (S)	99	%.	40-200		1	10/28/24 08:39	10/28/24 22:44		
13C28:2FTS (S)	102	%.	40-300		1	10/28/24 08:39	10/28/24 22:44		

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: Trip Blank **Lab ID: 10710908005** Collected: 10/04/24 07:00 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	3.9	0.75	1	10/28/24 08:39	10/28/24 23:00	763051-92-9	
3:3 FTCA	ND	ng/L	4.8	2.3	1	10/28/24 08:39	10/28/24 23:00	356-02-5	
4:2 FTS	ND	ng/L	3.9	0.47	1	10/28/24 08:39	10/28/24 23:00	757124-72-4	
5:3 FTCA	ND	ng/L	24.2	4.7	1	10/28/24 08:39	10/28/24 23:00	914637-49-3	
6:2 FTS	ND	ng/L	3.9	0.95	1	10/28/24 08:39	10/28/24 23:00	27619-97-2	
7:3 FTCA	ND	ng/L	24.2	5.1	1	10/28/24 08:39	10/28/24 23:00	812-70-4	
8:2 FTS	ND	ng/L	3.9	1.0	1	10/28/24 08:39	10/28/24 23:00	39108-34-4	
9Cl-PF3ONS	ND	ng/L	3.9	0.80	1	10/28/24 08:39	10/28/24 23:00	756426-58-1	
ADONA	ND	ng/L	3.9	0.57	1	10/28/24 08:39	10/28/24 23:00	919005-14-4	
HFPO-DA	ND	ng/L	3.9	0.75	1	10/28/24 08:39	10/28/24 23:00	13252-13-6	
NEtFOSAA	ND	ng/L	0.97	0.34	1	10/28/24 08:39	10/28/24 23:00	2991-50-6	
NEtFOSA	ND	ng/L	0.97	0.25	1	10/28/24 08:39	10/28/24 23:00	4151-50-2	
NEtFOSE	ND	ng/L	9.7	3.1	1	10/28/24 08:39	10/28/24 23:00	1691-99-2	
NFDHA	ND	ng/L	1.9	0.55	1	10/28/24 08:39	10/28/24 23:00	151772-58-6	
NMeFOSAA	ND	ng/L	0.97	0.31	1	10/28/24 08:39	10/28/24 23:00	2355-31-9	
NMeFOSA	ND	ng/L	0.97	0.26	1	10/28/24 08:39	10/28/24 23:00	31506-32-8	
NMeFOSE	ND	ng/L	9.7	2.6	1	10/28/24 08:39	10/28/24 23:00	24448-09-7	
PFBS	ND	ng/L	0.97	0.31	1	10/28/24 08:39	10/28/24 23:00	375-73-5	
PFDA	ND	ng/L	0.97	0.17	1	10/28/24 08:39	10/28/24 23:00	335-76-2	
PFHxA	ND	ng/L	0.97	0.15	1	10/28/24 08:39	10/28/24 23:00	307-24-4	
PFBA	ND	ng/L	3.9	0.59	1	10/28/24 08:39	10/28/24 23:00	375-22-4	
PFDS	ND	ng/L	0.97	0.26	1	10/28/24 08:39	10/28/24 23:00	335-77-3	
PFDoS	ND	ng/L	0.97	0.27	1	10/28/24 08:39	10/28/24 23:00	79780-39-5	
PFEESA	ND	ng/L	1.9	0.31	1	10/28/24 08:39	10/28/24 23:00	113507-82-7	
PFHpS	ND	ng/L	0.97	0.23	1	10/28/24 08:39	10/28/24 23:00	375-92-8	
PFMBA	ND	ng/L	1.9	0.31	1	10/28/24 08:39	10/28/24 23:00	863090-89-5	
PFMPA	ND	ng/L	1.9	0.47	1	10/28/24 08:39	10/28/24 23:00	377-73-1	
PFNS	ND	ng/L	0.97	0.23	1	10/28/24 08:39	10/28/24 23:00	68259-12-1	
PFOSA	ND	ng/L	0.97	0.23	1	10/28/24 08:39	10/28/24 23:00	754-91-6	
PFPeA	ND	ng/L	1.9	0.29	1	10/28/24 08:39	10/28/24 23:00	2706-90-3	
PFPeS	ND	ng/L	0.97	0.18	1	10/28/24 08:39	10/28/24 23:00	2706-91-4	
PFDoA	ND	ng/L	0.97	0.21	1	10/28/24 08:39	10/28/24 23:00	307-55-1	
PFHpA	ND	ng/L	0.97	0.21	1	10/28/24 08:39	10/28/24 23:00	375-85-9	
PFHxS	ND	ng/L	0.97	0.25	1	10/28/24 08:39	10/28/24 23:00	355-46-4	
PFNA	ND	ng/L	0.97	0.23	1	10/28/24 08:39	10/28/24 23:00	375-95-1	
PFOS	ND	ng/L	0.97	0.17	1	10/28/24 08:39	10/28/24 23:00	1763-23-1	
PFOA	ND	ng/L	0.97	0.33	1	10/28/24 08:39	10/28/24 23:00	335-67-1	
PFTeDA	ND	ng/L	0.97	0.28	1	10/28/24 08:39	10/28/24 23:00	376-06-7	
PFTrDA	ND	ng/L	0.97	0.19	1	10/28/24 08:39	10/28/24 23:00	72629-94-8	
PFUnA	ND	ng/L	0.97	0.24	1	10/28/24 08:39	10/28/24 23:00	2058-94-8	
Surrogates									
13C2-PFDoA (S)	86	%.	10-130		1	10/28/24 08:39	10/28/24 23:00		
13C3HFPO-DA (S)	92	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		
13C3-PFBS (S)	93	%.	40-135		1	10/28/24 08:39	10/28/24 23:00		
13C3-PFHxS (S)	94	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Sample: Trip Blank **Lab ID: 10710908005** Collected: 10/04/24 07:00 Received: 10/08/24 11:18 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	87	%.	5-130		1	10/28/24 08:39	10/28/24 23:00		
13C4-PFHpA (S)	91	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		
13C5-PFHxA (S)	85	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		
13C5-PFPeA (S)	88	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		
13C6-PFDA (S)	93	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		
13C8-PFOA (S)	91	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		
13C8-PFOS (S)	94	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		
13C8-PFOSA (S)	87	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		
13C9-PFNA (S)	88	%.	40-130		1	10/28/24 08:39	10/28/24 23:00		
d3-MeFOSAA (S)	81	%.	40-170		1	10/28/24 08:39	10/28/24 23:00		
d3-NMeFOSA (S)	76	%.	10-130		1	10/28/24 08:39	10/28/24 23:00		
d5-EtFOSAA (S)	79	%.	25-135		1	10/28/24 08:39	10/28/24 23:00		
d5-NEtFOSA (S)	79	%.	10-130		1	10/28/24 08:39	10/28/24 23:00		
d7-NMeFOSE (S)	88	%.	10-130		1	10/28/24 08:39	10/28/24 23:00		
d9-NEtFOSE (S)	90	%.	10-130		1	10/28/24 08:39	10/28/24 23:00		
13C2-PFTA (S)	85	%.	10-130		1	10/28/24 08:39	10/28/24 23:00		
13C7-PFUdA (S)	92	%.	30-130		1	10/28/24 08:39	10/28/24 23:00		
13C24:2FTS (S)	100	%.	40-200		1	10/28/24 08:39	10/28/24 23:00		
13C26:2FTS (S)	107	%.	40-200		1	10/28/24 08:39	10/28/24 23:00		
13C28:2FTS (S)	100	%.	40-300		1	10/28/24 08:39	10/28/24 23:00		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
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QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

QC Batch: 975704
QC Batch Method: EPA 1633 DRAFT
Analysis Method: EPA 1633 DRAFT
Analysis Description: 1633 W
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10710908001, 10710908002, 10710908003, 10710908004, 10710908005

METHOD BLANK: 5099682 Matrix: Water
Associated Lab Samples: 10710908001, 10710908002, 10710908003, 10710908004, 10710908005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
11Cl-PF3OUdS	ng/L	<0.77	4.0	0.77	10/28/24 17:48	
3:3 FTCA	ng/L	<2.3	4.9	2.3	10/28/24 17:48	
4:2 FTS	ng/L	<0.48	4.0	0.48	10/28/24 17:48	
5:3 FTCA	ng/L	<4.8	24.7	4.8	10/28/24 17:48	
6:2 FTS	ng/L	<0.97	4.0	0.97	10/28/24 17:48	
7:3 FTCA	ng/L	<5.2	24.7	5.2	10/28/24 17:48	
8:2 FTS	ng/L	<1.0	4.0	1.0	10/28/24 17:48	
9Cl-PF3ONS	ng/L	<0.81	4.0	0.81	10/28/24 17:48	
ADONA	ng/L	<0.58	4.0	0.58	10/28/24 17:48	
HFPO-DA	ng/L	<0.77	4.0	0.77	10/28/24 17:48	
NEtFOSA	ng/L	<0.25	0.99	0.25	10/28/24 17:48	
NEtFOSAA	ng/L	<0.34	0.99	0.34	10/28/24 17:48	
NEtFOSE	ng/L	<3.2	9.9	3.2	10/28/24 17:48	
NFDHA	ng/L	<0.56	2.0	0.56	10/28/24 17:48	
NMeFOSA	ng/L	<0.26	0.99	0.26	10/28/24 17:48	
NMeFOSAA	ng/L	<0.32	0.99	0.32	10/28/24 17:48	
NMeFOSE	ng/L	<2.6	9.9	2.6	10/28/24 17:48	
PFBA	ng/L	1.2J	4.0	0.61	10/28/24 17:48	
PFBS	ng/L	<0.32	0.99	0.32	10/28/24 17:48	
PFDA	ng/L	<0.18	0.99	0.18	10/28/24 17:48	
PFDoA	ng/L	<0.22	0.99	0.22	10/28/24 17:48	
PFDoS	ng/L	<0.27	0.99	0.27	10/28/24 17:48	
PFDS	ng/L	<0.26	0.99	0.26	10/28/24 17:48	
PFEESA	ng/L	<0.32	2.0	0.32	10/28/24 17:48	
PFHpA	ng/L	<0.21	0.99	0.21	10/28/24 17:48	
PFHpS	ng/L	<0.24	0.99	0.24	10/28/24 17:48	
PFHxA	ng/L	<0.15	0.99	0.15	10/28/24 17:48	
PFHxS	ng/L	<0.26	0.99	0.26	10/28/24 17:48	
PFMBA	ng/L	<0.31	2.0	0.31	10/28/24 17:48	
PFMPA	ng/L	<0.48	2.0	0.48	10/28/24 17:48	
PFNA	ng/L	<0.23	0.99	0.23	10/28/24 17:48	
PFNS	ng/L	<0.24	0.99	0.24	10/28/24 17:48	
PFOA	ng/L	<0.34	0.99	0.34	10/28/24 17:48	
PFOS	ng/L	<0.17	0.99	0.17	10/28/24 17:48	
PFOSA	ng/L	<0.24	0.99	0.24	10/28/24 17:48	
PFPeA	ng/L	<0.30	2.0	0.30	10/28/24 17:48	
PFPeS	ng/L	<0.18	0.99	0.18	10/28/24 17:48	
PFTeDA	ng/L	<0.28	0.99	0.28	10/28/24 17:48	
PFTrDA	ng/L	<0.20	0.99	0.20	10/28/24 17:48	
PFUnA	ng/L	<0.25	0.99	0.25	10/28/24 17:48	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

METHOD BLANK: 5099682 Matrix: Water
Associated Lab Samples: 10710908001, 10710908002, 10710908003, 10710908004, 10710908005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
13C2-PFDoA (S)	%.	86	10-130		10/28/24 17:48	
13C2-PFTA (S)	%.	86	10-130		10/28/24 17:48	
13C24:2FTS (S)	%.	105	40-200		10/28/24 17:48	
13C26:2FTS (S)	%.	108	40-200		10/28/24 17:48	
13C28:2FTS (S)	%.	96	40-300		10/28/24 17:48	
13C3-PFBS (S)	%.	96	40-135		10/28/24 17:48	
13C3-PFHxS (S)	%.	92	40-130		10/28/24 17:48	
13C3HFPO-DA (S)	%.	88	40-130		10/28/24 17:48	
13C4-PFBA (S)	%.	89	5-130		10/28/24 17:48	
13C4-PFHpA (S)	%.	92	40-130		10/28/24 17:48	
13C5-PFHxA (S)	%.	86	40-130		10/28/24 17:48	
13C5-PFPeA (S)	%.	89	40-130		10/28/24 17:48	
13C6-PFDA (S)	%.	92	40-130		10/28/24 17:48	
13C7-PFUdA (S)	%.	87	30-130		10/28/24 17:48	
13C8-PFOA (S)	%.	93	40-130		10/28/24 17:48	
13C8-PFOS (S)	%.	92	40-130		10/28/24 17:48	
13C8-PFOSA (S)	%.	93	40-130		10/28/24 17:48	
13C9-PFNA (S)	%.	93	40-130		10/28/24 17:48	
d3-MeFOSAA (S)	%.	84	40-170		10/28/24 17:48	
d3-NMeFOSA (S)	%.	84	10-130		10/28/24 17:48	
d5-EtFOSAA (S)	%.	86	25-135		10/28/24 17:48	
d5-NEtFOSA (S)	%.	88	10-130		10/28/24 17:48	
d7-NMeFOSE (S)	%.	95	10-130		10/28/24 17:48	
d9-NEtFOSE (S)	%.	100	10-130		10/28/24 17:48	

LABORATORY CONTROL SAMPLE & LCSD: 5099683 5099684

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
11Cl-PF3OUdS	ng/L	89.4	84.1	76.5	94	88	55-160	10	30	
3:3 FTCA	ng/L	118	115	111	97	96	65-130	3	30	
4:2 FTS	ng/L	88.8	88.8	82.8	100	96	70-145	7	30	
5:3 FTCA	ng/L	592	622	600	105	104	70-135	4	30	
6:2 FTS	ng/L	90	90.9	87.1	101	99	65-155	4	30	
7:3 FTCA	ng/L	592	580	554	98	96	50-145	5	30	
8:2 FTS	ng/L	91.1	94.5	87.5	104	98	60-150	8	30	
9Cl-PF3ONS	ng/L	88.8	85.8	79.1	97	91	70-155	8	30	
ADONA	ng/L	89.4	85.2	79.8	95	92	65-145	7	30	
HFPO-DA	ng/L	94.7	90.6	84.3	96	91	70-140	7	30	
NEtFOSA	ng/L	23.7	20.1	20.5	85	89	65-145	2	30	
NEtFOSAA	ng/L	23.7	20.6	20.6	87	89	70-145	0	30	
NEtFOSE	ng/L	237	241	228	102	99	70-135	5	30	
NFDHA	ng/L	47.3	46.5	46.5	98	101	50-150	0	30	
NMeFOSA	ng/L	23.7	22.1	21.1	94	91	60-150	5	30	
NMeFOSAA	ng/L	23.7	23.6	20.3	100	88	50-140	15	30	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

LABORATORY CONTROL SAMPLE & LCSD: 5099683 5099684

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
NMeFOSE	ng/L	237	230	221	97	96	70-145	4	30	
PFBA	ng/L	94.7	89.4	86.6	94	94	70-140	3	30	
PFBS	ng/L	21	19.4	18.9	92	92	60-145	2	30	
PFDA	ng/L	23.7	21.2	20.5	90	89	70-140	4	30	
PFDoA	ng/L	23.7	21.5	21.2	91	92	70-140	1	30	
PFDoS	ng/L	23	19.5	17.8	85	79	50-145	9	30	
PFDS	ng/L	22.8	19.9	19.2	87	86	60-145	4	30	
PFEESA	ng/L	42.1	42.7	39.7	101	97	70-140	7	30	
PFHpA	ng/L	23.7	22.3	21.4	94	93	70-150	4	30	
PFHpS	ng/L	22.5	21.0	20.7	93	94	70-150	1	30	
PFHxA	ng/L	23.7	23.4	22.6	99	98	70-145	4	30	
PFHxS	ng/L	21.7	19.6	19.6	90	93	65-145	0	30	
PFMBA	ng/L	47.3	45.8	46.1	97	100	60-150	1	30	
PFMPA	ng/L	47.3	43.4	42.4	92	92	55-140	2	30	
PFNA	ng/L	23.7	21.1	20.9	89	90	70-150	1	30	
PFNS	ng/L	22.8	20.8	19.9	91	89	65-145	4	30	
PFOA	ng/L	23.7	22.6	21.9	96	95	70-150	3	30	
PFOS	ng/L	22	19.0	19.2	87	90	55-150	1	30	
PFOSA	ng/L	23.7	22.4	21.0	94	91	70-145	6	30	
PFPeA	ng/L	47.3	46.4	44.5	98	96	65-135	4	30	
PFPeS	ng/L	22.3	20.6	21.4	92	99	65-140	4	30	
PFTeDA	ng/L	23.7	22.5	22.3	95	97	60-140	1	30	
PFTrDA	ng/L	23.7	22.8	22.7	96	98	65-140	1	30	
PFUnA	ng/L	23.7	23.2	21.9	98	95	70-145	6	30	
13C2-PFDoA (S)	%.				91	78	10-130			
13C2-PFTA (S)	%.				85	73	10-130			
13C24:2FTS (S)	%.				94	94	40-200			
13C26:2FTS (S)	%.				97	94	40-200			
13C28:2FTS (S)	%.				97	95	40-300			
13C3-PFBS (S)	%.				94	91	40-135			
13C3-PFHxS (S)	%.				94	88	40-130			
13C3HFPO-DA (S)	%.				92	87	40-130			
13C4-PFBA (S)	%.				93	83	5-130			
13C4-PFHpA (S)	%.				90	85	40-130			
13C5-PFHxA (S)	%.				88	83	40-130			
13C5-PFPeA (S)	%.				91	84	40-130			
13C6-PFDA (S)	%.				96	86	40-130			
13C7-PFUdA (S)	%.				88	81	30-130			
13C8-PFOA (S)	%.				89	85	40-130			
13C8-PFOS (S)	%.				97	88	40-130			
13C8-PFOSA (S)	%.				90	81	40-130			
13C9-PFNA (S)	%.				96	87	40-130			
d3-MeFOSAA (S)	%.				86	81	40-170			
d3-NMeFOSA (S)	%.				82	77	10-130			
d5-EtFOSAA (S)	%.				89	81	25-135			
d5-NEtFOSA (S)	%.				90	81	10-130			
d7-NMeFOSE (S)	%.				92	84	10-130			

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REPORT OF LABORATORY ANALYSIS

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1700 Elm Street
Minneapolis, MN 55414
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QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

LABORATORY CONTROL SAMPLE & LCSD: 5099683 5099684

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
d9-NEtFOSE (S)	%.				95	88	10-130			

LABORATORY CONTROL SAMPLE: 5099685

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
11Cl-PF3OUdS	ng/L	7.4	6.3	85	55-160	
3:3 FTCA	ng/L	9.8	8.4	85	65-130	
4:2 FTS	ng/L	7.3	6.6	90	70-145	
5:3 FTCA	ng/L	48.9	44.1	90	70-135	
6:2 FTS	ng/L	7.4	6.4	87	65-155	
7:3 FTCA	ng/L	48.9	42.3	86	50-145	
8:2 FTS	ng/L	7.5	7.0	93	60-150	
9Cl-PF3ONS	ng/L	7.3	6.3	86	70-155	
ADONA	ng/L	7.4	6.3	85	65-145	
HFPO-DA	ng/L	7.8	6.7	85	70-140	
NEtFOSA	ng/L	2	1.6	81	65-145	
NEtFOSAA	ng/L	2	2.0	101	70-145	
NEtFOSE	ng/L	19.6	16.9	86	70-135	
NFDHA	ng/L	3.9	3.9	100	50-150	
NMeFOSA	ng/L	2	1.7	85	60-150	
NMeFOSAA	ng/L	2	1.8	90	50-140	
NMeFOSE	ng/L	19.6	17.0	87	70-145	
PFBA	ng/L	7.8	7.3	93	70-140	
PFBS	ng/L	1.7	1.4	78	60-145	
PFDA	ng/L	2	1.6	83	70-140	
PFDoA	ng/L	2	1.6	84	70-140	
PFDoS	ng/L	1.9	1.6	87	50-145	
PFDS	ng/L	1.9	1.6	87	60-145	
PFEESA	ng/L	3.5	3.0	86	70-140	
PFHpA	ng/L	2	1.6	82	70-150	
PFHpS	ng/L	1.9	1.6	88	70-150	
PFHxA	ng/L	2	1.7	88	70-145	
PFHxS	ng/L	1.8	1.6	91	65-145	
PFMBA	ng/L	3.9	3.5	89	60-150	
PFMPA	ng/L	3.9	3.5	89	55-140	
PFNA	ng/L	2	1.7	86	70-150	
PFNS	ng/L	1.9	1.7	89	65-145	
PFOA	ng/L	2	1.6	81	70-150	
PFOS	ng/L	1.8	1.5	80	55-150	
PFOSA	ng/L	2	1.6	82	70-145	
PFPeA	ng/L	3.9	3.6	91	65-135	
PFPeS	ng/L	1.8	1.6	86	65-140	
PFTeDA	ng/L	2	1.7	88	60-140	
PFTrDA	ng/L	2	1.8	91	65-140	
PFUnA	ng/L	2	1.6	83	70-145	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

LABORATORY CONTROL SAMPLE: 5099685

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
13C2-PFDoA (S)	%.			88	10-130	
13C2-PFTA (S)	%.			87	10-130	
13C24:2FTS (S)	%.			121	40-200	
13C26:2FTS (S)	%.			130	40-200	
13C28:2FTS (S)	%.			115	40-300	
13C3-PFBS (S)	%.			94	40-135	
13C3-PFHxS (S)	%.			93	40-130	
13C3HFPO-DA (S)	%.			92	40-130	
13C4-PFBA (S)	%.			88	5-130	
13C4-PFHpA (S)	%.			87	40-130	
13C5-PFHxA (S)	%.			87	40-130	
13C5-PFPeA (S)	%.			89	40-130	
13C6-PFDA (S)	%.			93	40-130	
13C7-PFUdA (S)	%.			94	30-130	
13C8-PFOA (S)	%.			92	40-130	
13C8-PFOS (S)	%.			93	40-130	
13C8-PFOSA (S)	%.			90	40-130	
13C9-PFNA (S)	%.			87	40-130	
d3-MeFOSAA (S)	%.			82	40-170	
d3-NMeFOSA (S)	%.			84	10-130	
d5-EtFOSAA (S)	%.			82	25-135	
d5-NEtFOSA (S)	%.			92	10-130	
d7-NMeFOSE (S)	%.			99	10-130	
d9-NEtFOSE (S)	%.			104	10-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: B2305038.02 Jonny Rooter Sewer-Revised Report
Pace Project No.: 10710908

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10710908001	**MW-1**	EPA 1633 DRAFT	975704	EPA 1633 DRAFT	976464
10710908002	**MW-2**	EPA 1633 DRAFT	975704	EPA 1633 DRAFT	976464
10710908003	**MW-3**	EPA 1633 DRAFT	975704	EPA 1633 DRAFT	976464
10710908004	**MW-4**	EPA 1633 DRAFT	975704	EPA 1633 DRAFT	976464
10710908005	**Trip Blank**	EPA 1633 DRAFT	975704	EPA 1633 DRAFT	976464

BRAUN INTERTEC

Braun Intertec EDGE Chain-of-Custody Form

Chain-of-custody form is a legal document. Please complete all applicable fields.

Lab Work Order Sticker

PROJECT INFORMATION			
Project No.:	B2305038.02	MPCA Site ID:	----
Project Name:	Jonny Rooter Sewer and Drain	MPCA Task Code:	----
Project Manager:	Aaron Volker	MDH Program Code:	----
PM Email:	AVolker@braunintertec.com	MPCA WO No.:	----
PM Phone No.:	320.980.6461	Template/Profile:	34251
CC Name & Email:	Cling@braunintertec.com	Prelogin/Bottle Order:	----

LABORATORY			
Lab Name:	Pace Analytical	Turn-Around Time:	☒ Standard ☐ RUSH
Lab Address:	1700 Elm Street SE	Date Requested:	
	Minneapolis, MN 55414	Deliverable(s):	☒ Level II ☐ Level III ☐ Level IV
EPA Lab ID:	MN00064	Send lab data file to:	☒ Braun Intertec ☐ MPCA
Potential Hazard?	☒ No ☐ Yes	Billing Rate:	☒ Standard ☐ MPCA
If yes, specify in Comments field.			☐ Petrofund ☐ Other:

SAMPLE & ANALYSIS INFORMATION

SAMPLE TYPES
Sample = Sample
QC-FR = Duplicate
QC-FB = Field blank
QC-EB = Equipment blank
QC-TB = Trip blank
S-IDW = Inv. derived waste
QC-BLANK for LUI for QC-FB, QC-EB, QC-TB, S-IDW.

SAMPLING METHODS
SOILBORI = Subsurface soil from boring
SHALLSOIL = Surface soil
WELL-SUBMERS = Submersible pump
WELL-NONSUBMERS = Nonsubmersible pump
WELL-BAIL = Bailer
SW-GAS = Any soil vapor, indoor, or outdoor air
OTHER = Any other sampling method(s)
QC-BLANK = QC-FB, QC-EB, QC-TB, S-IDW

LAB MATRICES
SD = Soil, sediment, solid
NW = Nonpotable water
DW = Drinking water
AR = Air, gas, vapor
BL = Biological material
TS = Tissue
OT = Other
FB, EB, TB must have Lab Matrix

FIELD MATRICES
Soil-Sub = Subsurface soil
Soil-Surf = Surface soil
Wtr-Ground = Groundwater
Wtr-Drink = Drinking water
Gas-Soil = Soil gas/vapor
Air-Indoor = Indoor air
Air-Ambnt = Outdoor air
QC-BLANK for FB, EB, TB, IDW

List preservative used for each analysis; if n/a write "None". If soil and water samples have different preservatives for the same analysis, use two columns.

Preserv: None

Field-filtered, Y or N — FF: N

LUI	Sample Name	Sample Type	Start Date mm/dd/yyyy	Start Time 24-hr hh:mm	Depth Start	Depth End	Depth Units	End Date mm/dd/yyyy	End Time 24-hr hh:mm	Sampling Method	Lab Matrix	Field Matrix	AIS	Comments	# of Cont.	Analysis	PFAS by method 1633	Lab Sample No.	#
856812	MW-1	Sample	--	--	-	-	-	10/4/2024	10:48	Other	NW	Wtr-Drink	N		3		X	001	1
856813	MW-2	Sample	--	--	-	-	-	10/4/2024	14:00	Other	NW	Wtr-Drink	N		3		X	002	2
856814	MW-3	Sample	--	--	-	-	-	10/4/2024	13:15	Other	NW	Wtr-Drink	N		3		X	003	3
856815	MW-4	Sample	--	--	-	-	-	10/4/2024	12:05	Other	NW	Wtr-Drink	N		3		X	004	4
QC-Blank	Trip Blank	QC-TB	--	--	-	-	-	10/4/2024	7:00	QC-BLANK	NW	QC-BLANK	N		1		X	005	5
																			6
																			7
																			8
																			9
																			10

WO#: 10710908

10710908

Sampler's Name	Relinquished by (name)	Company	Date/Time	Received By	Company	Date/Time	Comments
Cooper Ling	Cooper Ling	Braun	10/4/2024 17:00	[signature]	Pace	10/8/24 0945	Lab supplied trip blank
Sampler's Phone: 612.723.4778	[signature]	Pace	10/8/24 0945	[signature]	Pace	10/8/24 1045	
Sampler's Signature: [signature]	[signature]	Pace	10/8/24 1118	[signature]		10/8/24 1118	

No. of Coolers/Boxes: 1

Page 1 of 1

Temp: 1.8

EZ 5161414

ENV-FRM-MIN4-0150 v17_Sample Condition Upon Receipt

CLIENT NAME: Braun **PROJECT #:** **WO#: 10710908**

PM: SH5 **Due Date: 10/17/24**

CLIENT: Braun-BLM

COURIER: ☐ Client ☐ Commercial ☐ FedEx ☑ Pace ☐ SpeeDee ☐ UPS ☐ USPS

TRACKING NUMBER: _____ ☐ See Exceptions form ENV-FRM-MIN4-0142

Custody Seal on Cooler/Box Present: ☐ YES ☑ NO **Seals Intact:** ☐ YES ☑ NO **Biological Tissue Frozen:** ☐ YES ☐ NO ☑ N/A

Packing Material: ☐ Bubble Bags ☐ Bubble Wrap ☑ None ☐ Other **Temp Blank:** ☑ YES ☐ NO **Type of Ice:** ☐ Blue ☐ Dry ☑ Wet ☐ Melted ☐ None

Thermometer: ☐ T1 (0461) ☐ T2 (0436) ☑ T3 (0459) ☐ T4 (0402) ☐ T5 (0178) ☐ T6 (0235) ☐ T7 (0042) ☐ T8 (0775) ☐ T9 (0727) ☐ 01339252 (1710)

Did Samples Originate in West Virginia: ☐ YES ☑ NO	**Were All Container Temps taken:** ☐ YES ☐ NO ☑ N/A
Correction Factor: -0.1 **Cooler Temp Read w/Temp Blank:** 1.7 °C **Cooler Temp Corrected w/Temp Blank:** 1.6 °C	**Average Corrected Temp (no Temp Blank Only):** _____ °C
***NOTE:** Temp should be above freezing to 6°C.*	☐ See Exceptions Form ENV-FRM-MIN4-0142 ☐ 1 Container
USDA Regulated Soil: ☑ N/A – Water Sample/Other (describe): _____	**Initials & Date of Person Examining Contents:** ATL 10/8/24
Did Samples originate from one of the following states (check maps) – AL, AR, AZ, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX, or VA: ☐ YES ☐ NO	Did samples originate from a foreign source (international, including Hawaii and Puerto Rico): ☐ YES ☐ NO
NOTE: If YES to either question, fill out a Regulated Soil Checklist (ENV-FRM-MIN4-0154) and include with SCUR/COC paperwork.	

LOCATION (check one): ☐ DULUTH ☑ MINNEAPOLIS ☐ VIRGINIA	YES	NO	N/A	COMMENT(S)
Chain of Custody Present and Filled Out?	☑	☐		1.
Chain of Custody Relinquished?	☑	☐		2.
Sampler Name and/or Signature on COC?	☑	☐	☐	3.
Samples Arrived within Hold Time?	☑	☐		4. If Fecal: ☐ <8 hrs ☐ >8 hr, <24 hr ☐ No
Short Hold Time Analysis (<72 hr)?	☐	☑		5. ☐ BOD / cBOD ☐ Fecal coliform ☐ Hex Chrom ☐ HPC ☐ Nitrate ☐ Nitrite ☐ Ortho Phos ☐ Total coliform/*E. coli* ☐ Other: _____
Rush Turn Around Time Requested?	☐	☑		6.
Sufficient Sample Volume?	☑	☐		7.
Correct Containers Used? – Pace Containers Used?	☑ ☑	☐ ☐	☐	8.
Containers Intact?	☑	☐		9.
Field Filtered Volume Received for Dissolved Tests?	☐	☐	☑	10. Is sediment visible in the dissolved container: ☐ YES ☐ NO
Is sufficient information available to reconcile the samples to the COC? **NOTE:** If ID/Date/Time don't match fill out section 11. Matrix: ☐ Oil ☐ Soil ☑ Water ☐ Other	☑	☐		11. **If NO, write ID/Date/Time of container below:** ☐ See Exceptions form ENV-FRM-MIN4-0142
All containers needing acid/base preservation have been checked?	☐	☐	☑	12. Sample #:
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, < 2 pH, NaOH > 9 Sulfide, NaOH > 10 Cyanide)	☐	☐	☑	☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC, Oil & Grease, DRO/8015 (water) and Dioxins/PFAS	☐	☐	☑	Positive for Residual Chlorine: ☐ YES ☐ NO
NOTE: If adding preservation to the container, **verify with the PM first.** Clients may require adding preservative to the field and equipment blanks when this occurs.				**pH Paper Lot #**
				Residual Chlorine / 0-6 Roll / 0-6 Strip / 0-14 Strip (blank)
				☐ See Exceptions form ENV-FRM-MIN4-0142
Headspace in Methyl Mercury Container?	☐	☐	☑	13.
Extra labels present on soil VOA or WIDRO containers?	☐	☐	☑	14.
Headspace in VOA Vials (greater than 6mm)?	☐	☐	☑	☐ See Exceptions form ENV-FRM-MIN4-0140
Trip Blanks Present?	☐	☐	☑	15.
Trip Blank Custody Seals Present?	☐	☐	☑	Pace Trip Blank Lot # (if purchased): NA

CLIENT NOTIFICATION / RESOLUTION **FIELD DATA REQUIRED:** ☐ YES ☐ NO

Person Contacted: _____ Date & Time: _____

Comments / Resolution: _____

Project Manager Review: Sydni Harrison **Date:** 10/09/2024

***NOTE:** When there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEQ Certification Office (i.e., out of hold, incorrect preservative, out of temp, incorrect containers).*

Labeled By: EMT **Line:** 3

Service Center Transfer Checklist

Service Center: MPLS ☐ BLM ☒ AZ ☐ MT ☐

Client: Braun Intertec

Destination Lab:

MPLS ☒ Duluth ☐ National ☐ Other ☐

Received w/ Custody Seal? Yes ☐ No ☒

Custody Seal Intact? Yes ☐ No ☒

Temperature °C: Temp Read: 2.0 | Corr. Factor: SUB 0.7 | Corr. Temp: 1.3

IR Gun: G87A9205200775 (T8) ☐ Samples on ice, in cool down

Rush ☐ **Short Hold** ☐ N/A ☒

Containers Intact? Yes ☒ No ☐

Repacked and Re-Iced? Yes ☐ No ☒

Notes:

No Temp Blank Section

Read Temp	Corr. Temp	Avg. Temp

10/8/24

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

July 15, 2024

Aaron Volker
Braun Intertec Corp.
3900 Roosevelt Rd.
Suite 113
Saint Cloud, MN 56301

RE: Project: B2305038.02
Pace Project No.: 10697938

Dear Aaron Volker:

Enclosed are the analytical results for sample(s) received by the laboratory on June 26, 2024. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Minneapolis

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brenna Bloome
brenna.bloome@pacelabs.com
(612)607-1700
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: B2305038.02
Pace Project No.: 10697938

Pace Analytical Services, LLC - Minneapolis MN
1700 Elm Street SE, Minneapolis, MN 55414
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
DoD Certification via A2LA #: 2926.01
EPA Region 8 Tribal Water Systems+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
GMP+ Certification #: GMP050884
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
ISO/IEC 17025 Certification via A2LA #: 2926.01
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: AI-03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Approval: via MN 027-053-137
Minnesota Petrofund Registration #: 1240
Mississippi Certification #: MN00064
Missouri Certification #: 10100
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification (A2LA) #: R-036
North Dakota Certification (MN) #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification (1700) #: CL101
Oklahoma Certification #: 9507
Oregon Primary Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Vermont Certification #: VT-027053137
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DEP Certification #: 382
West Virginia DW Certification #: 9952 C
Wisconsin Certification #: 999407970
Wyoming UST Certification via A2LA #: 2926.01
USDA Permit #: P330-19-00208

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: B2305038.02
Pace Project No.: 10697938

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10697938001	**EB-1**	Water	06/25/24 08:42	06/26/24 11:00
10697938002	**Drilling Water**	Water	06/25/24 08:35	06/26/24 11:00
10697938003	**TB-1**	Water	06/25/24 08:00	06/26/24 11:00

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: B2305038.02
Pace Project No.: 10697938

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10697938001	**EB-1**	EPA 1633 DRAFT	MJL	64	PASI-M
10697938002	**Drilling Water**	EPA 1633 DRAFT	MJL	64	PASI-M
10697938003	**TB-1**	EPA 1633 DRAFT	MJL	64	PASI-M

PASI-M = Pace Analytical Services - Minneapolis

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

PROJECT NARRATIVE

Project: B2305038.02
Pace Project No.: 10697938

Method: **EPA 1633 DRAFT**
Description: EPA 1633 DRAFT Water
Client: Braun Intertec Corporation
Date: July 15, 2024

General Information:
3 samples were analyzed for EPA 1633 DRAFT by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 1633 DRAFT with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02
Pace Project No.: 10697938

Sample: EB-1 **Lab ID: 10697938001** Collected: 06/25/24 08:42 Received: 06/26/24 11:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.1	0.81	1	07/08/24 12:11	07/11/24 23:34	763051-92-9	
3:3 FTCA	ND	ng/L	5.2	2.4	1	07/08/24 12:11	07/11/24 23:34	356-02-5	
4:2 FTS	ND	ng/L	4.1	0.50	1	07/08/24 12:11	07/11/24 23:34	757124-72-4	
5:3 FTCA	ND	ng/L	25.9	5.0	1	07/08/24 12:11	07/11/24 23:34	914637-49-3	
6:2 FTS	ND	ng/L	4.1	1.0	1	07/08/24 12:11	07/11/24 23:34	27619-97-2	
7:3 FTCA	ND	ng/L	25.9	5.4	1	07/08/24 12:11	07/11/24 23:34	812-70-4	
8:2 FTS	ND	ng/L	4.1	1.1	1	07/08/24 12:11	07/11/24 23:34	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.1	0.85	1	07/08/24 12:11	07/11/24 23:34	756426-58-1	
ADONA	ND	ng/L	4.1	0.61	1	07/08/24 12:11	07/11/24 23:34	919005-14-4	
HFPO-DA	ND	ng/L	4.1	0.81	1	07/08/24 12:11	07/11/24 23:34	13252-13-6	
NEtFOSAA	ND	ng/L	1.0	0.36	1	07/08/24 12:11	07/11/24 23:34	2991-50-6	
NEtFOSA	ND	ng/L	1.0	0.27	1	07/08/24 12:11	07/11/24 23:34	4151-50-2	
NEtFOSE	ND	ng/L	10.4	3.3	1	07/08/24 12:11	07/11/24 23:34	1691-99-2	
NFDHA	ND	ng/L	2.1	0.59	1	07/08/24 12:11	07/11/24 23:34	151772-58-6	
NMeFOSAA	ND	ng/L	1.0	0.33	1	07/08/24 12:11	07/11/24 23:34	2355-31-9	
NMeFOSA	ND	ng/L	1.0	0.28	1	07/08/24 12:11	07/11/24 23:34	31506-32-8	
NMeFOSE	ND	ng/L	10.4	2.8	1	07/08/24 12:11	07/11/24 23:34	24448-09-7	
PFBS	ND	ng/L	1.0	0.33	1	07/08/24 12:11	07/11/24 23:34	375-73-5	
PFDA	ND	ng/L	1.0	0.18	1	07/08/24 12:11	07/11/24 23:34	335-76-2	
PFHxA	ND	ng/L	1.0	0.16	1	07/08/24 12:11	07/11/24 23:34	307-24-4	
PFBA	ND	ng/L	4.1	0.63	1	07/08/24 12:11	07/11/24 23:34	375-22-4	
PFDS	ND	ng/L	1.0	0.27	1	07/08/24 12:11	07/11/24 23:34	335-77-3	
PFDoS	ND	ng/L	1.0	0.29	1	07/08/24 12:11	07/11/24 23:34	79780-39-5	
PFEESA	ND	ng/L	2.1	0.33	1	07/08/24 12:11	07/11/24 23:34	113507-82-7	
PFHpS	ND	ng/L	1.0	0.25	1	07/08/24 12:11	07/11/24 23:34	375-92-8	
PFMBA	ND	ng/L	2.1	0.33	1	07/08/24 12:11	07/11/24 23:34	863090-89-5	
PFMPA	ND	ng/L	2.1	0.50	1	07/08/24 12:11	07/11/24 23:34	377-73-1	
PFNS	ND	ng/L	1.0	0.25	1	07/08/24 12:11	07/11/24 23:34	68259-12-1	
PFOSA	ND	ng/L	1.0	0.25	1	07/08/24 12:11	07/11/24 23:34	754-91-6	
PFPeA	ND	ng/L	2.1	0.31	1	07/08/24 12:11	07/11/24 23:34	2706-90-3	
PFPeS	ND	ng/L	1.0	0.19	1	07/08/24 12:11	07/11/24 23:34	2706-91-4	
PFDoA	ND	ng/L	1.0	0.23	1	07/08/24 12:11	07/11/24 23:34	307-55-1	
PFHpA	ND	ng/L	1.0	0.22	1	07/08/24 12:11	07/11/24 23:34	375-85-9	
PFHxS	ND	ng/L	1.0	0.27	1	07/08/24 12:11	07/11/24 23:34	355-46-4	
PFNA	ND	ng/L	1.0	0.24	1	07/08/24 12:11	07/11/24 23:34	375-95-1	
PFOS	ND	ng/L	1.0	0.18	1	07/08/24 12:11	07/11/24 23:34	1763-23-1	
PFOA	ND	ng/L	1.0	0.35	1	07/08/24 12:11	07/11/24 23:34	335-67-1	
PFTeDA	ND	ng/L	1.0	0.30	1	07/08/24 12:11	07/11/24 23:34	376-06-7	
PFTrDA	ND	ng/L	1.0	0.21	1	07/08/24 12:11	07/11/24 23:34	72629-94-8	
PFUnA	ND	ng/L	1.0	0.26	1	07/08/24 12:11	07/11/24 23:34	2058-94-8	
Surrogates									
13C2-PFDoA (S)	83	%.	10-130		1	07/08/24 12:11	07/11/24 23:34		
13C3HFPO-DA (S)	102	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		
13C3-PFBS (S)	105	%.	40-135		1	07/08/24 12:11	07/11/24 23:34		
13C3-PFHxS (S)	101	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02
Pace Project No.: 10697938

Sample: EB-1 **Lab ID: 10697938001** Collected: 06/25/24 08:42 Received: 06/26/24 11:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	98	%.	5-130		1	07/08/24 12:11	07/11/24 23:34		
13C4-PFHpA (S)	97	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		
13C5-PFHxA (S)	97	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		
13C5-PFPeA (S)	102	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		
13C6-PFDA (S)	96	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		
13C8-PFOA (S)	97	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		
13C8-PFOS (S)	96	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		
13C8-PFOSA (S)	86	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		
13C9-PFNA (S)	98	%.	40-130		1	07/08/24 12:11	07/11/24 23:34		
d3-MeFOSAA (S)	89	%.	40-170		1	07/08/24 12:11	07/11/24 23:34		
d3-NMeFOSA (S)	69	%.	10-130		1	07/08/24 12:11	07/11/24 23:34		
d5-EtFOSAA (S)	85	%.	25-135		1	07/08/24 12:11	07/11/24 23:34		
d5-NEtFOSA (S)	71	%.	10-130		1	07/08/24 12:11	07/11/24 23:34		
d7-NMeFOSE (S)	78	%.	10-130		1	07/08/24 12:11	07/11/24 23:34		
d9-NEtFOSE (S)	81	%.	10-130		1	07/08/24 12:11	07/11/24 23:34		
13C2-PFTA (S)	78	%.	10-130		1	07/08/24 12:11	07/11/24 23:34		
13C7-PFUdA (S)	92	%.	30-130		1	07/08/24 12:11	07/11/24 23:34		
13C24:2FTS (S)	123	%.	40-200		1	07/08/24 12:11	07/11/24 23:34		
13C26:2FTS (S)	115	%.	40-200		1	07/08/24 12:11	07/11/24 23:34		
13C28:2FTS (S)	110	%.	40-300		1	07/08/24 12:11	07/11/24 23:34		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02
Pace Project No.: 10697938

Sample: Drilling Water **Lab ID: 10697938002** Collected: 06/25/24 08:35 Received: 06/26/24 11:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	4.6	0.89	1	07/08/24 12:11	07/11/24 23:49	763051-92-9	
3:3 FTCA	ND	ng/L	5.7	2.7	1	07/08/24 12:11	07/11/24 23:49	356-02-5	
4:2 FTS	ND	ng/L	4.6	0.55	1	07/08/24 12:11	07/11/24 23:49	757124-72-4	
5:3 FTCA	ND	ng/L	28.6	5.5	1	07/08/24 12:11	07/11/24 23:49	914637-49-3	
6:2 FTS	ND	ng/L	4.6	1.1	1	07/08/24 12:11	07/11/24 23:49	27619-97-2	
7:3 FTCA	ND	ng/L	28.6	6.0	1	07/08/24 12:11	07/11/24 23:49	812-70-4	
8:2 FTS	ND	ng/L	4.6	1.2	1	07/08/24 12:11	07/11/24 23:49	39108-34-4	
9Cl-PF3ONS	ND	ng/L	4.6	0.94	1	07/08/24 12:11	07/11/24 23:49	756426-58-1	
ADONA	ND	ng/L	4.6	0.67	1	07/08/24 12:11	07/11/24 23:49	919005-14-4	
HFPO-DA	ND	ng/L	4.6	0.89	1	07/08/24 12:11	07/11/24 23:49	13252-13-6	
NEtFOSAA	ND	ng/L	1.1	0.40	1	07/08/24 12:11	07/11/24 23:49	2991-50-6	
NEtFOSA	ND	ng/L	1.1	0.29	1	07/08/24 12:11	07/11/24 23:49	4151-50-2	
NEtFOSE	ND	ng/L	11.5	3.7	1	07/08/24 12:11	07/11/24 23:49	1691-99-2	
NFDHA	ND	ng/L	2.3	0.65	1	07/08/24 12:11	07/11/24 23:49	151772-58-6	
NMeFOSAA	ND	ng/L	1.1	0.37	1	07/08/24 12:11	07/11/24 23:49	2355-31-9	
NMeFOSA	ND	ng/L	1.1	0.30	1	07/08/24 12:11	07/11/24 23:49	31506-32-8	
NMeFOSE	ND	ng/L	11.5	3.1	1	07/08/24 12:11	07/11/24 23:49	24448-09-7	
PFBS	ND	ng/L	1.1	0.37	1	07/08/24 12:11	07/11/24 23:49	375-73-5	
PFDA	ND	ng/L	1.1	0.20	1	07/08/24 12:11	07/11/24 23:49	335-76-2	
PFHxA	ND	ng/L	1.1	0.17	1	07/08/24 12:11	07/11/24 23:49	307-24-4	
PFBA	**4.6**	ng/L	4.6	0.70	1	07/08/24 12:11	07/11/24 23:49	375-22-4	
PFDS	ND	ng/L	1.1	0.30	1	07/08/24 12:11	07/11/24 23:49	335-77-3	
PFDoS	ND	ng/L	1.1	0.32	1	07/08/24 12:11	07/11/24 23:49	79780-39-5	
PFEESA	ND	ng/L	2.3	0.37	1	07/08/24 12:11	07/11/24 23:49	113507-82-7	
PFHpS	ND	ng/L	1.1	0.27	1	07/08/24 12:11	07/11/24 23:49	375-92-8	
PFMBA	ND	ng/L	2.3	0.36	1	07/08/24 12:11	07/11/24 23:49	863090-89-5	
PFMPA	ND	ng/L	2.3	0.55	1	07/08/24 12:11	07/11/24 23:49	377-73-1	
PFNS	ND	ng/L	1.1	0.28	1	07/08/24 12:11	07/11/24 23:49	68259-12-1	
PFOSA	ND	ng/L	1.1	0.27	1	07/08/24 12:11	07/11/24 23:49	754-91-6	
PFPeA	ND	ng/L	2.3	0.34	1	07/08/24 12:11	07/11/24 23:49	2706-90-3	
PFPeS	ND	ng/L	1.1	0.21	1	07/08/24 12:11	07/11/24 23:49	2706-91-4	
PFDoA	ND	ng/L	1.1	0.25	1	07/08/24 12:11	07/11/24 23:49	307-55-1	
PFHpA	ND	ng/L	1.1	0.24	1	07/08/24 12:11	07/11/24 23:49	375-85-9	
PFHxS	ND	ng/L	1.1	0.30	1	07/08/24 12:11	07/11/24 23:49	355-46-4	
PFNA	ND	ng/L	1.1	0.27	1	07/08/24 12:11	07/11/24 23:49	375-95-1	
PFOS	ND	ng/L	1.1	0.20	1	07/08/24 12:11	07/11/24 23:49	1763-23-1	
PFOA	ND	ng/L	1.1	0.39	1	07/08/24 12:11	07/11/24 23:49	335-67-1	
PFTeDA	ND	ng/L	1.1	0.33	1	07/08/24 12:11	07/11/24 23:49	376-06-7	
PFTrDA	ND	ng/L	1.1	0.23	1	07/08/24 12:11	07/11/24 23:49	72629-94-8	
PFUnA	ND	ng/L	1.1	0.29	1	07/08/24 12:11	07/11/24 23:49	2058-94-8	
Surrogates									
13C2-PFDoA (S)	59	%.	10-130		1	07/08/24 12:11	07/11/24 23:49		
13C3HFPO-DA (S)	66	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		
13C3-PFBS (S)	65	%.	40-135		1	07/08/24 12:11	07/11/24 23:49		
13C3-PFHxS (S)	62	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02
Pace Project No.: 10697938

Sample: Drilling Water **Lab ID: 10697938002** Collected: 06/25/24 08:35 Received: 06/26/24 11:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	45	%.	5-130		1	07/08/24 12:11	07/11/24 23:49		
13C4-PFHpA (S)	61	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		
13C5-PFHxA (S)	63	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		
13C5-PFPeA (S)	71	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		
13C6-PFDA (S)	58	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		
13C8-PFOA (S)	58	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		
13C8-PFOS (S)	61	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		
13C8-PFOSA (S)	55	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		
13C9-PFNA (S)	61	%.	40-130		1	07/08/24 12:11	07/11/24 23:49		
d3-MeFOSAA (S)	59	%.	40-170		1	07/08/24 12:11	07/11/24 23:49		
d3-NMeFOSA (S)	40	%.	10-130		1	07/08/24 12:11	07/11/24 23:49		
d5-EtFOSAA (S)	59	%.	25-135		1	07/08/24 12:11	07/11/24 23:49		
d5-NEtFOSA (S)	41	%.	10-130		1	07/08/24 12:11	07/11/24 23:49		
d7-NMeFOSE (S)	49	%.	10-130		1	07/08/24 12:11	07/11/24 23:49		
d9-NEtFOSE (S)	54	%.	10-130		1	07/08/24 12:11	07/11/24 23:49		
13C2-PFTA (S)	58	%.	10-130		1	07/08/24 12:11	07/11/24 23:49		
13C7-PFUdA (S)	61	%.	30-130		1	07/08/24 12:11	07/11/24 23:49		
13C24:2FTS (S)	80	%.	40-200		1	07/08/24 12:11	07/11/24 23:49		
13C26:2FTS (S)	77	%.	40-200		1	07/08/24 12:11	07/11/24 23:49		
13C28:2FTS (S)	74	%.	40-300		1	07/08/24 12:11	07/11/24 23:49		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02
Pace Project No.: 10697938

Sample: TB-1 **Lab ID: 10697938003** Collected: 06/25/24 08:00 Received: 06/26/24 11:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ng/L	3.9	0.76	1	07/08/24 12:11	07/12/24 00:05	763051-92-9	
3:3 FTCA	ND	ng/L	4.9	2.3	1	07/08/24 12:11	07/12/24 00:05	356-02-5	
4:2 FTS	ND	ng/L	3.9	0.47	1	07/08/24 12:11	07/12/24 00:05	757124-72-4	
5:3 FTCA	ND	ng/L	24.5	4.7	1	07/08/24 12:11	07/12/24 00:05	914637-49-3	
6:2 FTS	ND	ng/L	3.9	0.95	1	07/08/24 12:11	07/12/24 00:05	27619-97-2	
7:3 FTCA	ND	ng/L	24.5	5.1	1	07/08/24 12:11	07/12/24 00:05	812-70-4	
8:2 FTS	ND	ng/L	3.9	1.0	1	07/08/24 12:11	07/12/24 00:05	39108-34-4	
9Cl-PF3ONS	ND	ng/L	3.9	0.80	1	07/08/24 12:11	07/12/24 00:05	756426-58-1	
ADONA	ND	ng/L	3.9	0.57	1	07/08/24 12:11	07/12/24 00:05	919005-14-4	
HFPO-DA	ND	ng/L	3.9	0.76	1	07/08/24 12:11	07/12/24 00:05	13252-13-6	
NEtFOSAA	ND	ng/L	0.98	0.34	1	07/08/24 12:11	07/12/24 00:05	2991-50-6	
NEtFOSA	ND	ng/L	0.98	0.25	1	07/08/24 12:11	07/12/24 00:05	4151-50-2	
NEtFOSE	ND	ng/L	9.8	3.1	1	07/08/24 12:11	07/12/24 00:05	1691-99-2	
NFDHA	ND	ng/L	2.0	0.55	1	07/08/24 12:11	07/12/24 00:05	151772-58-6	
NMeFOSAA	ND	ng/L	0.98	0.31	1	07/08/24 12:11	07/12/24 00:05	2355-31-9	
NMeFOSA	ND	ng/L	0.98	0.26	1	07/08/24 12:11	07/12/24 00:05	31506-32-8	
NMeFOSE	ND	ng/L	9.8	2.6	1	07/08/24 12:11	07/12/24 00:05	24448-09-7	
PFBS	ND	ng/L	0.98	0.31	1	07/08/24 12:11	07/12/24 00:05	375-73-5	
PFDA	ND	ng/L	0.98	0.17	1	07/08/24 12:11	07/12/24 00:05	335-76-2	
PFHxA	ND	ng/L	0.98	0.15	1	07/08/24 12:11	07/12/24 00:05	307-24-4	
PFBA	ND	ng/L	3.9	0.60	1	07/08/24 12:11	07/12/24 00:05	375-22-4	
PFDS	ND	ng/L	0.98	0.26	1	07/08/24 12:11	07/12/24 00:05	335-77-3	
PFDoS	ND	ng/L	0.98	0.27	1	07/08/24 12:11	07/12/24 00:05	79780-39-5	
PFEESA	ND	ng/L	2.0	0.31	1	07/08/24 12:11	07/12/24 00:05	113507-82-7	
PFHpS	ND	ng/L	0.98	0.23	1	07/08/24 12:11	07/12/24 00:05	375-92-8	
PFMBA	ND	ng/L	2.0	0.31	1	07/08/24 12:11	07/12/24 00:05	863090-89-5	
PFMPA	ND	ng/L	2.0	0.47	1	07/08/24 12:11	07/12/24 00:05	377-73-1	
PFNS	ND	ng/L	0.98	0.24	1	07/08/24 12:11	07/12/24 00:05	68259-12-1	
PFOSA	ND	ng/L	0.98	0.23	1	07/08/24 12:11	07/12/24 00:05	754-91-6	
PFPeA	ND	ng/L	2.0	0.29	1	07/08/24 12:11	07/12/24 00:05	2706-90-3	
PFPeS	ND	ng/L	0.98	0.18	1	07/08/24 12:11	07/12/24 00:05	2706-91-4	
PFDoA	ND	ng/L	0.98	0.22	1	07/08/24 12:11	07/12/24 00:05	307-55-1	
PFHpA	ND	ng/L	0.98	0.21	1	07/08/24 12:11	07/12/24 00:05	375-85-9	
PFHxS	ND	ng/L	0.98	0.25	1	07/08/24 12:11	07/12/24 00:05	355-46-4	
PFNA	ND	ng/L	0.98	0.23	1	07/08/24 12:11	07/12/24 00:05	375-95-1	
PFOS	ND	ng/L	0.98	0.17	1	07/08/24 12:11	07/12/24 00:05	1763-23-1	
PFOA	ND	ng/L	0.98	0.33	1	07/08/24 12:11	07/12/24 00:05	335-67-1	
PFTeDA	ND	ng/L	0.98	0.28	1	07/08/24 12:11	07/12/24 00:05	376-06-7	
PFTrDA	ND	ng/L	0.98	0.19	1	07/08/24 12:11	07/12/24 00:05	72629-94-8	
PFUnA	ND	ng/L	0.98	0.25	1	07/08/24 12:11	07/12/24 00:05	2058-94-8	
Surrogates									
13C2-PFDoA (S)	83	%.	10-130		1	07/08/24 12:11	07/12/24 00:05		
13C3HFPO-DA (S)	94	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		
13C3-PFBS (S)	105	%.	40-135		1	07/08/24 12:11	07/12/24 00:05		
13C3-PFHxS (S)	100	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02
Pace Project No.: 10697938

Sample: TB-1 **Lab ID: 10697938003** Collected: 06/25/24 08:00 Received: 06/26/24 11:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Water	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C4-PFBA (S)	94	%.	5-130		1	07/08/24 12:11	07/12/24 00:05		
13C4-PFHpA (S)	93	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		
13C5-PFHxA (S)	94	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		
13C5-PFPeA (S)	97	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		
13C6-PFDA (S)	93	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		
13C8-PFOA (S)	92	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		
13C8-PFOS (S)	95	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		
13C8-PFOSA (S)	83	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		
13C9-PFNA (S)	95	%.	40-130		1	07/08/24 12:11	07/12/24 00:05		
d3-MeFOSAA (S)	85	%.	40-170		1	07/08/24 12:11	07/12/24 00:05		
d3-NMeFOSA (S)	68	%.	10-130		1	07/08/24 12:11	07/12/24 00:05		
d5-EtFOSAA (S)	84	%.	25-135		1	07/08/24 12:11	07/12/24 00:05		
d5-NEtFOSA (S)	67	%.	10-130		1	07/08/24 12:11	07/12/24 00:05		
d7-NMeFOSE (S)	76	%.	10-130		1	07/08/24 12:11	07/12/24 00:05		
d9-NEtFOSE (S)	78	%.	10-130		1	07/08/24 12:11	07/12/24 00:05		
13C2-PFTA (S)	77	%.	10-130		1	07/08/24 12:11	07/12/24 00:05		
13C7-PFUdA (S)	87	%.	30-130		1	07/08/24 12:11	07/12/24 00:05		
13C24:2FTS (S)	121	%.	40-200		1	07/08/24 12:11	07/12/24 00:05		
13C26:2FTS (S)	118	%.	40-200		1	07/08/24 12:11	07/12/24 00:05		
13C28:2FTS (S)	109	%.	40-300		1	07/08/24 12:11	07/12/24 00:05		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02
Pace Project No.: 10697938

QC Batch: 954553
QC Batch Method: EPA 1633 DRAFT
Analysis Method: EPA 1633 DRAFT
Analysis Description: 1633 W
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10697938001, 10697938002, 10697938003

METHOD BLANK: 4991042 Matrix: Water
Associated Lab Samples: 10697938001, 10697938002, 10697938003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
11Cl-PF3OUdS	ng/L	ND	3.9	0.76	07/11/24 10:44	
3:3 FTCA	ng/L	ND	4.9	2.3	07/11/24 10:44	
4:2 FTS	ng/L	ND	3.9	0.47	07/11/24 10:44	
5:3 FTCA	ng/L	ND	24.5	4.7	07/11/24 10:44	
6:2 FTS	ng/L	ND	3.9	0.95	07/11/24 10:44	
7:3 FTCA	ng/L	ND	24.5	5.1	07/11/24 10:44	
8:2 FTS	ng/L	ND	3.9	1.0	07/11/24 10:44	
9Cl-PF3ONS	ng/L	ND	3.9	0.80	07/11/24 10:44	
ADONA	ng/L	ND	3.9	0.57	07/11/24 10:44	
HFPO-DA	ng/L	ND	3.9	0.76	07/11/24 10:44	
NEtFOSA	ng/L	ND	0.98	0.25	07/11/24 10:44	
NEtFOSAA	ng/L	ND	0.98	0.34	07/11/24 10:44	
NEtFOSE	ng/L	ND	9.8	3.1	07/11/24 10:44	
NFDHA	ng/L	ND	2.0	0.55	07/11/24 10:44	
NMeFOSA	ng/L	ND	0.98	0.26	07/11/24 10:44	
NMeFOSAA	ng/L	ND	0.98	0.31	07/11/24 10:44	
NMeFOSE	ng/L	ND	9.8	2.6	07/11/24 10:44	
PFBA	ng/L	ND	3.9	0.60	07/11/24 10:44	
PFBS	ng/L	ND	0.98	0.31	07/11/24 10:44	
PFDA	ng/L	ND	0.98	0.17	07/11/24 10:44	
PFDoA	ng/L	ND	0.98	0.22	07/11/24 10:44	
PFDoS	ng/L	ND	0.98	0.27	07/11/24 10:44	
PFDS	ng/L	ND	0.98	0.26	07/11/24 10:44	
PFEESA	ng/L	ND	2.0	0.31	07/11/24 10:44	
PFHpA	ng/L	ND	0.98	0.21	07/11/24 10:44	
PFHpS	ng/L	ND	0.98	0.23	07/11/24 10:44	
PFHxA	ng/L	ND	0.98	0.15	07/11/24 10:44	
PFHxS	ng/L	ND	0.98	0.25	07/11/24 10:44	
PFMBA	ng/L	ND	2.0	0.31	07/11/24 10:44	
PFMPA	ng/L	ND	2.0	0.47	07/11/24 10:44	
PFNA	ng/L	ND	0.98	0.23	07/11/24 10:44	
PFNS	ng/L	ND	0.98	0.24	07/11/24 10:44	
PFOA	ng/L	ND	0.98	0.33	07/11/24 10:44	
PFOS	ng/L	ND	0.98	0.17	07/11/24 10:44	
PFOSA	ng/L	ND	0.98	0.23	07/11/24 10:44	
PFPeA	ng/L	ND	2.0	0.29	07/11/24 10:44	
PFPeS	ng/L	ND	0.98	0.18	07/11/24 10:44	
PFTeDA	ng/L	ND	0.98	0.28	07/11/24 10:44	
PFTrDA	ng/L	ND	0.98	0.19	07/11/24 10:44	
PFUnA	ng/L	ND	0.98	0.25	07/11/24 10:44	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02
Pace Project No.: 10697938

METHOD BLANK: 4991042 Matrix: Water
Associated Lab Samples: 10697938001, 10697938002, 10697938003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
13C2-PFDoA (S)	%.	89	10-130		07/11/24 10:44	
13C2-PFTA (S)	%.	86	10-130		07/11/24 10:44	
13C24:2FTS (S)	%.	121	40-200		07/11/24 10:44	
13C26:2FTS (S)	%.	117	40-200		07/11/24 10:44	
13C28:2FTS (S)	%.	115	40-300		07/11/24 10:44	
13C3-PFBS (S)	%.	102	40-135		07/11/24 10:44	
13C3-PFHxS (S)	%.	102	40-130		07/11/24 10:44	
13C3HFPO-DA (S)	%.	96	40-130		07/11/24 10:44	
13C4-PFBA (S)	%.	96	5-130		07/11/24 10:44	
13C4-PFHpA (S)	%.	96	40-130		07/11/24 10:44	
13C5-PFHxA (S)	%.	95	40-130		07/11/24 10:44	
13C5-PFPeA (S)	%.	97	40-130		07/11/24 10:44	
13C6-PFDA (S)	%.	96	40-130		07/11/24 10:44	
13C7-PFUdA (S)	%.	95	30-130		07/11/24 10:44	
13C8-PFOA (S)	%.	94	40-130		07/11/24 10:44	
13C8-PFOS (S)	%.	95	40-130		07/11/24 10:44	
13C8-PFOSA (S)	%.	88	40-130		07/11/24 10:44	
13C9-PFNA (S)	%.	97	40-130		07/11/24 10:44	
d3-MeFOSAA (S)	%.	91	40-170		07/11/24 10:44	
d3-NMeFOSA (S)	%.	75	10-130		07/11/24 10:44	
d5-EtFOSAA (S)	%.	92	25-135		07/11/24 10:44	
d5-NEtFOSA (S)	%.	77	10-130		07/11/24 10:44	
d7-NMeFOSE (S)	%.	86	10-130		07/11/24 10:44	
d9-NEtFOSE (S)	%.	89	10-130		07/11/24 10:44	

LABORATORY CONTROL SAMPLE & LCSD: 4991043 4991044

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
11Cl-PF3OUdS	ng/L	91.7	76.7	85.9	84	91	55-160	11	30	
3:3 FTCA	ng/L	121	94.9	111	78	89	65-130	16	30	
4:2 FTS	ng/L	91.1	90.3	92.2	99	99	70-145	2	30	
5:3 FTCA	ng/L	607	502	577	83	92	70-135	14	30	
6:2 FTS	ng/L	92.3	92.0	94.1	100	99	65-155	2	30	
7:3 FTCA	ng/L	607	488	540	80	87	50-145	10	30	
8:2 FTS	ng/L	93.5	97.2	99.7	104	104	60-150	3	30	
9Cl-PF3ONS	ng/L	91.1	80.3	90.0	88	96	70-155	11	30	
ADONA	ng/L	91.7	75.1	86.3	82	92	65-145	14	30	
HFPO-DA	ng/L	97.2	79.4	92.2	82	92	70-140	15	30	
NEtFOSA	ng/L	24.3	21.8	21.9	90	88	65-145	0	30	
NEtFOSAA	ng/L	24.3	21.9	23.1	90	93	70-145	5	30	
NEtFOSE	ng/L	243	231	229	95	92	70-135	1	30	
NFDHA	ng/L	48.6	45.9	49.2	94	99	50-150	7	30	
NMeFOSA	ng/L	24.3	22.2	22.1	92	89	60-150	1	30	
NMeFOSAA	ng/L	24.3	22.9	22.9	94	92	50-140	0	30	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02
Pace Project No.: 10697938

LABORATORY CONTROL SAMPLE & LCSD: 4991043 4991044

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
NMeFOSE	ng/L	243	227	228	93	91	70-145	1	30	
PFBA	ng/L	97.2	94.1	94.4	97	95	70-140	0	30	
PFBS	ng/L	21.6	20.3	20.3	94	92	60-145	0	30	
PFDA	ng/L	24.3	23.0	23.6	95	94	70-140	2	30	
PFDoA	ng/L	24.3	23.2	23.8	96	96	70-140	3	30	
PFDoS	ng/L	23.6	20.9	20.7	89	86	50-145	1	30	
PFDS	ng/L	23.4	22.0	21.8	94	91	60-145	1	30	
PFEESA	ng/L	43.2	40.3	42.3	93	95	70-140	5	30	
PFHpA	ng/L	24.3	23.4	23.9	96	96	70-150	2	30	
PFHpS	ng/L	23.1	21.4	21.2	92	89	70-150	1	30	
PFHxA	ng/L	24.3	23.6	24.2	97	97	70-145	3	30	
PFHxS	ng/L	22.2	21.2	21.4	95	94	65-145	1	30	
PFMBA	ng/L	48.6	44.2	45.6	91	91	60-150	3	30	
PFMPA	ng/L	48.6	42.9	45.3	88	91	55-140	6	30	
PFNA	ng/L	24.3	22.9	23.1	94	93	70-150	1	30	
PFNS	ng/L	23.4	23.2	22.9	99	96	65-145	1	30	
PFOA	ng/L	24.3	23.3	23.4	96	94	70-150	1	30	
PFOS	ng/L	22.5	21.6	21.0	96	91	55-150	3	30	
PFOSA	ng/L	24.3	22.9	23.5	94	94	70-145	2	30	
PFPeA	ng/L	48.6	46.7	47.3	96	95	65-135	1	30	
PFPeS	ng/L	22.8	22.9	23.4	100	100	65-140	2	30	
PFTeDA	ng/L	24.3	23.4	23.9	96	96	60-140	2	30	
PFTrDA	ng/L	24.3	22.9	23.3	94	93	65-140	2	30	
PFUnA	ng/L	24.3	22.4	23.3	92	94	70-145	4	30	
13C2-PFDoA (S)	%.				93	90	10-130			
13C2-PFTA (S)	%.				91	85	10-130			
13C24:2FTS (S)	%.				108	105	40-200			
13C26:2FTS (S)	%.				108	107	40-200			
13C28:2FTS (S)	%.				102	100	40-300			
13C3-PFBS (S)	%.				102	101	40-135			
13C3-PFHxS (S)	%.				100	98	40-130			
13C3HFPO-DA (S)	%.				96	97	40-130			
13C4-PFBA (S)	%.				96	97	5-130			
13C4-PFHpA (S)	%.				94	95	40-130			
13C5-PFHxA (S)	%.				94	96	40-130			
13C5-PFPeA (S)	%.				95	99	40-130			
13C6-PFDA (S)	%.				97	95	40-130			
13C7-PFUdA (S)	%.				99	94	30-130			
13C8-PFOA (S)	%.				94	97	40-130			
13C8-PFOS (S)	%.				100	99	40-130			
13C8-PFOSA (S)	%.				93	87	40-130			
13C9-PFNA (S)	%.				97	97	40-130			
d3-MeFOSAA (S)	%.				94	89	40-170			
d3-NMeFOSA (S)	%.				82	65	10-130			
d5-EtFOSAA (S)	%.				98	88	25-135			
d5-NEtFOSA (S)	%.				84	66	10-130			
d7-NMeFOSE (S)	%.				93	81	10-130			

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02
Pace Project No.: 10697938

LABORATORY CONTROL SAMPLE & LCSD: 4991043 4991044

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
d9-NEtFOSE (S)	%.				96	83	10-130			

LABORATORY CONTROL SAMPLE: 4991045

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
11Cl-PF3OUdS	ng/L	7.5	6.7	89	55-160	
3:3 FTCA	ng/L	10	8.5	86	65-130	
4:2 FTS	ng/L	7.5	6.8	92	70-145	
5:3 FTCA	ng/L	49.8	41.8	84	70-135	
6:2 FTS	ng/L	7.6	7.0	92	65-155	
7:3 FTCA	ng/L	49.8	40.1	81	50-145	
8:2 FTS	ng/L	7.7	7.7	100	60-150	
9Cl-PF3ONS	ng/L	7.5	7.1	95	70-155	
ADONA	ng/L	7.5	6.8	90	65-145	
HFPO-DA	ng/L	8	7.2	91	70-140	
NEtFOSA	ng/L	2	1.8	91	65-145	
NEtFOSAA	ng/L	2	2.1	104	70-145	
NEtFOSE	ng/L	19.9	17.7	89	70-135	
NFDHA	ng/L	4	3.6	91	50-150	
NMeFOSA	ng/L	2	1.7	84	60-150	
NMeFOSAA	ng/L	2	1.7	86	50-140	
NMeFOSE	ng/L	19.9	17.3	87	70-145	
PFBA	ng/L	8	7.6	95	70-140	
PFBS	ng/L	1.8	1.7	96	60-145	
PFDA	ng/L	2	1.8	89	70-140	
PFDoA	ng/L	2	1.8	88	70-140	
PFDoS	ng/L	1.9	1.6	84	50-145	
PFDS	ng/L	1.9	1.7	88	60-145	
PFEESA	ng/L	3.5	3.3	93	70-140	
PFHpA	ng/L	2	1.8	91	70-150	
PFHpS	ng/L	1.9	2.0	106	70-150	
PFHxA	ng/L	2	1.9	95	70-145	
PFHxS	ng/L	1.8	1.7	94	65-145	
PFMBA	ng/L	4	3.5	87	60-150	
PFMPA	ng/L	4	3.6	90	55-140	
PFNA	ng/L	2	1.8	89	70-150	
PFNS	ng/L	1.9	1.9	98	65-145	
PFOA	ng/L	2	1.9	93	70-150	
PFOS	ng/L	1.8	1.8	100	55-150	
PFOSA	ng/L	2	1.9	94	70-145	
PFPeA	ng/L	4	3.6	91	65-135	
PFPeS	ng/L	1.9	1.8	99	65-140	
PFTeDA	ng/L	2	1.8	90	60-140	
PFTrDA	ng/L	2	1.7	87	65-140	
PFUnA	ng/L	2	1.7	84	70-145	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02
Pace Project No.: 10697938

LABORATORY CONTROL SAMPLE: 4991045

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
13C2-PFDoA (S)	%.			92	10-130	
13C2-PFTA (S)	%.			89	10-130	
13C24:2FTS (S)	%.			121	40-200	
13C26:2FTS (S)	%.			122	40-200	
13C28:2FTS (S)	%.			112	40-300	
13C3-PFBS (S)	%.			105	40-135	
13C3-PFHxS (S)	%.			101	40-130	
13C3HFPO-DA (S)	%.			94	40-130	
13C4-PFBA (S)	%.			97	5-130	
13C4-PFHpA (S)	%.			95	40-130	
13C5-PFHxA (S)	%.			97	40-130	
13C5-PFPeA (S)	%.			97	40-130	
13C6-PFDA (S)	%.			99	40-130	
13C7-PFUdA (S)	%.			97	30-130	
13C8-PFOA (S)	%.			96	40-130	
13C8-PFOS (S)	%.			96	40-130	
13C8-PFOSA (S)	%.			90	40-130	
13C9-PFNA (S)	%.			94	40-130	
d3-MeFOSAA (S)	%.			92	40-170	
d3-NMeFOSA (S)	%.			75	10-130	
d5-EtFOSAA (S)	%.			93	25-135	
d5-NEtFOSA (S)	%.			75	10-130	
d7-NMeFOSE (S)	%.			87	10-130	
d9-NEtFOSE (S)	%.			90	10-130	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: B2305038.02
Pace Project No.: 10697938

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: B2305038.02
Pace Project No.: 10697938

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10697938001	**EB-1**	EPA 1633 DRAFT	954553	EPA 1633 DRAFT	956242
10697938002	**Drilling Water**	EPA 1633 DRAFT	954553	EPA 1633 DRAFT	956242
10697938003	**TB-1**	EPA 1633 DRAFT	954553	EPA 1633 DRAFT	956242

CHAIN-OF-CUSTODY Analytical Request Document

Pace Analytical®

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

LAB USE ONLY- Affix Workorder/L MTJ

WO# : 10697938

10697938

ALL SHADED AI

Company: Braun Intertec	Billing Information: SAME
Address: 11001 Hampshire Ave S	
Report To: Aaron Volker	Email To: AVolker@braunintertec.com
Copy To:	Site Collection Info/Address: 4958 CR 8
Customer Project Name/Number: B23050038.02	State: MN County/City: St. Cloud Time Zone Collected: [ ] PT [ ] MT [X] CT [ ] ET
Phone: Email:	Site/Facility ID #: Compliance Monitoring? [ ] Yes [X] No
Collected By (print): Priya Sheno	Purchase Order #: Quote #: DW PWS ID #: DW Location Code:
Collected By (signature):	Turnaround Date Required: STAND Immediately Packed on Ice: [X] Yes [ ] No
Sample Disposal: [ ] Dispose as appropriate [ ] Return [ ] Archive: _____ [ ] Hold: _____	Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply) Field Filtered (if applicable): [ ] Yes [X] No Analysis: _____

Container Preservative Type **: U

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other _____

Analyses: PFAS 1628

Lab Profile/Line: 34257

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected (or Composite Start) Time	Composite End Date	Composite End Time	Res Cl	# of Ctns	PFAS		
EB-1			6/25/24	0842				3	X		001
Drilling Water			1	0885				1	X		002
TB-1			1	0800				1	X		003

Lab Sample Receipt Checklist:

Custody Seals Present/Intact	Y	N	NA
Custody Signatures Present	Y	N	NA
Collector Signature Present	Y	N	NA
Bottles Intact	Y	N	NA
Correct Bottles	Y	N	NA
Sufficient Volume	Y	N	NA
Samples Received on Ice	Y	N	NA
VOA - Headspace Acceptable	Y	N	NA
USDA Regulated Soils	Y	N	NA
Samples in Holding Time	Y	N	NA
Residual Chlorine Present	Y	N	NA
Cl Strips: _____			
Sample pH Acceptable	Y	N	NA
pH Strips: _____			
Sulfide Present	Y	N	NA
Lead Acetate Strips: _____			

LAB USE ONLY:
Lab Sample # / Comments:

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None

Packing Material Used:

Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A

Lab Tracking #: 2913923

Samples received via: FEDEX UPS Client Courier Pace Courier

Lab Sample Temperature Info:
Temp Blank Received: Y N NA
Therm ID#: T7
Cooler 1 Temp Upon Receipt: 4.1 oC
Cooler 1 Therm Corr. Factor: -0.3 oC
Cooler 1 Corrected Temp: 3.8 oC
Comments:

Relinquished by/Company: (Signature)	Date/Time: 6/25/24 1845	Received by/Company: (Signature)	Date/Time: 6/26/24 1000
Relinquished by/Company: (Signature)	Date/Time: 6/26/24 1000	Received by/Company: (Signature)	Date/Time: 6/26/24 1500
Relinquished by/Company: (Signature)	Date/Time: 6/26/24 11:50	Received by/Company: (Signature)	Date/Time: 6/26/24 1100

MTJL LAB USE ONLY
Table #:
Acctnum:
Template:
Prelogin:
PM:
PB:

Trip Blank Received: Y N NA
HCL MeOH TSP Other

Non Conformance(s): YES / NO

Page: 1 of: 1

ENV-FRM-MIN4-0150 v17_Sample Condition Upon Receipt

CLIENT NAME: Braun Interfor **PROJECT #:** **WO#: 10697938**

COURIER: ☐ Client ☐ Commercial ☐ FedEx ☒ Pace ☐ SpeeDee ☐ UPS ☐ USPS

PM: BGB **Due Date: 07/08/24**

CLIENT: Braun-BLM

TRACKING NUMBER: _____ ☐ See Exceptions form ENV-FRM-MIN4-0142

Custody Seal on Cooler/Box Present: ☐ YES ☒ NO **Seals Intact:** ☐ YES ☑ NO **Biological Tissue Frozen:** ☐ YES ☐ NO ☒ N/A

Packing Material: ☐ Bubble Bags ☐ Bubble Wrap ☑ None ☐ Other **Temp Blank:** ☑ YES ☐ NO **Type of Ice:** ☐ Blue ☐ Dry ☑ Wet ☐ Melted ☐ None

Thermometer: ☐ T1 (0461) ☐ T2 (0436) ☐ T3 (0459) ☐ T4 (0402) ☐ T5 (0178) ☐ T6 (0235) ☑ T7 (0042) ☐ T8 (0775) ☐ T9 (0727) ☐ 01339252 (1710)

Did Samples Originate in West Virginia: ☐ YES ☒ NO	**Were All Container Temps taken:** ☐ YES ☐ NO ☒ N/A
Correction Factor: -0.3 **Cooler Temp Read w/Temp Blank:** 4.1 °C **Cooler Temp Corrected w/Temp Blank:** 3.8 °C	**Average Corrected Temp (no Temp Blank Only):** _____ °C
***NOTE:** Temp should be above freezing to 6°C.*	☐ See Exceptions Form ENV-FRM-MIN4-0142 ☐ 1 Container
USDA Regulated Soil: ☒ N/A – Water Sample/Other (describe): _____	**Initials & Date of Person Examining Contents:** HB 6/26/24
Did Samples originate from one of the following states (check maps) – AL, AR, AZ, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX, or VA: ☐ YES ☐ NO	Did samples originate from a foreign source (international, including Hawaii and Puerto Rico): ☐ YES ☐ NO
NOTE: If YES to either question, fill out a Regulated Soil Checklist (ENV-FRM-MIN4-0154) and include with SCUR/COC paperwork.	

LOCATION (check one): ☐ DULUTH ☒ MINNEAPOLIS ☐ VIRGINIA	YES	NO	N/A	COMMENT(S)
Chain of Custody Present and Filled Out?	☑	☐		1.
Chain of Custody Relinquished?	☑	☐		2.
Sampler Name and/or Signature on COC?	☑	☐	☐	3.
Samples Arrived within Hold Time?	☑	☐		4. If Fecal: ☐ <8 hrs ☐ >8 hr, <24 hr ☐ No
Short Hold Time Analysis (<72 hr)?	☐	☑		5. ☐ BOD / cBOD ☐ Fecal coliform ☐ Hex Chrom ☐ HPC ☐ Nitrate ☐ Nitrite ☐ Ortho Phos ☐ Total coliform/*E. coli* ☐ Other: _____
Rush Turn Around Time Requested?	☐	☒		6.
Sufficient Sample Volume?	☑	☐		7.
Correct Containers Used? – Pace Containers Used?	☑ ☑	☐ ☐	☐	8. 001-002: 2 NT24, 1 ~~BP~~ NT4U HB 6/26/24 003: 3 NT24
Containers Intact?	☒	☐		9.
Field Filtered Volume Received for Dissolved Tests?	☐	☐	☒	10. Is sediment visible in the dissolved container: ☐ YES ☐ NO
Is sufficient information available to reconcile the samples to the COC? **NOTE:** If ID/Date/Time don't match fill out section 11. Matrix: ☐ Oil ☐ Soil ☒ Water ☐ Other	☒	☐		11. **If NO, write ID/Date/Time of container below:** ☐ See Exceptions form ENV-FRM-MIN4-0142
All containers needing acid/base preservation have been checked?	☐	☐	☑	12. Sample #:
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, < 2 pH, NaOH > 9 Sulfide, NaOH > 10 Cyanide)	☐	☐	☑	☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC, Oil & Grease, DRO/8015 (water) and Dioxins/PFAS	☐	☐	☒	Positive for Residual Chlorine: ☐ YES ☐ NO
NOTE: If adding preservation to the container, **verify with the PM first.** Clients may require adding preservative to the field and equipment blanks when this occurs.				**pH Paper Lot #**
				Residual Chlorine / 0-6 Roll / 0-6 Strip / 0-14 Strip
				☐ See Exceptions form ENV-FRM-MIN4-0142
Headspace in Methyl Mercury Container?	☐	☐	☑	13.
Extra labels present on soil VOA or WIDRO containers?	☐	☐	☑	14.
Headspace in VOA Vials (greater than 6mm)?	☐	☐	☑	☐ See Exceptions form ENV-FRM-MIN4-0140
Trip Blanks Present?	☐	☐	☑	15.
Trip Blank Custody Seals Present?	☐	☐	☑	Pace Trip Blank Lot # (if purchased): _____

CLIENT NOTIFICATION / RESOLUTION **FIELD DATA REQUIRED:** ☐ YES ☐ NO

Person Contacted: _____ Date & Time: _____

Comments / Resolution: _____

Project Manager Review: Ashley Richardson **Date:** 6/26/24

***NOTE:** When there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEQ Certification Office (i.e., out of hold, incorrect preservative, out of temp, incorrect containers).*

Labeled By: HB **Line:** 3

Service Center Transfer Checklist

Service Center: MPLS ☐ BLM ☒ AZ ☐ MT ☐

Client: Braun Intertec

Destination Lab:

MPLS ☒ Duluth ☐ National ☐ Other ☐

Received w/ Custody Seal? Yes ☐ No ☒

Custody Seal Intact? Yes ☐ No ☒

Temperature °C: Temp Read 10.6 | Corr. Factor SUB 0.6 | Corr. Temp 10.6

IR Gun: G87A9205200775 (T8) ☒ Samples on ice, in cool down

Rush ☐ **Short Hold** ☐ **N/A** ☒

Containers Intact? Yes ☒ No ☐

Repacked and Re-Iced? Yes ☐ No ☒

Notes:

No Temp Blank Section

Read Temp	Corr. Temp	Avg. Temp

6/26/24

AS 1

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

August 02, 2024

Aaron Volker
Braun Intertec Corp.
3900 Roosevelt Rd.
Suite 113
Saint Cloud, MN 56301

RE: Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Dear Aaron Volker:

Enclosed are the analytical results for sample(s) received by the laboratory on July 03, 2024. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Minneapolis

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brenna Bloome
brenna.bloome@pacelabs.com
(612)607-1700
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Pace Analytical Services, LLC - Minneapolis MN
1700 Elm Street SE, Minneapolis, MN 55414
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
DoD Certification via A2LA #: 2926.01
EPA Region 8 Tribal Water Systems+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605
Georgia Certification #: 959
GMP+ Certification #: GMP050884
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
ISO/IEC 17025 Certification via A2LA #: 2926.01
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: AI-03086
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064
Maryland Certification #: 322
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137
Minnesota Dept of Ag Approval: via MN 027-053-137
Minnesota Petrofund Registration #: 1240
Mississippi Certification #: MN00064
Missouri Certification #: 10100
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081
New Jersey Certification #: MN002
New York Certification #: 11647
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification (A2LA) #: R-036
North Dakota Certification (MN) #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification (1700) #: CL101
Oklahoma Certification #: 9507
Oregon Primary Certification #: MN300001
Oregon Secondary Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192
Utah Certification #: MN00064
Vermont Certification #: VT-027053137
Virginia Certification #: 460163
Washington Certification #: C486
West Virginia DEP Certification #: 382
West Virginia DW Certification #: 9952 C
Wisconsin Certification #: 999407970
Wyoming UST Certification via A2LA #: 2926.01
USDA Permit #: P330-19-00208

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1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10698917001	**MW-1 Cuttings**	Solid	07/01/24 11:40	07/03/24 11:10
10698917002	**MW-2 Cuttings**	Solid	07/01/24 15:45	07/03/24 11:10
10698917003	**MW-3 Cuttings**	Solid	07/01/24 14:40	07/03/24 11:10
10698917004	**MW-4 Cuttings**	Solid	07/01/24 15:00	07/03/24 11:10

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(612)607-1700

SAMPLE ANALYTE COUNT

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10698917001	**MW-1 Cuttings**	ASTM D2974	JDL	1	PASI-M
		EPA 1633 DRAFT	NBH	64	PASI-M
10698917002	**MW-2 Cuttings**	ASTM D2974	JDL	1	PASI-M
		EPA 1633 DRAFT	NBH	64	PASI-M
10698917003	**MW-3 Cuttings**	ASTM D2974	JDL	1	PASI-M
		EPA 1633 DRAFT	NBH	64	PASI-M
10698917004	**MW-4 Cuttings**	ASTM D2974	JDL	1	PASI-M
		EPA 1633 DRAFT	NBH	64	PASI-M

PASI-M = Pace Analytical Services - Minneapolis

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1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

PROJECT NARRATIVE

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Method: **EPA 1633 DRAFT**
Description: EPA 1633 DRAFT Soil
Client: Braun Intertec Corporation
Date: August 02, 2024

General Information:
4 samples were analyzed for EPA 1633 DRAFT by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 1633 DRAFT with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Sample: MW-1 Cuttings **Lab ID: 10698917001** Collected: 07/01/24 11:40 Received: 07/03/24 11:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**12.6**	%	0.10	0.10	1		07/05/24 09:50		N2
EPA 1633 DRAFT Soil	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ug/kg	0.79	0.22	1	07/30/24 12:07	07/31/24 19:43	763051-92-9	
3:3 FTCA	ND	ug/kg	0.99	0.33	1	07/30/24 12:07	07/31/24 19:43	356-02-5	
4:2 FTS	ND	ug/kg	0.79	0.17	1	07/30/24 12:07	07/31/24 19:43	757124-72-4	
5:3 FTCA	ND	ug/kg	5.0	0.94	1	07/30/24 12:07	07/31/24 19:43	914637-49-3	
6:2 FTS	ND	ug/kg	0.79	0.18	1	07/30/24 12:07	07/31/24 19:43	27619-97-2	
7:3 FTCA	ND	ug/kg	5.0	0.87	1	07/30/24 12:07	07/31/24 19:43	812-70-4	
8:2 FTS	ND	ug/kg	0.79	0.21	1	07/30/24 12:07	07/31/24 19:43	39108-34-4	
9Cl-PF3ONS	ND	ug/kg	0.79	0.22	1	07/30/24 12:07	07/31/24 19:43	756426-58-1	
ADONA	ND	ug/kg	0.79	0.17	1	07/30/24 12:07	07/31/24 19:43	919005-14-4	
HFPO-DA	ND	ug/kg	0.79	0.23	1	07/30/24 12:07	07/31/24 19:43	13252-13-6	
NEtFOSAA	ND	ug/kg	0.20	0.052	1	07/30/24 12:07	07/31/24 19:43	2991-50-6	
NEtFOSA	ND	ug/kg	0.20	0.067	1	07/30/24 12:07	07/31/24 19:43	4151-50-2	
NEtFOSE	ND	ug/kg	2.0	0.58	1	07/30/24 12:07	07/31/24 19:43	1691-99-2	
NFDHA	ND	ug/kg	0.40	0.11	1	07/30/24 12:07	07/31/24 19:43	151772-58-6	
NMeFOSAA	ND	ug/kg	0.20	0.077	1	07/30/24 12:07	07/31/24 19:43	2355-31-9	
NMeFOSA	ND	ug/kg	0.20	0.064	1	07/30/24 12:07	07/31/24 19:43	31506-32-8	
NMeFOSE	ND	ug/kg	2.0	0.72	1	07/30/24 12:07	07/31/24 19:43	24448-09-7	
PFBS	ND	ug/kg	0.20	0.045	1	07/30/24 12:07	07/31/24 19:43	375-73-5	
PFDA	**0.49**	ug/kg	0.20	0.044	1	07/30/24 12:07	07/31/24 19:43	335-76-2	
PFHxA	**0.38**	ug/kg	0.20	0.058	1	07/30/24 12:07	07/31/24 19:43	307-24-4	
PFBA	ND	ug/kg	0.79	0.23	1	07/30/24 12:07	07/31/24 19:43	375-22-4	
PFDS	ND	ug/kg	0.20	0.059	1	07/30/24 12:07	07/31/24 19:43	335-77-3	
PFDoS	ND	ug/kg	0.20	0.054	1	07/30/24 12:07	07/31/24 19:43	79780-39-5	
PFEESA	ND	ug/kg	0.40	0.080	1	07/30/24 12:07	07/31/24 19:43	113507-82-7	
PFHpS	ND	ug/kg	0.20	0.051	1	07/30/24 12:07	07/31/24 19:43	375-92-8	
PFMBA	ND	ug/kg	0.40	0.11	1	07/30/24 12:07	07/31/24 19:43	863090-89-5	
PFMPA	ND	ug/kg	0.40	0.13	1	07/30/24 12:07	07/31/24 19:43	377-73-1	
PFNS	ND	ug/kg	0.20	0.053	1	07/30/24 12:07	07/31/24 19:43	68259-12-1	
PFOSA	ND	ug/kg	0.20	0.044	1	07/30/24 12:07	07/31/24 19:43	754-91-6	
PFPeA	**0.99**	ug/kg	0.40	0.11	1	07/30/24 12:07	07/31/24 19:43	2706-90-3	
PFPeS	ND	ug/kg	0.20	0.060	1	07/30/24 12:07	07/31/24 19:43	2706-91-4	
PFDoA	ND	ug/kg	0.20	0.049	1	07/30/24 12:07	07/31/24 19:43	307-55-1	
PFHpA	ND	ug/kg	0.20	0.057	1	07/30/24 12:07	07/31/24 19:43	375-85-9	
PFHxS	ND	ug/kg	0.20	0.051	1	07/30/24 12:07	07/31/24 19:43	355-46-4	
PFNA	**0.23**	ug/kg	0.20	0.060	1	07/30/24 12:07	07/31/24 19:43	375-95-1	
PFOS	ND	ug/kg	0.20	0.049	1	07/30/24 12:07	07/31/24 19:43	1763-23-1	
PFOA	**1.5**	ug/kg	0.20	0.070	1	07/30/24 12:07	07/31/24 19:43	335-67-1	
PFTeDA	ND	ug/kg	0.20	0.059	1	07/30/24 12:07	07/31/24 19:43	376-06-7	
PFTrDA	ND	ug/kg	0.20	0.047	1	07/30/24 12:07	07/31/24 19:43	72629-94-8	
PFUnA	ND	ug/kg	0.20	0.054	1	07/30/24 12:07	07/31/24 19:43	2058-94-8	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Sample: MW-1 Cuttings **Lab ID: 10698917001** Collected: 07/01/24 11:40 Received: 07/03/24 11:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Soil	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C2-PFDoA (S)	82	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C3HFPO-DA (S)	87	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C3-PFBS (S)	88	%.	40-135		1	07/30/24 12:07	07/31/24 19:43		
13C3-PFHxS (S)	89	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C4-PFBA (S)	86	%.	8-130		1	07/30/24 12:07	07/31/24 19:43		
13C4-PFHpA (S)	87	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C5-PFHxA (S)	85	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C5-PFPeA (S)	88	%.	35-130		1	07/30/24 12:07	07/31/24 19:43		
13C6-PFDA (S)	87	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C8-PFOA (S)	86	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C8-PFOS (S)	89	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C8-PFOSA (S)	82	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C9-PFNA (S)	88	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
d3-MeFOSAA (S)	80	%.	40-135		1	07/30/24 12:07	07/31/24 19:43		
d3-NMeFOSA (S)	64	%.	10-130		1	07/30/24 12:07	07/31/24 19:43		
d5-EtFOSAA (S)	82	%.	40-150		1	07/30/24 12:07	07/31/24 19:43		
d5-NEtFOSA (S)	52	%.	10-130		1	07/30/24 12:07	07/31/24 19:43		
d7-NMeFOSE (S)	71	%.	20-130		1	07/30/24 12:07	07/31/24 19:43		
d9-NEtFOSE (S)	69	%.	15-130		1	07/30/24 12:07	07/31/24 19:43		
13C2-PFTA (S)	75	%.	20-130		1	07/30/24 12:07	07/31/24 19:43		
13C7-PFUdA (S)	84	%.	40-130		1	07/30/24 12:07	07/31/24 19:43		
13C24:2FTS (S)	103	%.	40-165		1	07/30/24 12:07	07/31/24 19:43		
13C26:2FTS (S)	105	%.	40-215		1	07/30/24 12:07	07/31/24 19:43		
13C28:2FTS (S)	105	%.	40-275		1	07/30/24 12:07	07/31/24 19:43		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Sample: MW-2 Cuttings **Lab ID: 10698917002** Collected: 07/01/24 15:45 Received: 07/03/24 11:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**14.5**	%	0.10	0.10	1		07/05/24 09:51		N2
EPA 1633 DRAFT Soil	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ug/kg	0.80	0.22	1	07/30/24 12:07	07/31/24 19:58	763051-92-9	
3:3 FTCA	ND	ug/kg	1.0	0.34	1	07/30/24 12:07	07/31/24 19:58	356-02-5	
4:2 FTS	ND	ug/kg	0.80	0.17	1	07/30/24 12:07	07/31/24 19:58	757124-72-4	
5:3 FTCA	ND	ug/kg	5.0	0.94	1	07/30/24 12:07	07/31/24 19:58	914637-49-3	
6:2 FTS	ND	ug/kg	0.80	0.18	1	07/30/24 12:07	07/31/24 19:58	27619-97-2	
7:3 FTCA	ND	ug/kg	5.0	0.87	1	07/30/24 12:07	07/31/24 19:58	812-70-4	
8:2 FTS	ND	ug/kg	0.80	0.21	1	07/30/24 12:07	07/31/24 19:58	39108-34-4	
9Cl-PF3ONS	ND	ug/kg	0.80	0.22	1	07/30/24 12:07	07/31/24 19:58	756426-58-1	
ADONA	ND	ug/kg	0.80	0.17	1	07/30/24 12:07	07/31/24 19:58	919005-14-4	
HFPO-DA	ND	ug/kg	0.80	0.23	1	07/30/24 12:07	07/31/24 19:58	13252-13-6	
NEtFOSAA	ND	ug/kg	0.20	0.052	1	07/30/24 12:07	07/31/24 19:58	2991-50-6	
NEtFOSA	ND	ug/kg	0.20	0.068	1	07/30/24 12:07	07/31/24 19:58	4151-50-2	
NEtFOSE	ND	ug/kg	2.0	0.58	1	07/30/24 12:07	07/31/24 19:58	1691-99-2	
NFDHA	ND	ug/kg	0.40	0.11	1	07/30/24 12:07	07/31/24 19:58	151772-58-6	
NMeFOSAA	ND	ug/kg	0.20	0.077	1	07/30/24 12:07	07/31/24 19:58	2355-31-9	
NMeFOSA	ND	ug/kg	0.20	0.065	1	07/30/24 12:07	07/31/24 19:58	31506-32-8	
NMeFOSE	ND	ug/kg	2.0	0.73	1	07/30/24 12:07	07/31/24 19:58	24448-09-7	
PFBS	**0.20**	ug/kg	0.20	0.045	1	07/30/24 12:07	07/31/24 19:58	375-73-5	
PFDA	**0.26**	ug/kg	0.20	0.045	1	07/30/24 12:07	07/31/24 19:58	335-76-2	
PFHxA	ND	ug/kg	0.20	0.058	1	07/30/24 12:07	07/31/24 19:58	307-24-4	
PFBA	ND	ug/kg	0.80	0.23	1	07/30/24 12:07	07/31/24 19:58	375-22-4	
PFDS	ND	ug/kg	0.20	0.059	1	07/30/24 12:07	07/31/24 19:58	335-77-3	
PFDoS	ND	ug/kg	0.20	0.054	1	07/30/24 12:07	07/31/24 19:58	79780-39-5	
PFEESA	ND	ug/kg	0.40	0.081	1	07/30/24 12:07	07/31/24 19:58	113507-82-7	
PFHpS	ND	ug/kg	0.20	0.051	1	07/30/24 12:07	07/31/24 19:58	375-92-8	
PFMBA	ND	ug/kg	0.40	0.11	1	07/30/24 12:07	07/31/24 19:58	863090-89-5	
PFMPA	ND	ug/kg	0.40	0.13	1	07/30/24 12:07	07/31/24 19:58	377-73-1	
PFNS	ND	ug/kg	0.20	0.053	1	07/30/24 12:07	07/31/24 19:58	68259-12-1	
PFOSA	**0.22**	ug/kg	0.20	0.044	1	07/30/24 12:07	07/31/24 19:58	754-91-6	
PFPeA	ND	ug/kg	0.40	0.11	1	07/30/24 12:07	07/31/24 19:58	2706-90-3	
PFPeS	ND	ug/kg	0.20	0.060	1	07/30/24 12:07	07/31/24 19:58	2706-91-4	
PFDoA	ND	ug/kg	0.20	0.050	1	07/30/24 12:07	07/31/24 19:58	307-55-1	
PFHpA	ND	ug/kg	0.20	0.057	1	07/30/24 12:07	07/31/24 19:58	375-85-9	
PFHxS	ND	ug/kg	0.20	0.051	1	07/30/24 12:07	07/31/24 19:58	355-46-4	
PFNA	**0.29**	ug/kg	0.20	0.060	1	07/30/24 12:07	07/31/24 19:58	375-95-1	
PFOS	**3.8**	ug/kg	0.20	0.050	1	07/30/24 12:07	07/31/24 19:58	1763-23-1	
PFOA	**0.61**	ug/kg	0.20	0.071	1	07/30/24 12:07	07/31/24 19:58	335-67-1	
PFTeDA	ND	ug/kg	0.20	0.060	1	07/30/24 12:07	07/31/24 19:58	376-06-7	
PFTrDA	ND	ug/kg	0.20	0.048	1	07/30/24 12:07	07/31/24 19:58	72629-94-8	
PFUnA	ND	ug/kg	0.20	0.054	1	07/30/24 12:07	07/31/24 19:58	2058-94-8	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Sample: MW-2 Cuttings **Lab ID: 10698917002** Collected: 07/01/24 15:45 Received: 07/03/24 11:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Soil	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C2-PFDoA (S)	87	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C3HFPO-DA (S)	89	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C3-PFBS (S)	91	%.	40-135		1	07/30/24 12:07	07/31/24 19:58		
13C3-PFHxS (S)	90	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C4-PFBA (S)	87	%.	8-130		1	07/30/24 12:07	07/31/24 19:58		
13C4-PFHpA (S)	89	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C5-PFHxA (S)	86	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C5-PFPeA (S)	89	%.	35-130		1	07/30/24 12:07	07/31/24 19:58		
13C6-PFDA (S)	89	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C8-PFOA (S)	88	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C8-PFOS (S)	90	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C8-PFOSA (S)	84	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C9-PFNA (S)	86	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
d3-MeFOSAA (S)	81	%.	40-135		1	07/30/24 12:07	07/31/24 19:58		
d3-NMeFOSA (S)	70	%.	10-130		1	07/30/24 12:07	07/31/24 19:58		
d5-EtFOSAA (S)	82	%.	40-150		1	07/30/24 12:07	07/31/24 19:58		
d5-NEtFOSA (S)	60	%.	10-130		1	07/30/24 12:07	07/31/24 19:58		
d7-NMeFOSE (S)	73	%.	20-130		1	07/30/24 12:07	07/31/24 19:58		
d9-NEtFOSE (S)	72	%.	15-130		1	07/30/24 12:07	07/31/24 19:58		
13C2-PFTA (S)	80	%.	20-130		1	07/30/24 12:07	07/31/24 19:58		
13C7-PFUdA (S)	85	%.	40-130		1	07/30/24 12:07	07/31/24 19:58		
13C24:2FTS (S)	107	%.	40-165		1	07/30/24 12:07	07/31/24 19:58		
13C26:2FTS (S)	117	%.	40-215		1	07/30/24 12:07	07/31/24 19:58		
13C28:2FTS (S)	116	%.	40-275		1	07/30/24 12:07	07/31/24 19:58		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Sample: MW-3 Cuttings **Lab ID: 10698917003** Collected: 07/01/24 14:40 Received: 07/03/24 11:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**14.7**	%	0.10	0.10	1		07/05/24 09:51		N2
EPA 1633 DRAFT Soil	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ug/kg	0.79	0.22	1	07/30/24 12:07	07/31/24 20:14	763051-92-9	
3:3 FTCA	ND	ug/kg	0.99	0.33	1	07/30/24 12:07	07/31/24 20:14	356-02-5	
4:2 FTS	ND	ug/kg	0.79	0.17	1	07/30/24 12:07	07/31/24 20:14	757124-72-4	
5:3 FTCA	ND	ug/kg	5.0	0.94	1	07/30/24 12:07	07/31/24 20:14	914637-49-3	
6:2 FTS	ND	ug/kg	0.79	0.18	1	07/30/24 12:07	07/31/24 20:14	27619-97-2	
7:3 FTCA	ND	ug/kg	5.0	0.87	1	07/30/24 12:07	07/31/24 20:14	812-70-4	
8:2 FTS	ND	ug/kg	0.79	0.21	1	07/30/24 12:07	07/31/24 20:14	39108-34-4	
9Cl-PF3ONS	ND	ug/kg	0.79	0.22	1	07/30/24 12:07	07/31/24 20:14	756426-58-1	
ADONA	ND	ug/kg	0.79	0.17	1	07/30/24 12:07	07/31/24 20:14	919005-14-4	
HFPO-DA	ND	ug/kg	0.79	0.23	1	07/30/24 12:07	07/31/24 20:14	13252-13-6	
NEtFOSAA	ND	ug/kg	0.20	0.052	1	07/30/24 12:07	07/31/24 20:14	2991-50-6	
NEtFOSA	ND	ug/kg	0.20	0.067	1	07/30/24 12:07	07/31/24 20:14	4151-50-2	
NEtFOSE	ND	ug/kg	2.0	0.58	1	07/30/24 12:07	07/31/24 20:14	1691-99-2	
NFDHA	ND	ug/kg	0.40	0.11	1	07/30/24 12:07	07/31/24 20:14	151772-58-6	
NMeFOSAA	ND	ug/kg	0.20	0.077	1	07/30/24 12:07	07/31/24 20:14	2355-31-9	
NMeFOSA	ND	ug/kg	0.20	0.064	1	07/30/24 12:07	07/31/24 20:14	31506-32-8	
NMeFOSE	ND	ug/kg	2.0	0.72	1	07/30/24 12:07	07/31/24 20:14	24448-09-7	
PFBS	ND	ug/kg	0.20	0.045	1	07/30/24 12:07	07/31/24 20:14	375-73-5	
PFDA	ND	ug/kg	0.20	0.044	1	07/30/24 12:07	07/31/24 20:14	335-76-2	
PFHxA	ND	ug/kg	0.20	0.058	1	07/30/24 12:07	07/31/24 20:14	307-24-4	
PFBA	ND	ug/kg	0.79	0.23	1	07/30/24 12:07	07/31/24 20:14	375-22-4	
PFDS	ND	ug/kg	0.20	0.058	1	07/30/24 12:07	07/31/24 20:14	335-77-3	
PFDoS	ND	ug/kg	0.20	0.054	1	07/30/24 12:07	07/31/24 20:14	79780-39-5	
PFEESA	ND	ug/kg	0.40	0.080	1	07/30/24 12:07	07/31/24 20:14	113507-82-7	
PFHpS	ND	ug/kg	0.20	0.051	1	07/30/24 12:07	07/31/24 20:14	375-92-8	
PFMBA	ND	ug/kg	0.40	0.11	1	07/30/24 12:07	07/31/24 20:14	863090-89-5	
PFMPA	ND	ug/kg	0.40	0.13	1	07/30/24 12:07	07/31/24 20:14	377-73-1	
PFNS	ND	ug/kg	0.20	0.053	1	07/30/24 12:07	07/31/24 20:14	68259-12-1	
PFOSA	ND	ug/kg	0.20	0.043	1	07/30/24 12:07	07/31/24 20:14	754-91-6	
PFPeA	ND	ug/kg	0.40	0.11	1	07/30/24 12:07	07/31/24 20:14	2706-90-3	
PFPeS	ND	ug/kg	0.20	0.060	1	07/30/24 12:07	07/31/24 20:14	2706-91-4	
PFDoA	ND	ug/kg	0.20	0.049	1	07/30/24 12:07	07/31/24 20:14	307-55-1	
PFHpA	ND	ug/kg	0.20	0.057	1	07/30/24 12:07	07/31/24 20:14	375-85-9	
PFHxS	ND	ug/kg	0.20	0.051	1	07/30/24 12:07	07/31/24 20:14	355-46-4	
PFNA	ND	ug/kg	0.20	0.060	1	07/30/24 12:07	07/31/24 20:14	375-95-1	
PFOS	**0.22**	ug/kg	0.20	0.049	1	07/30/24 12:07	07/31/24 20:14	1763-23-1	
PFOA	ND	ug/kg	0.20	0.070	1	07/30/24 12:07	07/31/24 20:14	335-67-1	
PFTeDA	ND	ug/kg	0.20	0.059	1	07/30/24 12:07	07/31/24 20:14	376-06-7	
PFTrDA	ND	ug/kg	0.20	0.047	1	07/30/24 12:07	07/31/24 20:14	72629-94-8	
PFUnA	ND	ug/kg	0.20	0.053	1	07/30/24 12:07	07/31/24 20:14	2058-94-8	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Sample: MW-3 Cuttings **Lab ID: 10698917003** Collected: 07/01/24 14:40 Received: 07/03/24 11:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Soil	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C2-PFDoA (S)	79	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C3HFPO-DA (S)	87	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C3-PFBS (S)	92	%.	40-135		1	07/30/24 12:07	07/31/24 20:14		
13C3-PFHxS (S)	89	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C4-PFBA (S)	86	%.	8-130		1	07/30/24 12:07	07/31/24 20:14		
13C4-PFHpA (S)	88	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C5-PFHxA (S)	85	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C5-PFPeA (S)	88	%.	35-130		1	07/30/24 12:07	07/31/24 20:14		
13C6-PFDA (S)	88	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C8-PFOA (S)	84	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C8-PFOS (S)	91	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C8-PFOSA (S)	80	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C9-PFNA (S)	88	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
d3-MeFOSAA (S)	79	%.	40-135		1	07/30/24 12:07	07/31/24 20:14		
d3-NMeFOSA (S)	62	%.	10-130		1	07/30/24 12:07	07/31/24 20:14		
d5-EtFOSAA (S)	79	%.	40-150		1	07/30/24 12:07	07/31/24 20:14		
d5-NEtFOSA (S)	52	%.	10-130		1	07/30/24 12:07	07/31/24 20:14		
d7-NMeFOSE (S)	71	%.	20-130		1	07/30/24 12:07	07/31/24 20:14		
d9-NEtFOSE (S)	73	%.	15-130		1	07/30/24 12:07	07/31/24 20:14		
13C2-PFTA (S)	76	%.	20-130		1	07/30/24 12:07	07/31/24 20:14		
13C7-PFUdA (S)	82	%.	40-130		1	07/30/24 12:07	07/31/24 20:14		
13C24:2FTS (S)	99	%.	40-165		1	07/30/24 12:07	07/31/24 20:14		
13C26:2FTS (S)	107	%.	40-215		1	07/30/24 12:07	07/31/24 20:14		
13C28:2FTS (S)	102	%.	40-275		1	07/30/24 12:07	07/31/24 20:14		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Sample: MW-4 Cuttings **Lab ID: 10698917004** Collected: 07/01/24 15:00 Received: 07/03/24 11:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**8.7**	%	0.10	0.10	1		07/05/24 09:51		N2
EPA 1633 DRAFT Soil	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
11Cl-PF3OUdS	ND	ug/kg	0.79	0.22	1	07/30/24 12:07	07/31/24 20:30	763051-92-9	
3:3 FTCA	ND	ug/kg	0.99	0.33	1	07/30/24 12:07	07/31/24 20:30	356-02-5	
4:2 FTS	ND	ug/kg	0.79	0.17	1	07/30/24 12:07	07/31/24 20:30	757124-72-4	
5:3 FTCA	ND	ug/kg	4.9	0.93	1	07/30/24 12:07	07/31/24 20:30	914637-49-3	
6:2 FTS	ND	ug/kg	0.79	0.17	1	07/30/24 12:07	07/31/24 20:30	27619-97-2	
7:3 FTCA	ND	ug/kg	4.9	0.86	1	07/30/24 12:07	07/31/24 20:30	812-70-4	
8:2 FTS	ND	ug/kg	0.79	0.20	1	07/30/24 12:07	07/31/24 20:30	39108-34-4	
9Cl-PF3ONS	ND	ug/kg	0.79	0.22	1	07/30/24 12:07	07/31/24 20:30	756426-58-1	
ADONA	ND	ug/kg	0.79	0.17	1	07/30/24 12:07	07/31/24 20:30	919005-14-4	
HFPO-DA	ND	ug/kg	0.79	0.23	1	07/30/24 12:07	07/31/24 20:30	13252-13-6	
NEtFOSAA	ND	ug/kg	0.20	0.051	1	07/30/24 12:07	07/31/24 20:30	2991-50-6	
NEtFOSA	ND	ug/kg	0.20	0.067	1	07/30/24 12:07	07/31/24 20:30	4151-50-2	
NEtFOSE	ND	ug/kg	2.0	0.57	1	07/30/24 12:07	07/31/24 20:30	1691-99-2	
NFDHA	ND	ug/kg	0.39	0.11	1	07/30/24 12:07	07/31/24 20:30	151772-58-6	
NMeFOSAA	ND	ug/kg	0.20	0.076	1	07/30/24 12:07	07/31/24 20:30	2355-31-9	
NMeFOSA	ND	ug/kg	0.20	0.064	1	07/30/24 12:07	07/31/24 20:30	31506-32-8	
NMeFOSE	ND	ug/kg	2.0	0.72	1	07/30/24 12:07	07/31/24 20:30	24448-09-7	
PFBS	ND	ug/kg	0.20	0.045	1	07/30/24 12:07	07/31/24 20:30	375-73-5	
PFDA	ND	ug/kg	0.20	0.044	1	07/30/24 12:07	07/31/24 20:30	335-76-2	
PFHxA	ND	ug/kg	0.20	0.057	1	07/30/24 12:07	07/31/24 20:30	307-24-4	
PFBA	ND	ug/kg	0.79	0.23	1	07/30/24 12:07	07/31/24 20:30	375-22-4	
PFDS	ND	ug/kg	0.20	0.058	1	07/30/24 12:07	07/31/24 20:30	335-77-3	
PFDoS	ND	ug/kg	0.20	0.053	1	07/30/24 12:07	07/31/24 20:30	79780-39-5	
PFEESA	ND	ug/kg	0.39	0.080	1	07/30/24 12:07	07/31/24 20:30	113507-82-7	
PFHpS	ND	ug/kg	0.20	0.051	1	07/30/24 12:07	07/31/24 20:30	375-92-8	
PFMBA	ND	ug/kg	0.39	0.11	1	07/30/24 12:07	07/31/24 20:30	863090-89-5	
PFMPA	ND	ug/kg	0.39	0.13	1	07/30/24 12:07	07/31/24 20:30	377-73-1	
PFNS	ND	ug/kg	0.20	0.052	1	07/30/24 12:07	07/31/24 20:30	68259-12-1	
PFOSA	ND	ug/kg	0.20	0.043	1	07/30/24 12:07	07/31/24 20:30	754-91-6	
PFPeA	ND	ug/kg	0.39	0.11	1	07/30/24 12:07	07/31/24 20:30	2706-90-3	
PFPeS	ND	ug/kg	0.20	0.060	1	07/30/24 12:07	07/31/24 20:30	2706-91-4	
PFDoA	ND	ug/kg	0.20	0.049	1	07/30/24 12:07	07/31/24 20:30	307-55-1	
PFHpA	ND	ug/kg	0.20	0.056	1	07/30/24 12:07	07/31/24 20:30	375-85-9	
PFHxS	ND	ug/kg	0.20	0.050	1	07/30/24 12:07	07/31/24 20:30	355-46-4	
PFNA	ND	ug/kg	0.20	0.059	1	07/30/24 12:07	07/31/24 20:30	375-95-1	
PFOS	ND	ug/kg	0.20	0.049	1	07/30/24 12:07	07/31/24 20:30	1763-23-1	
PFOA	ND	ug/kg	0.20	0.070	1	07/30/24 12:07	07/31/24 20:30	335-67-1	
PFTeDA	ND	ug/kg	0.20	0.059	1	07/30/24 12:07	07/31/24 20:30	376-06-7	
PFTrDA	ND	ug/kg	0.20	0.047	1	07/30/24 12:07	07/31/24 20:30	72629-94-8	
PFUnA	ND	ug/kg	0.20	0.053	1	07/30/24 12:07	07/31/24 20:30	2058-94-8	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Sample: MW-4 Cuttings **Lab ID: 10698917004** Collected: 07/01/24 15:00 Received: 07/03/24 11:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
EPA 1633 DRAFT Soil	Analytical Method: EPA 1633 DRAFT Preparation Method: EPA 1633 DRAFT Pace Analytical Services - Minneapolis								
Surrogates									
13C2-PFDoA (S)	84	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C3HFPO-DA (S)	93	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C3-PFBS (S)	93	%.	40-135		1	07/30/24 12:07	07/31/24 20:30		
13C3-PFHxS (S)	89	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C4-PFBA (S)	88	%.	8-130		1	07/30/24 12:07	07/31/24 20:30		
13C4-PFHpA (S)	92	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C5-PFHxA (S)	91	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C5-PFPeA (S)	94	%.	35-130		1	07/30/24 12:07	07/31/24 20:30		
13C6-PFDA (S)	90	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C8-PFOA (S)	86	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C8-PFOS (S)	91	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C8-PFOSA (S)	83	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C9-PFNA (S)	91	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
d3-MeFOSAA (S)	83	%.	40-135		1	07/30/24 12:07	07/31/24 20:30		
d3-NMeFOSA (S)	68	%.	10-130		1	07/30/24 12:07	07/31/24 20:30		
d5-EtFOSAA (S)	85	%.	40-150		1	07/30/24 12:07	07/31/24 20:30		
d5-NEtFOSA (S)	63	%.	10-130		1	07/30/24 12:07	07/31/24 20:30		
d7-NMeFOSE (S)	76	%.	20-130		1	07/30/24 12:07	07/31/24 20:30		
d9-NEtFOSE (S)	79	%.	15-130		1	07/30/24 12:07	07/31/24 20:30		
13C2-PFTA (S)	80	%.	20-130		1	07/30/24 12:07	07/31/24 20:30		
13C7-PFUdA (S)	86	%.	40-130		1	07/30/24 12:07	07/31/24 20:30		
13C24:2FTS (S)	107	%.	40-165		1	07/30/24 12:07	07/31/24 20:30		
13C26:2FTS (S)	108	%.	40-215		1	07/30/24 12:07	07/31/24 20:30		
13C28:2FTS (S)	106	%.	40-275		1	07/30/24 12:07	07/31/24 20:30		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

QC Batch: 954916
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight / %M by ASTM D2974
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10698917001, 10698917002, 10698917003, 10698917004

SAMPLE DUPLICATE: 4992800

Parameter	Units	10698702004 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	17.3	13.0	29	30	N2

SAMPLE DUPLICATE: 4992801

Parameter	Units	10698487002 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	23.9	24.7	3	30	N2

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

QC Batch: 959053
QC Batch Method: EPA 1633 DRAFT
Analysis Method: EPA 1633 DRAFT
Analysis Description: 1633 SL
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10698917001, 10698917002, 10698917003, 10698917004

METHOD BLANK: 5014263 Matrix: Solid
Associated Lab Samples: 10698917001, 10698917002, 10698917003, 10698917004

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
11Cl-PF3OUdS	ug/kg	ND	0.80	0.22	07/31/24 18:40	
3:3 FTCA	ug/kg	ND	1.0	0.34	07/31/24 18:40	
4:2 FTS	ug/kg	ND	0.80	0.18	07/31/24 18:40	
5:3 FTCA	ug/kg	ND	5.0	0.94	07/31/24 18:40	
6:2 FTS	ug/kg	ND	0.80	0.18	07/31/24 18:40	
7:3 FTCA	ug/kg	ND	5.0	0.87	07/31/24 18:40	
8:2 FTS	ug/kg	ND	0.80	0.21	07/31/24 18:40	
9Cl-PF3ONS	ug/kg	ND	0.80	0.22	07/31/24 18:40	
ADONA	ug/kg	ND	0.80	0.17	07/31/24 18:40	
HFPO-DA	ug/kg	ND	0.80	0.23	07/31/24 18:40	
NEtFOSA	ug/kg	ND	0.20	0.068	07/31/24 18:40	
NEtFOSAA	ug/kg	ND	0.20	0.052	07/31/24 18:40	
NEtFOSE	ug/kg	ND	2.0	0.58	07/31/24 18:40	
NFDHA	ug/kg	ND	0.40	0.11	07/31/24 18:40	
NMeFOSA	ug/kg	ND	0.20	0.065	07/31/24 18:40	
NMeFOSAA	ug/kg	ND	0.20	0.077	07/31/24 18:40	
NMeFOSE	ug/kg	ND	2.0	0.73	07/31/24 18:40	
PFBA	ug/kg	ND	0.80	0.23	07/31/24 18:40	
PFBS	ug/kg	ND	0.20	0.045	07/31/24 18:40	
PFDA	ug/kg	ND	0.20	0.045	07/31/24 18:40	
PFDoA	ug/kg	ND	0.20	0.050	07/31/24 18:40	
PFDoS	ug/kg	ND	0.20	0.054	07/31/24 18:40	
PFDS	ug/kg	ND	0.20	0.059	07/31/24 18:40	
PFEESA	ug/kg	ND	0.40	0.081	07/31/24 18:40	
PFHpA	ug/kg	ND	0.20	0.057	07/31/24 18:40	
PFHpS	ug/kg	ND	0.20	0.052	07/31/24 18:40	
PFHxA	ug/kg	ND	0.20	0.058	07/31/24 18:40	
PFHxS	ug/kg	ND	0.20	0.051	07/31/24 18:40	
PFMBA	ug/kg	ND	0.40	0.11	07/31/24 18:40	
PFMPA	ug/kg	ND	0.40	0.13	07/31/24 18:40	
PFNA	ug/kg	ND	0.20	0.060	07/31/24 18:40	
PFNS	ug/kg	ND	0.20	0.053	07/31/24 18:40	
PFOA	ug/kg	ND	0.20	0.071	07/31/24 18:40	
PFOS	ug/kg	ND	0.20	0.050	07/31/24 18:40	
PFOSA	ug/kg	ND	0.20	0.044	07/31/24 18:40	
PFPeA	ug/kg	ND	0.40	0.11	07/31/24 18:40	
PFPeS	ug/kg	ND	0.20	0.060	07/31/24 18:40	
PFTeDA	ug/kg	ND	0.20	0.060	07/31/24 18:40	
PFTrDA	ug/kg	ND	0.20	0.048	07/31/24 18:40	
PFUnA	ug/kg	ND	0.20	0.054	07/31/24 18:40	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

METHOD BLANK: 5014263 Matrix: Solid
Associated Lab Samples: 10698917001, 10698917002, 10698917003, 10698917004

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
13C2-PFDoA (S)	%.	77	40-130		07/31/24 18:40	
13C2-PFTA (S)	%.	76	20-130		07/31/24 18:40	
13C24:2FTS (S)	%.	111	40-165		07/31/24 18:40	
13C26:2FTS (S)	%.	115	40-215		07/31/24 18:40	
13C28:2FTS (S)	%.	105	40-275		07/31/24 18:40	
13C3-PFBS (S)	%.	95	40-135		07/31/24 18:40	
13C3-PFHxS (S)	%.	96	40-130		07/31/24 18:40	
13C3HFPO-DA (S)	%.	95	40-130		07/31/24 18:40	
13C4-PFBA (S)	%.	92	8-130		07/31/24 18:40	
13C4-PFHpA (S)	%.	94	40-130		07/31/24 18:40	
13C5-PFHxA (S)	%.	93	40-130		07/31/24 18:40	
13C5-PFPeA (S)	%.	95	35-130		07/31/24 18:40	
13C6-PFDA (S)	%.	88	40-130		07/31/24 18:40	
13C7-PFUdA (S)	%.	83	40-130		07/31/24 18:40	
13C8-PFOA (S)	%.	90	40-130		07/31/24 18:40	
13C8-PFOS (S)	%.	91	40-130		07/31/24 18:40	
13C8-PFOSA (S)	%.	73	40-130		07/31/24 18:40	
13C9-PFNA (S)	%.	90	40-130		07/31/24 18:40	
d3-MeFOSAA (S)	%.	76	40-135		07/31/24 18:40	
d3-NMeFOSA (S)	%.	40	10-130		07/31/24 18:40	
d5-EtFOSAA (S)	%.	76	40-150		07/31/24 18:40	
d5-NEtFOSA (S)	%.	41	10-130		07/31/24 18:40	
d7-NMeFOSE (S)	%.	53	20-130		07/31/24 18:40	
d9-NEtFOSE (S)	%.	55	15-130		07/31/24 18:40	

LABORATORY CONTROL SAMPLE & LCSD: 5014264 5014265

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
11Cl-PF3OUdS	ug/kg	9.1	8.5	8.1	94	90	45-160	5	30	
3:3 FTCA	ug/kg	12	10.8	11.1	90	93	45-130	3	30	
4:2 FTS	ug/kg	9	8.8	8.5	97	95	60-150	3	30	
5:3 FTCA	ug/kg	60	51.9	51.5	87	86	60-130	1	30	
6:2 FTS	ug/kg	9.1	9.1	8.7	100	96	55-200	4	30	
7:3 FTCA	ug/kg	60	50.7	52.3	85	87	60-150	3	30	
8:2 FTS	ug/kg	9.2	9.4	9.2	101	99	70-150	2	30	
9Cl-PF3ONS	ug/kg	9	9.1	8.5	101	95	70-150	6	30	
ADONA	ug/kg	9.1	8.6	8.3	95	92	70-160	4	30	
HFPO-DA	ug/kg	9.6	9.3	8.8	97	92	70-145	6	30	
NEtFOSA	ug/kg	2.4	2.3	2.3	94	94	70-140	0	30	
NEtFOSAA	ug/kg	2.4	2.2	2.1	93	89	65-165	4	30	
NEtFOSE	ug/kg	24	22.8	22.1	95	92	70-135	3	30	
NFDHA	ug/kg	4.8	4.7	4.8	98	100	60-155	2	30	
NMeFOSA	ug/kg	2.4	2.4	2.3	98	94	70-155	4	30	
NMeFOSAA	ug/kg	2.4	2.1	2.1	86	87	65-155	0	30	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

LABORATORY CONTROL SAMPLE & LCSD: 5014264 5014265

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
NMeFOSE	ug/kg	24	22.9	22.7	95	94	70-140	1	30	
PFBA	ug/kg	9.6	9.1	8.9	95	93	70-140	2	30	
PFBS	ug/kg	2.1	2.0	1.9	93	91	65-145	3	30	
PFDA	ug/kg	2.4	2.2	2.1	91	89	70-155	2	30	
PFDoA	ug/kg	2.4	2.3	2.3	96	94	70-150	2	30	
PFDoS	ug/kg	2.3	2.0	2.0	85	85	25-160	1	30	
PFDS	ug/kg	2.3	2.1	2.1	90	89	40-155	2	30	
PFEESA	ug/kg	4.3	4.3	4.2	100	98	70-140	2	30	
PFHpA	ug/kg	2.4	2.3	2.2	95	92	65-145	3	30	
PFHpS	ug/kg	2.3	2.1	2.1	92	90	65-155	2	30	
PFHxA	ug/kg	2.4	2.3	2.2	96	91	65-140	5	30	
PFHxS	ug/kg	2.2	2.0	2.0	93	93	60-150	0	30	
PFMBA	ug/kg	4.8	4.6	4.6	95	95	60-150	0	30	
PFMPA	ug/kg	4.8	4.3	4.4	91	91	30-140	1	30	
PFNA	ug/kg	2.4	2.3	2.2	95	90	70-155	5	30	
PFNS	ug/kg	2.3	2.1	2.1	93	92	55-140	1	30	
PFOA	ug/kg	2.4	2.2	2.3	94	94	70-150	1	30	
PFOS	ug/kg	2.2	2.1	2.0	92	91	65-160	1	30	
PFOSA	ug/kg	2.4	2.3	2.3	96	94	70-140	3	30	
PFPeA	ug/kg	4.8	4.5	4.4	95	93	60-150	2	30	
PFPeS	ug/kg	2.3	2.1	2.2	95	98	55-160	3	30	
PFTeDA	ug/kg	2.4	2.3	2.3	98	94	65-150	4	30	
PFTrDA	ug/kg	2.4	2.2	2.2	93	93	65-150	1	30	
PFUnA	ug/kg	2.4	2.3	2.2	94	94	70-155	1	30	
13C2-PFDoA (S)	%.				83	78	40-130			
13C2-PFTA (S)	%.				79	76	20-130			
13C24:2FTS (S)	%.				99	96	40-165			
13C26:2FTS (S)	%.				105	103	40-215			
13C28:2FTS (S)	%.				98	91	40-275			
13C3-PFBS (S)	%.				92	89	40-135			
13C3-PFHxS (S)	%.				93	86	40-130			
13C3HFPO-DA (S)	%.				91	88	40-130			
13C4-PFBA (S)	%.				89	85	8-130			
13C4-PFHpA (S)	%.				92	88	40-130			
13C5-PFHxA (S)	%.				89	86	40-130			
13C5-PFPeA (S)	%.				92	88	35-130			
13C6-PFDA (S)	%.				90	87	40-130			
13C7-PFUdA (S)	%.				86	81	40-130			
13C8-PFOA (S)	%.				85	82	40-130			
13C8-PFOS (S)	%.				93	87	40-130			
13C8-PFOSA (S)	%.				77	78	40-130			
13C9-PFNA (S)	%.				89	85	40-130			
d3-MeFOSAA (S)	%.				86	81	40-135			
d3-NMeFOSA (S)	%.				47	48	10-130			
d5-EtFOSAA (S)	%.				82	79	40-150			
d5-NEtFOSA (S)	%.				47	46	10-130			
d7-NMeFOSE (S)	%.				58	54	20-130			

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
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QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

LABORATORY CONTROL SAMPLE & LCSD: 5014264 5014265

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
d9-NEtFOSE (S)	%.				58	55	15-130			

LABORATORY CONTROL SAMPLE: 5014266

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
11Cl-PF3OUdS	ug/kg	0.76	.59J	78	40-150	
3:3 FTCA	ug/kg	1	.81J	81	40-150	
4:2 FTS	ug/kg	0.75	.62J	83	40-150	
5:3 FTCA	ug/kg	5	3.6J	72	40-150	
6:2 FTS	ug/kg	0.76	.65J	85	40-150	
7:3 FTCA	ug/kg	5	3.4J	68	40-150	
8:2 FTS	ug/kg	0.77	.66J	85	40-150	
9Cl-PF3ONS	ug/kg	0.75	.65J	87	40-150	
ADONA	ug/kg	0.76	.64J	84	40-150	
HFPO-DA	ug/kg	0.8	.69J	86	40-150	
NEtFOSA	ug/kg	0.2	.17J	84	40-150	
NEtFOSAA	ug/kg	0.2	.18J	89	40-150	
NEtFOSE	ug/kg	2	1.7J	84	40-150	
NFDHA	ug/kg	0.4	0.41	103	40-150	
NMeFOSA	ug/kg	0.2	.17J	85	40-150	
NMeFOSAA	ug/kg	0.2	.15J	76	40-150	
NMeFOSE	ug/kg	2	1.7J	85	40-150	
PFBA	ug/kg	0.8	.7J	88	40-150	
PFBS	ug/kg	0.18	.17J	93	40-150	
PFDA	ug/kg	0.2	.17J	85	40-150	
PFDoA	ug/kg	0.2	.16J	80	40-150	
PFDoS	ug/kg	0.19	.14J	73	40-150	
PFDS	ug/kg	0.19	.15J	80	40-150	
PFEESA	ug/kg	0.36	.3J	85	40-150	
PFHpA	ug/kg	0.2	.16J	78	40-150	
PFHpS	ug/kg	0.19	0.20	107	40-150	
PFHxA	ug/kg	0.2	.16J	79	40-150	
PFHxS	ug/kg	0.18	.16J	86	40-150	
PFMBA	ug/kg	0.4	.33J	83	40-150	
PFMPA	ug/kg	0.4	.33J	83	40-150	
PFNA	ug/kg	0.2	.15J	75	40-150	
PFNS	ug/kg	0.19	.15J	80	40-150	
PFOA	ug/kg	0.2	.16J	81	40-150	
PFOS	ug/kg	0.19	.16J	88	40-150	
PFOSA	ug/kg	0.2	.19J	93	40-150	
PFPeA	ug/kg	0.4	.32J	81	40-150	
PFPeS	ug/kg	0.19	.16J	87	40-150	
PFTeDA	ug/kg	0.2	.16J	80	40-150	
PFTrDA	ug/kg	0.2	.16J	79	40-150	
PFUnA	ug/kg	0.2	.16J	79	40-150	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

LABORATORY CONTROL SAMPLE: 5014266

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
13C2-PFDoA (S)	%.			83	40-130	
13C2-PFTA (S)	%.			80	20-130	
13C24:2FTS (S)	%.			110	40-165	
13C26:2FTS (S)	%.			111	40-215	
13C28:2FTS (S)	%.			104	40-275	
13C3-PFBS (S)	%.			91	40-135	
13C3-PFHxS (S)	%.			91	40-130	
13C3HFPO-DA (S)	%.			91	40-130	
13C4-PFBA (S)	%.			89	8-130	
13C4-PFHpA (S)	%.			91	40-130	
13C5-PFHxA (S)	%.			89	40-130	
13C5-PFPeA (S)	%.			92	35-130	
13C6-PFDA (S)	%.			90	40-130	
13C7-PFUdA (S)	%.			89	40-130	
13C8-PFOA (S)	%.			88	40-130	
13C8-PFOS (S)	%.			92	40-130	
13C8-PFOSA (S)	%.			76	40-130	
13C9-PFNA (S)	%.			91	40-130	
d3-MeFOSAA (S)	%.			82	40-135	
d3-NMeFOSA (S)	%.			44	10-130	
d5-EtFOSAA (S)	%.			81	40-150	
d5-NEtFOSA (S)	%.			41	10-130	
d7-NMeFOSE (S)	%.			53	20-130	
d9-NEtFOSE (S)	%.			53	15-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

N2	The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: B2305038.02 Jonny Rooter Sewer
Pace Project No.: 10698917

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10698917001	**MW-1 Cuttings**	ASTM D2974	954916		
10698917002	**MW-2 Cuttings**	ASTM D2974	954916		
10698917003	**MW-3 Cuttings**	ASTM D2974	954916		
10698917004	**MW-4 Cuttings**	ASTM D2974	954916		
10698917001	**MW-1 Cuttings**	EPA 1633 DRAFT	959053	EPA 1633 DRAFT	959956
10698917002	**MW-2 Cuttings**	EPA 1633 DRAFT	959053	EPA 1633 DRAFT	959956
10698917003	**MW-3 Cuttings**	EPA 1633 DRAFT	959053	EPA 1633 DRAFT	959956
10698917004	**MW-4 Cuttings**	EPA 1633 DRAFT	959053	EPA 1633 DRAFT	959956

BRAUN INTERTEC

Braun Intertec EDGE Chain-of-Custody Form

Chain-of-custody form is a legal document. Please complete all applicable fields.

Lab Work Order Sticker

PROJECT INFORMATION			
Project No.:	B2305038.02	MPCA Site ID:	—
Project Name:	Jonny Rooter Sewer and Drain	MPCA Task Code:	—
Project Manager:	Aaron Volker	MDH Program Code:	—
PM Email:	AVolker@braunintertec.com	MPCA WO No.:	— Profile
PM Phone No.:	320.980.6461	Template/Profile:	34125
CC Name & Email:	Cling@braunintertec.com	Prelogin/Bottle Order:	—

LABORATORY			
Lab Name:	Pace Analytical	Turn-Around Time:	☒ Standard ☐ RUSH
Lab Address:	1700 Elm Street SE	Date Requested:	
	Minneapolis, MN 55414	Deliverable(s):	☒ Level II ☐ Level III ☐ Level IV
EPA Lab ID:	MN00064	Send lab data file to:	☒ Braun Intertec ☐ MPCA
Potential Hazard?	☒ No ☐ Yes	Billing Rate:	☒ Standard ☐ MPCA
If yes, specify in Comments field.			☐ Petrofund ☐ Other:

SAMPLE & ANALYSIS INFORMATION

SAMPLE TYPES
Sample = Sample
QC-FR = Duplicate
QC-FB = Field blank
QC-EB = Equipment blank
QC-TB = Trip blank
S-IDW = Inv. derived waste
QC-BLANK for LUI for QC-FB, QC-EB, QC-TB, S-IDW.

SAMPLING METHODS
SOILBORI = Subsurface soil from boring
SHALLSOIL = Surface soil
WELL-SUBMERS = Submersible pump
WELL-NONSUBMERS = Nonsubmersible pump
WELL-BAIL = Bailer
SW-GAS = Any soil vapor, indoor, or outdoor air
OTHER = Any other sampling method(s)
QC-BLANK = QC-FB, QC-EB, QC-TB, S-IDW

LAB MATRICES
SD = Soil, sediment, solid
NW = Nonpotable water
DW = Drinking water
AR = Air, gas, vapor
BL = Biological material
TS = Tissue
OT = Other
FB, EB, TB must have Lab Matrix

FIELD MATRICES
Soil-Sub = Subsurface soil
Soil-Surf = Surface soil
Wtr-Ground = Groundwater
Wtr-Drink = Drinking water
Gas-Soil = Soil gas/vapor
Air-Indoor = Indoor air
Air-Ambnt = Outdoor air
QC-BLANK for FB, EB, TB, IDW

List preservative used for each analysis; if n/a write "None". If soil and water samples have different preservatives for the same analysis, use two columns.

LUI	Sample Name	Sample Type	Start Date mm/dd/yyyy	Start Time 24-hr hh:mm	Depth Start	Depth End	Depth Units	End Date mm/dd/yyyy	End Time 24-hr hh:mm	Sampling Method	Lab Matrix	Field Matrix	AIS	Comments	# of Cont.	Analysis	PFAS by method 1633	Moisture	Lab Sample No.	#
													Preserv				None	None		
													FF				N	N		
856812	MW-1 Cuttings	Sample	--	--	-	-	FT	7/1/2024	11:40	SOILBORI	SD	Soil-Sub	N		2		X	X	001	1
856813	MW-2 Cuttings	Sample	--	--	-	-	FT	7/1/2024	15:45	SOILBORI	SD	Soil-Sub	N		2		X	X	002	2
856814	MW-3 Cuttings	Sample	--	--	-	-	FT	7/1/2024	14:40	SOILBORI	SD	Soil-Sub	N		2		X	X	003	3
856815	MW-4 Cuttings	Sample	--	--	-	-	FT	7/1/2024	15:00	SOILBORI	SD	Soil-Sub	N		2		X	X	004	4
																				5
																				6
																				7
																				8
																				9
																				10

WO# : 10698917

10698917

Sampler's Name:	Relinquished by (name):	Company:	Date/Time:	Received By:	Company:	Date/Time:	Comments:	No. of Coolers/Boxes:
Cooper Ling	Cooper Ling	Braun	7/2/2024 17:00		Pace	7/3/24 1010		1
Sampler's Phone: 612.723.4778	Relinquished by:	Company: Pace	Date/Time: 7/3/24 1010	Received By:	Company: Pace	Date/Time: 7/3/24 1010		
Sampler's Signature:	Relinquished by:	Company: Pace	Date/Time: 7/3/24 1115	Received By:	Company: Pace	Date/Time: 7/3/24 1410		

Page 1 of 1

Braun Intertec EDGE COC Soil/Water 2023-11-13

EZ 3/27931

Temp: 2.7

ENV-FRM-MIN4-0150 v17_Sample Condition Upon Receipt

CLIENT NAME: Braun Intertec **PROJECT #:**

WO#: 10698917

PM: BGB **Due Date: 07/15/24**

CLIENT: Braun-BLM

COURIER: ☐ Client ☐ Commercial ☐ FedEx ☑ Pace ☐ SpeeDee ☐ UPS ☐ USPS

TRACKING NUMBER: _____ ☐ See Exceptions form ENV-FRM-MIN4-0142

Custody Seal on Cooler/Box Present: ☐ YES ☑ NO **Seals Intact:** ☐ YES ☑ NO **Biological Tissue Frozen:** ☐ YES ☐ NO ☑ N/A

Packing Material: ☐ Bubble Bags ☐ Bubble Wrap ☑ None ☐ Other **Temp Blank:** ☑ YES ☐ NO **Type of Ice:** ☐ Blue ☐ Dry ☑ Wet ☐ Melted ☐ None

Thermometer: ☐ T1 (0461) ☐ T2 (0436) ☑ T3 (0459) ☐ T4 (0402) ☐ T5 (0178) ☐ T6 (0235) ☐ T7 (0042) ☐ T8 (0775) ☐ T9 (0727) ☐ 01339252 (1710)

Did Samples Originate in West Virginia: ☐ YES ☑ NO	**Were All Container Temps taken:** ☐ YES ☐ NO ☑ N/A
Correction Factor: -0.3 **Cooler Temp Read w/Temp Blank:** 3.0 °C **Cooler Temp Corrected w/Temp Blank:** 2.7 °C	**Average Corrected Temp (no Temp Blank Only):** _____ °C
NOTE: *Temp should be above freezing to 6°C.*	☐ See Exceptions Form ENV-FRM-MIN4-0142 ☐ 1 Container
USDA Regulated Soil: ☑ N/A – Water Sample/Other (describe): _____	**Initials & Date of Person Examining Contents:** DGS 7/3/24
Did Samples originate from one of the following states (check maps) – AL, AR, AZ, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX, or VA: ☐ YES ☑ NO	Did samples originate from a foreign source (international, including Hawaii and Puerto Rico): ☐ YES ☑ NO DGS 7/3/24
NOTE: If YES to either question, fill out a Regulated Soil Checklist (ENV-FRM-MIN4-0154) and include with SCUR/COC paperwork.	

LOCATION (check one): ☐ DULUTH ☑ MINNEAPOLIS ☐ VIRGINIA	YES	NO	N/A	COMMENT(S)
Chain of Custody Present and Filled Out?	☑	☐		1.
Chain of Custody Relinquished?	☑	☐		2.
Sampler Name and/or Signature on COC?	☑	☐	☐	3.
Samples Arrived within Hold Time?	☑	☐		4. If Fecal: ☐ <8 hrs ☐ >8 hr, <24 hr ☐ No
Short Hold Time Analysis (<72 hr)?	☐	☑		5. ☐ BOD / cBOD ☐ Fecal coliform ☐ Hex Chrom ☐ HPC ☐ Nitrate ☐ Nitrite ☐ Ortho Phos ☐ Total coliform/*E. coli* ☐ Other: _____
Rush Turn Around Time Requested?	☐	☑		6.
Sufficient Sample Volume?	☑	☐		7.
Correct Containers Used?	☑	☐	☐	8.
– Pace Containers Used?	☑	☐		
Containers Intact?	☑	☐		9.
Field Filtered Volume Received for Dissolved Tests?	☐	☐	☑	10. Is sediment visible in the dissolved container: ☐ YES ☐ NO
Is sufficient information available to reconcile the samples to the COC? **NOTE:** If ID/Date/Time don't match fill out section 11. Matrix: ☐ Oil ☑ Soil ☐ Water ☐ Other	☑	☐		11. **If NO, write ID/Date/Time of container below:** ☐ See Exceptions form ENV-FRM-MIN4-0142
All containers needing acid/base preservation have been checked?	☐	☐	☑	12. Sample #:
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, < 2 pH, NaOH > 9 Sulfide, NaOH > 10 Cyanide)	☐	☐	☑	☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC, Oil & Grease, DRO/8015 (water) and Dioxins/PFAS	☐	☐	☑	Positive for Residual Chlorine: ☐ YES ☐ NO
NOTE: If adding preservation to the container, **verify with the PM first.** Clients may require adding preservative to the field and equipment blanks when this occurs.				**pH Paper Lot #**
				Residual Chlorine / 0-6 Roll / 0-6 Strip / 0-14 Strip
				☐ See Exceptions form ENV-FRM-MIN4-0142
Headspace in Methyl Mercury Container?	☐	☐	☑	13.
Extra labels present on soil VOA or WIDRO containers?	☐	☐	☑	14.
Headspace in VOA Vials (greater than 6mm)?	☐	☐	☑	☐ See Exceptions form ENV-FRM-MIN4-0140
Trip Blanks Present?	☐	☐	☑	15.
Trip Blank Custody Seals Present?	☐	☐	☑	Pace Trip Blank Lot # (if purchased): _____

CLIENT NOTIFICATION / RESOLUTION **FIELD DATA REQUIRED:** ☐ YES ☐ NO

Person Contacted: _____ Date & Time: _____

Comments / Resolution: _____

Project Manager Review: Brenna Bloome **Date:** 07/05/2024

NOTE: *When there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEQ Certification Office (i.e., out of hold, incorrect preservative, out of temp, incorrect containers).*

Labeled By: DGS **Line:** 1

Appendix E

Domestic Well Reports

Minnesota Unique Well Number

131369

County Sherburne
Quad Clearwater
Quad ID 139A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 04/17/1988
Update Date 02/14/2014
Received Date

Well Name	Township	Range	Dir	Section	Subsection
CANNON, GENE	35	30	W	30	DABDAA

Elevation 1021 **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
20 SLOT SAND	0	30	BROWN	HARD
30 SLOT WATERSAND	30	49	BROWN	HARD

Remarks

Well Depth 49 ft. **Depth Completed** 49 ft. **Date Well Completed** 03/16/1977

Drill Method Cable Tool **Drill Fluid**

Use domestic **Status** Active

Well Hydrofractured? **Yes** ☐ **No** ☐ **From** **To**

Casing Type Single casing **Joint** Threaded
Drive Shoe? **Yes** ☒ **No** ☐ **Above/Below** 1 ft.

Casing Diameter **Weight**
4 in. To 45 ft. 11 lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
4 in.	30	0.8 ft.	45 ft.	49 ft.

Static Water Level
30 ft. land surface Measure 03/16/1977

Pumping Level (below land surface)
33 ft. 1 hrs. Pumping at 15 g.p.m.

Wellhead Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☒ No ☐ Not Specified

Nearest Known Source of Contamination
85 feet West Direction Septic tank/drain field Type
Well disinfected upon completion? ☒ Yes ☐ No

Pump ☐ Not Installed Date Installed 03/16/1977
Manufacturer's name AERMOTOR
Model Number SD1275 HP 0.75 Volt 230
Length of drop pipe 34 ft Capacity 15 g.p. Typ Submersible

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous
First Bedrock Aquifer Quat. Water
Last Strat sand-brown Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method Digitized - scale 1:24,000 or larger (Digitizing Table)
System UTM - NAD83, Zone 15, Meters X 413088 Y 5038318
Unique Number Verification Name on mailbox Input Date 04/12/1995

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Traut Well	73157	MAJERUS, S.

Minnesota Unique Well Number

192314

County Sherburne
Quad Clearwater
Quad ID 139A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 12/01/1990
Update Date 02/14/2014
Received Date

Well Name	Township	Range	Dir	Section	Subsection
HARTMAN,	35	30	W	30	DABBAD

Elevation 1020 **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SAND	0	34	BROWN	SOFT
CLAY	34	71	BROWN	SOFT
MUDDY SAND	71	84	BROWN	SOFT
SAND WITH CLAY	84	95	GRAY	SOFT

Remarks

Well Depth 95 ft. **Depth Completed** 95 ft. **Date Well Completed** 07/07/1981

Drill Method Non-specified Rotary **Drill Fluid**

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☒ **Above/Below** 1 ft.

Casing Diameter		Weight	
4	in. To 87 ft.	10.8	lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make** JOHNSON

Diameter	Slot/Gauze	Length		Set		
2 in.	12	8	ft.	87 ft.	95	ft.

Static Water Level
32 ft. land surface Measure 07/07/1981

Pumping Level (below land surface)
38 ft. 1 hrs. Pumping at 15 g.p.m.

Wellhead Completion
Pitless adapter manufacturer MAASS Model J
☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☒ No ☐ Not Specified

Nearest Known Source of Contamination
100 feet Direction Septic tank/drain field Type
Well disinfected upon completion? ☒ Yes ☐ No

Pump ☐ Not Installed Date Installed 07/09/1981
Manufacturer's name STANDARD
Model Number 9D9P051 HP 0.5 Volt 230
Length of drop pipe 70 ft Capacity 9 g.p. Typ Submersible

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous
First Bedrock Aquifer Quat. buried
Last Strat clay+sand-gray Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method Digitized - scale 1:24,000 or larger (Digitizing Table)
System UTM - NAD83, Zone 15, Meters X 412955 Y 5038371
Unique Number Verification Information from Input Date 04/12/1995

Angled Drill Hole

Well Contractor
North Star Drilling 48038 WITUCKI, J.
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

497680

County Sherburne
Quad Clearwater
Quad ID 139A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 06/14/1992
Update Date 02/14/2014
Received Date

Well Name	Township	Range	Dir	Section	Subsection
MILD, RICK &	35	30	W	30	ABCACB

Elevation 1022 **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

C/W 2053 49TH ST SE ST CLOUD MN

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
TOP SOIL	0	3	BLACK	SOFT
SAND	3	7	BROWN	SOFT
SAND & GRAVEL	7	35	BROWN	SOFT
SANDY CLAY	35	47	GRAY	SOFT
COAL	47	48	BLACK	SOFT
SANDY CLAY	48	55	GRAY	SOFT
SMEARY CLAY	55	73	GRAY	SOFT
CLAY	73	85	GRAY	M.HARD
COAL	85	86	BLACK	SOFT
CLAY	86	98	GRAY	M.HARD
MARL	98	103	BROWN	SOFT
COAL	103	105	BLACK	SOFT
SHALE	105	108	BROWN	SOFT
MARL & FINE QUARTZ	108	116	WHITE	SOFT

Remarks

Well Depth 116 ft. **Depth Completed** 116 ft. **Date Well Completed** 10/25/1991

Drill Method Non-specified Rotary **Drill Fluid**

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint** Glued
Drive Shoe? Yes ☐ No ☐ **Above/Below** 2 ft.

Casing Diameter **Weight**
4 in. To 87 ft. lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
4 in.	12	8 ft.	108 ft.	116 ft.

Static Water Level
20 ft. land surface Measure 10/25/1991

Pumping Level (below land surface)
108 ft. 1 hrs. Pumping at 10 g.p.m.

Wellhead Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☒ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement		7 ft.	37 ft.
bentonite		37 ft.	98 ft.

Nearest Known Source of Contamination
feet Direction Type
Well disinfected upon completion? ☒ Yes ☐ No

Pump ☒ Not Installed Date Installed
Manufacturer's name
Model Number HP Volt
Length of drop pipe ft Capacity g.p. Typ

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous
First Bedrock Cretaceous undiff. Aquifer Cretaceous
Last Strat Cretaceous regolith Depth to Bedrock 55 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 412589 Y 5038960
Unique Number Verification Address verification Input Date 07/27/2010

Angled Drill Hole

Well Contractor
Traut M.J. Well Co. 71536 GORDY/KURT
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

570862

County Sherburne
Quad Clearwater
Quad ID 139A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 04/16/1996
Update Date 02/14/2014
Received Date

Well Name	Township	Range	Dir	Section	Subsection
AANERUD,	35	30	W	30	ADBBAD

Elevation 1023 **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

Well 4959 8 CR SE ST CLOUD MN 56304

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
TOP SOIL	0	2	BLACK	
SANDY CLAY	2	5	BROWN	
SAND & GRAVEL	5	52	BROWN	

Remarks

Well Depth 52 ft. **Depth Completed** 52 ft. **Date Well Completed** 08/04/1995

Drill Method Non-specified Rotary **Drill Fluid** Bentonite

Use domestic **Status** Active

Well Hydrofractured? **Yes** ☐ **No** ☐ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? **Yes** ☐ **No** ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
4 in. To 48 ft.	lbs./ft.	6.2 in. To 52 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** plastic **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set
4 in.	18	4 ft.	48 ft. 52 ft.

Static Water Level
26 ft. land surface Measure 08/04/1995

Pumping Level (below land surface)
52 ft. 1 hrs. Pumping at 25 g.p.m.

Wellhead Completion
Pitless adapter manufacturer MAAS Model 4J1
☐ Casing Protection ☒ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
bentonite		0 ft.	40 ft.

Nearest Known Source of Contamination
feet Direction Type
Well disinfected upon completion? ☒ Yes ☐ No

Pump ☒ Not Installed Date Installed
Manufacturer's name
Model Number HP Volt
Length of drop pipe ft Capacity g.p. Typ

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous
First Bedrock Aquifer Quat. Water
Last Strat sand +larger-brown Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 412994 Y 5038773
Unique Number Verification Address verification Input Date 07/27/2010

Angled Drill Hole

Well Contractor
Traut M.J. Well Co. 71536 JOHN/LYLE
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

640304

County Sherburne
Quad Clearwater
Quad ID 139A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 06/15/2000
Update Date 10/07/2010
Received Date

Well Name	Township	Range	Dir	Section	Subsection
SCHMIDT, JOHN	35	30	W	30	ACAAAA

Elevation 1023 **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

Well 4958 8 CR SE ST CLOUD MN 56304

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SAND	0	21	BROWN	SOFT
CLAY	21	28	BROWN	HARD
SAND	28	43	BROWN	M.HARD
CLAY	43	43	GRAY	HARD

Remarks

Well Depth 53 ft. **Depth Completed** 53 ft. **Date Well Completed** 12/13/1999

Drill Method Non-specified Rotary **Drill Fluid** Bentonite

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint** Threaded

Drive Shoe? Yes ☐ No ☒ **Above/Below**

Casing Diameter		Weight	
4 in. To 39 ft.		11	lbs./ft.
4 in. To 53 ft.		11	lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
4 in.	25	4 ft.	39 ft.	43 ft.

Static Water Level

28 ft. land surface Measure 12/13/1999

Pumping Level (below land surface)

ft. 1 hrs. Pumping at 20 g.p.m.

Wellhead Completion

Pitless adapter manufacturer MAASS Model 4JC-1

☐ Casing Protection ☒ 12 in. above grade

☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
high solids bentonite		0 ft.	30 ft.

Nearest Known Source of Contamination

105 feet West Direction Septic tank/drain field Type

Well disinfected upon completion? ☒ Yes ☐ No

Pump ☐ Not Installed Date Installed 03/14/2000

Manufacturer's name JACUZZI

Model Number 7S18B HP 0.75 Volt 230

Length of drop pipe 34 ft Capacity 18 g.p. Typ Submersible

Abandoned

Does property have any not in use and not sealed well(s)? ☒ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock Aquifer Quat. Water

Last Strat clay-gray Depth to Bedrock ft

Located by Minnesota Geological Survey

Locate Method GPS SA Off (averaged) (15 meters)

System UTM - NAD83, Zone 15, Meters X 412880 Y 5038786

Unique Number Verification Address verification Input Date 07/27/2010

Angled Drill Hole

Well Contractor

G & M Drilling 73542 MAJERUS, J

Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

719180

County Sherburne
Quad Clearwater
Quad ID 139A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date
Update Date 10/07/2010
Received Date 10/11/2004

Well Name	Township	Range	Dir	Section	Subsection
SKUZA, BILL	35	30	W	30	BADBDB

Elevation 1018 **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

Well 1881 49TH ST SE ST CLOUD MN 56304

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
ROCKY CLAY	0	35	BROWN	
STREAKY SAND &	35	72	GRAY	
SAND	72	80	GRAY	

Remarks

Well Depth	Depth Completed	Date Well Completed
80 ft.	80 ft.	09/29/2004

Drill Method Non-specified Rotary **Drill Fluid** Bentonite

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint** Threaded
Drive Shoe? Yes ☐ No ☒ **Above/Below**

Casing Diameter	Weight	Hole Diameter
4 in. To 72 ft.	0 lbs./ft.	6.7 in. To 80 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set
4 in.	15	8 ft.	72 ft. 80 ft.

Static Water Level
40 ft. land surface Measure 09/29/2004

Pumping Level (below land surface)
ft. hrs. Pumping at 20 g.p.m.

Wellhead Completion
Pitless adapter manufacturer MAASS Model J
☐ Casing Protection ☒ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
high solids bentonite	0	ft.	30 ft.

Nearest Known Source of Contamination
feet Direction Type
Well disinfected upon completion? ☒ Yes ☐ No

Pump ☒ Not Installed Date Installed
Manufacturer's name
Model Number HP Volt
Length of drop pipe ft Capacity g.p. Typ

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous
First Bedrock Aquifer Quat. buried
Last Strat sand-gray Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 412324 Y 5038941
Unique Number Verification Address verification Input Date 07/27/2010

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Boart Longyear	49653	RAGER, L.

Minnesota Unique Well Number

759189

County Sherburne
Quad Clearwater
Quad ID 139A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 08/28/2009
Update Date 01/16/2013
Received Date 09/12/2008

Well Name	Township	Range	Dir	Section	Subsection
LINDGREN,	35	30	W	30	BADAAB

Elevation 1022 **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

Well 1950 49TH ST SE ST CLOUD MN 56304

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SAND	0	18	BROWN	SOFT
CLAY	18	51	GRAY	HARD
SAND	51	84	GRAY	SOFT

Remarks

Well Depth 84 ft. **Depth Completed** 84 ft. **Date Well Completed** 08/07/2008

Drill Method Non-specified Rotary **Drill Fluid** Bentonite

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint** Threaded

Drive Shoe? Yes ☐ No ☒ **Above/Below**

Casing Diameter		Weight	
4	in. To 76 ft.	11	lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set
4 in.	25	8 ft.	76 ft. 84 ft.

Static Water Level

39 ft. land surface Measure 08/07/2008

Pumping Level (below land surface)

ft. 1 hrs. Pumping at 30 g.p.m.

Wellhead Completion

Pitless adapter manufacturer MAASS Model 4JC-1

☐ Casing Protection ☒ 12 in. above grade

☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
bentonite		ft. 50	ft.

Nearest Known Source of Contamination

50 feet North Direction Septic tank/drain field Type

Well disinfected upon completion? ☒ Yes ☐ No

Pump ☐ Not Installed Date Installed 08/08/2008

Manufacturer's name AT MCDONALD

Model Number 23100P-3 HP 1 Volt 230

Length of drop pipe 63 ft Capacity 18 g.p. Typ Submersible

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock Aquifer Quat. buried

Last Strat sand-gray Depth to Bedrock ft

Located by Minnesota Geological Survey

Locate Method GPS SA Off (averaged) (15 meters)

System UTM - NAD83, Zone 15, Meters X 412452 Y 5038994

Unique Number Verification Address verification Input Date 07/27/2010

Angled Drill Hole

Well Contractor

GM Drilling, Inc. 1921 MAJERUS, S.

Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Well Index Report | **759189** | Printed on 06/13/2023

HE-01205-15

Appendix F

Standard Operating Procedures

Guidance for Per- and Polyfluoroalkyl substances (PFAS): Sampling

The Minnesota Pollution Control Agency (MPCA) intends to update the information within this PFAS Guidance document as new information becomes available. Users of this PFAS Guidance are encouraged to visit the https://www.pca.state.mn.us/about-mpca/mpca-quality-system to access the current version of this document.

Per- and Polyfluoroalkyl substances (PFAS) are a suite of many human-made emerging contaminants composed of fluorinated organic chemicals. The actual number of compounds is continuously growing. Some PFAS are no longer manufactured in the United States due to regulatory and voluntary actions, but these substances are still present in historic waste sites, current waste streams, the atmosphere, soil, water, some products, and even our bodies. There are many other PFAS that are manufactured and imported legally into the United States.

Purpose and objectives

The purpose of this document is to provide guidance and information on collecting or handling PFAS environmental samples. This document also pertains to subsurface sampling activities such as soil borings and/or well installation or well abandonment at PFAS sites. This guidance document is meant to be a resource for PFAS sampling, to provide guidance in order to improve sampling consistency and avoid cross-contamination. Decisions about sampling procedures and quality control samples should be made on a project specific basis. Discussions with project managers and/or MPCA QA staff should consider data quality objectives.

General PFAS sampling considerations

Prior to conducting any PFAS sampling, review the project-specific quality assurance documentation. This should include a list of analytes, methods, environmental matrices, and desired reporting limits.

PFAS samples can easily be contaminated from sources such as consumer products or other PFAS-contaminated media. Potential cross-contamination in a typical sampling event may include:

- Water used during drilling or decontamination
- Sampling equipment
- Field clothing
- Personal Protective Equipment (PPE)
- Sun and biological protection products
- Personal hygiene and personal care products
- Food packaging
- Other environmental media (soil, dust…)

Materials associated with sampling potential cross contamination can be categorized into acceptable, needs screening, or prohibited.

Sampling materials and equipment

Acceptable: These materials are safe to use when sampling.

- LDPE bags (E.g. zip-top) that do not come into direct contact with the sample media or with samples
- New LDPE pump tubing (assume using a peristaltic pump).
- Materials that are made of high-density polyethylene (HDPE), polypropylene, silicone, acetate
- Powderless nitrile gloves
- Aluminum foil

Prohibited: DO NOT use these products as they may cause contamination.

- Polytetrafluoroethylene (PTFE) – (often with the brand names Teflon® or Hostaflon®) found in hose linings, wiring, gears, and objects that require parts sliding
- Polyvinyl fluoride (PFDF) – (Kynar®) found in tubing, films/coatings on aluminum, galvanized steel, wire insulators, lithium ion batteries
- Polychlorotrifluoroethylene (PCTFE)- (Neoflon®) found in valves, seals, gaskets, food packaging
- Ethylene-tetrafluoroethylene (ETFE) – (Tefzel®) found in wire and cable insulation, films for housing exteriors, pipe liners
- Fluorinated ethylene propylene (FEP) – (Teflon Hostaflon®, Neoflon®) found in wire and cable insulation, pipe linings and some labware
- Teflon or teflon-lined pump tubing
- Teflon wash bottles
- Teflon tape
- Fluorinated ethylene propylene (FEP) – (Teflon Hostaflon, Neoflon) found in wire and cable insulation, pipe linings and some labware
- Dry-erase markers

Field Clothing and Personal Protective Equipment (PPE)

Field planning needs to address the hazards associated with each site; physical, chemical and biological. PFAS is extensively used in many industries and products, including PPE. During an investigation, PFAS must be avoided to prevent cross-contamination. While preparing for sampling, focus should be made on avoiding clothing advertised as having waterproof, water-resistant/repellant, or dirt and stain resistant characteristics as these types of clothing are most likely to contain PFAS.

Acceptable: These materials are safe to use when sampling

- Powderless nitrile gloves
- Wax-coated fabrics
- Neoprene
- Synthetic and natural fibers (cotton) that are well laundered (6+ times with no fabric softener) –
- PFAS-free boot coverings

Needs screening: Verify these materials are PFAS-free prior to use:

- Latex gloves
- Water resistant or stain-treated clothing and PPE
- Tyvek suits and clothing containing Tyvek
- Clothing chemically treated for insect resistance and UV protection

Prohibited: DO NOT use these products as they may cause contamination.

- Clothing washed with fabric softeners
- Clothing made with or washed with water-, dirt-, and/or stain-resistant chemicals
- Clothing or PPE from brands known to contain PFAS

Food packaging

Coatings against grease, oil, and water for paper and paperboards can include PFAS. Though PFOA and PFOS have been phased out of production in the US and not legally intentionally added to food packaging, other PFAS are approved by the FDA for use in food contact materials including paper plates, food containers, bags, wraps, etc. PFOA and PFOS may be present in these products as well due to recycling or environmental contamination. Keep pre-wrapped food or snacks (candy bars, microwave popcorn, fast food, etc.) out of the sampling staging areas. When sampling personnel require food breaks all gloves, coveralls, and PPE should be removed in the staging area and move to a designated eating/drinking area. After eating samplers should wash their hands and don a fresh pair of gloves prior to returning to sampling.

PFAS sampling procedures: Sample containers

Sample collectors should request lab verified PFAS-free sample bottles from the laboratory. Prior to sampling, samplers may come into contact with PFAS in carpets and car interiors. Samplers need to be aware of materials and other treated surfaces (water or stain resistant coatings) that have a potential to cross-contaminate PFAS samples. Sampling equipment should not be stored on or come into contact with materials suspected to contain PFAS.

- Wash hands well before sampling when possible.
- Put on clean powderless nitrile gloves prior to sample collection or handling sample equipment.
- Keep sample container(s) sealed at all times and only open during sample collection.
- Never place the sample container cap(s) or lid(s) on any surface unless it is PFAS-free. The cap or lid must never be place directly on the ground or facing downward.
- Follow method specific sample preservation, thermal storage, and holding times to limit microbial growth. Biota samples are recommended to be kept frozen until the sample is prepared.

PFAS sampling procedures: Sample shipment

Samples must be kept on ice from time of sample collection to arrival at the laboratory. The following procedures should be used for sample shipment:

- Samples need to be cooled and maintained at or below the proper temperature the entire life from collection to the lab, refresh ice as needed.
- Fish and other tissue/wildlife samples should be placed on dry ice and frozen from collection, prior to shipment.
- Samples, ice, and chain of custody (COC) should be bagged in polyethylene zip-top bags. The COC bag should be taped to inside cooler lid to prevent damage or loss.
- The cooler should be made tamper proof or given a custody seal.
- Samples should be shipped as soon as possible according to the laboratory's guidance to ensure samples arrive within temperature and holding time specified by the lab.
- For international shipping, follow the laboratory's and commercial courier's guidance to prepare the shipping manifests and commercial invoice forms that must accompany these shipments.

PFAS sampling procedures: Sampling sequence

Establish a sampling sequence prior to any sampling event to reduce the risk of cross-contamination by collecting the samples likely to have the lowest PFAS concentrations first. For example, collect field blank samples prior to routine environmental samples. At sites with known contamination, if possible, start in areas expected/known to be least contaminated then continue to areas anticipated to contain PFAS or high levels of PFAS. If no historical information is available, use potential PFAS migration patterns: up gradient or upstream to down gradient or downstream. Review possible PFAS sources prior to sampling.

When multiple samples from one site are collected, for example monitoring wells, sample up gradient areas first followed by those down gradient from the suspected source. When considering the sample type, collect in the following order: drinking water (residential wells), foam on surface water, surface water, groundwater, soil, sediment, and porewater.

Decontamination procedures

Non-disposable sampling equipment used at multiple sites or sampling locations can easily become contaminated with PFAS. For this reason, disposable sampling equipment should be used when possible or available, especially for materials that are used in direct contact with the sample and/or sampling equipment for an extended period of time. For non-disposable equipment, decontamination procedures must occur to prevent cross-contamination, specifically between individual sample locations. Decontamination should also occur after all sampling is finished.

Decontamination method example:

- Initially scrape or brush equipment caked with drill cuttings, soil, or other material. The scrapings can be sampled, characterized, and appropriately disposed of. Equipment will then be sprayed with potable water using a high pressure washer.
- Wash equipment with PFAS-free water, which can be requested from the laboratory.
- Place decontaminated downhole equipment (e.g. drill pipe, drive casing, bits, tools, bailers) on clean plastic sheeting (PFAS-free) to prevent contact with contaminated soil and allowed to air dry. Minimize airborne contamination by covering or wrapping equipment in PFAS-free plastic sheeting until use.
- Use a four stage decontamination process to clean field sampling and other downhole equipment between multiple uses.
    1. Rinse equipment in a bucket containing a mixture of potable water and PFAS-free soap.
    2. Rinse equipment in clean potable water (repeat minimum 2x).
    3. Final rinse of equipment is with PFAS-free water. Use this rinse to collect an equipment blank/equipment rinse blank.

Replenish decontamination solutions between sampling locations. Spent decontamination fluids should be containerized, properly labeled, and appropriately disposed of according to investigative-derived waste plans specified in the quality assurance documentation.

Field quality control samples:

Field quality control (QC) samples are a means of assessing quality from the point of collection. PFAS data are collected for a variety of purposes and reporting limit goals (down to parts per trillion). Appropriate field quality control processes should be taken to ensure that the sensitivity of the results desired is not compromised by potential cross contamination. Collection and analysis of field QC samples are important to ensure accuracy and representativeness of the results to the samples media, and to assess potential cross-contamination. Below is a table of recommended field QC and frequency based on the most stringent data quality objectives to account for potential contamination.

QC sample	Description	Recommended frequency
Trip Blank (TB)	Clean sample of matrix that is taken from the laboratory to the sampling site and transported back to the laboratory without being exposed to sampling.	One per cooler
Field reagent blank (FRB)	Lab provided reagent water (matrix of interest), poured into empty sample bottle (exactly as samples being collected), sealed, and shipped to sampling site along with sample bottles.	One per day per matrix per sample set
Source water blank	Water collected from potable water source that is utilized during sampling process	One per site, preferably prior to sampling event (if possible) and at least once during sampling event
Equipment blank (EB)/Equipment rinse blank (ERB)	Final rinse of non-dedicated sampling equipment with lab-verified PFAS-free water	One per type of sampling equipment used for each matrix sampled per decontamination procedure, preferably prior to the sampling event.
Field duplicate	Two samples collected at the same time and location under identical circumstances	5% of samples and one per day per matrix
Spiked Trip blank	Sample containing known concentrations of project analytes - lab provided	One per project per matrix, or data quality objectives and sampling media
Matrix Spike (MS)/Matrix Spike Duplicate (MSD)	A representative but randomly chosen client samples that have known concentrations of analytes of interest added to the samples prior to sample preparation and analysis. They are processed along with the same un-spiked sample.	One pair collected ≤ 20 samples

Sampling groundwater:

- Nonpotable water does not require chemical preservative
- Sampling equipment used can contaminate sample and/or well (ERB required)
  - Decontaminate all non-dedicated equipment
  - Replace Teflon® or fluoropolymer o-rings or gaskets with non-PFAS materials
  - Use inert materials whenever possible (stainless steel, silicone and HDPE)
  - Be sure all dedicated equipment is PFAS-free prior to sampling
- Ensure tubing is PFAS-free
- Do not filter sample as filters can absorb PFAS.

Sampling surface water:

- Sample location(s) in the water column should consider the potential stratification of PFAS in solution and their tendency to accumulate at the air/water interface. Sampling collection must be addressed in quality assurance documentation.
- Transfer containers (beakers or dippers) which may attach to extension rods should be used if samples have preservatives. Sampling by direct sample container immersion is not recommended.
- Add foam sampling coincidental with surface water sample directly below and include GIS location for EQuIS co-location data points.

Sampling sediment:

- Most core and grab sampling devices are stainless steel; however, if HDPE sleeves are inserted, ensure materials that contact the sampled media do not have water-resistant coatings that contain PFAS.
- Use PFAS-fee waders and personal floatation devices if they could potentially come in contact with sampled media.

Sampling fish:

- The species of fish as well as the portion of fish (fillet or whole) can determine quantity and quality of tissue, fish handling requirements, lab sample preparation (single or composite fish samples, and whole or fillet preparation), and packaging and shipping requirements. Fish/biota samples should be wrapped in HDPE or polypropylene bags.

Sampling air emissions and ambient air:

- Stack measurement of air emissions can be performed by OTM-45 or using modifications of existing USEPA method sampling train.
- TO-13 and TO-9 methods can be modified to collect ambient air. High volume air samples fitted with both a particulate filter glass fiber filter/quartz fiber filter (GFF/QFF) and sorbent cartridge for collection of particulate and gaseous phases are recommended and provide optimized detection limits. Flow rates should be approximately 225 liters/minute. The solid sorbent used is a sandwich polyurethane foam (PUF) and XAD-2 (polymer of styrene divinyl benzene).
- PFAS in ambient air can be measured using both active and passive sampling techniques:
  - PUF
  - XAD-2
  - Sorbent-impregnated PUF (SIP)
  - Particulate filter (glass or quartz fiber) ahead of sorbent module

- Neat filter, sorbent media, or components within the sampler can greatly influence PFAS artifacts. Do not use Teflon gaskets in high-volume air samplers. Field sampling must include collection of field blanks. Consider including duplicates or co-located samples and isotopically labeled PFAS surrogates. The laboratory can apply/spike the isotopically labeled PFAS into the sorbent media prior to field deployment to assess “native PFAS” in the air.
- Passive samples should also make use of mass-labeled PFAS as a sample specific quality control measure to account for native PFAS. It is also recommended to analyze a portion of samples as front PUF/XAD-2 and back PUF to assess whether breakthrough to back PUF has occurred.

Sampling high concentration samples:

- Single-use, disposable equipment is highly recommended. If not possible, take additional precautions – collect more equipment rinse blanks and dedicating equipment to only high concentration PFAS samples.
- Segregate high concentration samples during shipping to the laboratory and clearly identify them on the chain of custody
- AFFF product samples are considered high concentration samples and segregated from other samples during sampling and shipping to avoid cross-contamination. Notify the laboratory in advance. Expect serial dilutions for these samples.

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Minneapolis, MN 55438

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Web: braunintertec.com

PFAS Compound Sampling Guide

1. Introduction

Due to the unique chemical properties of per- and polyfluoroalkyl substances (PFAS) compounds and the fact that PFAS compounds are present in many everyday products, specific measures will be taken in the field to reduce the potential to introduce PFAS compounds into soil and groundwater samples due to cross contamination.

PFAS compounds are found in typical environmental sampling equipment, standard clothing, and personal protection equipment. PFAS compounds are also common in many types of cosmetics, lotions, fabric softeners, water and stain resistant products, food packaging, Post-it® notes, and other products. This document provides guidance to be used by field personnel during collection of soil and groundwater samples that will be analyzed for PFAS compounds. The guidance is intended to reduce the risk of introducing PFAS compounds into the samples.

The information in this document is based on information published in the following guidance documents:

- *General PFAS Sampling Guidance*. Michigan Department of Environmental Quality, Revised October 16, 2018;
- *Site Characterization Considerations, Sampling Precautions, and Laboratory Analytical Methods for Per- and Polyfluoroalkyl Substances (PFAS)*. Interstate Technology Regulatory Council, April 2020; and
- *PFAS Field Sampling Guide*. Pace Analytical Services, November 2018.

1.1. Prohibited items while field sampling for PFAS compounds

The following materials and products will not be used, present in the sampling area, or worn by sampling personnel during collection of soil or groundwater samples that will be analyzed for PFAS compounds:

- Teflon containing products (e.g., tubing, hose linings, and wiring).*
- Polyvinylidene fluoride (PVDF) containing products, includes the trademark Kynar®, found in many items, including but not limited to, tubing, wire insulators, lithium-ion batteries, films/coatings on aluminum, galvanized, and aluminized steel.
- Polychlorotrifluoroethylene (PCTFE) that includes the trademark Neoflon®, which can be found in many items, including but not limited to, valves, seals, gaskets, and food packaging.
- Low-density polyethylene (LDPE) for any items that will come into direct contact with the sample media. LDPE can be found in many items, including but not limited to, containers and bottles, plastic bags, and tubing.**
- Stain and water-resistant clothing.

- Clothing or boots containing Gore-Tex®.
- Plastic clipboards, binders, or spiral notebooks.
- Water-proof Field Books.
- Post-it® notes.
- Clothing washed in fabric softener.
- Clothing that has been made with or washed with water, dirt, and/or stain resistant chemicals, or treated with waterproof or UV resistant products.
- Sharpies and permanent markers.
- Tyvek.
- Aluminum Foil.
- Chemical (blue) ice packs.
- Cosmetics, moisturizers, hand cream, or other related products.
- Paper plates, paper food packaging, and food bags or containers (i.e., fast food packaging).
- No food or drink on-site with exception of bottled water and/or hydration drinks. Field personnel will thoroughly wash hands after contact with any food, beverages, or packaging.

* There may be Teflon lined caps on the sample containers required for non-PFAS analyses. Procedures for handling sample containers are described in Section 1.3.

** LDPE bags (e.g., Ziploc®) may be used for packing soil or groundwater samples if the bags do not come into direct contact with the sample media.

1.2. Acceptable items while field sampling for PFAS compounds

The following items are acceptable to be used during sampling for PFAS compounds:

- Sampling materials made of stainless steel, high-density polyethylene (HDPE), acetate, silicon, or polypropylene (PP).
- Steel or aluminum clip boards.
- Ball point pens.
- Powder free nitrile gloves.
- Clothing made from cotton or other natural fibers such as wool that is well laundered (washed six or more times without fabric softener).
- Loose paper forms.
- Coolers filled with regular ice.
- Laboratory provided water certified as “PFAS-free” for decontamination of sample equipment. **No other** water sources will be used. Please note that laboratory-supplied water is only certified to be free of the specific PFAS compounds analyzed by the specific laboratory. Therefore, samples should be submitted for PFAS compound analysis at the same laboratory that supplied the PFAS-free water.
- Alconox or Liquinox for decontamination of equipment.
- Organic natural sunscreens.

1.3. PFAS Sampling Procedures

All sample containers for PFAS compound analysis will be provided by a certified laboratory and will be constructed of PFAS-free materials (i.e., HPDE). The laboratory performs lot checks on the sample containers to ensure that they are PFAS free.

Car interiors and similar textiles that are often treated with PFAS compounds may be encountered. Field personnel will wash their hands thoroughly after contact with car interiors or other potentially PFAS treated fabric (stain resistant carpet, furniture, etc.) and prevent sampling equipment and sample containers from contacting these materials.

Field personnel must wash their hands thoroughly with approved soaps and PFAS-free water before each sample. After washing hands, field personnel will don new, powder free nitrile gloves prior to handling sample containers. The sample containers must be kept sealed and only be opened during sample collection. Sample containers and lids will not be placed on any surface while collecting the samples unless the surface is PFAS free. Field personnel will avoid all contact with the sample bottle interior and inside of the sample bottle lid.

Field personnel will wear new nitrile gloves whenever handling sample containers in the field. Prior to use, the sample containers will be transported in LDPE resealable storage (i.e., Ziploc®) bags. The sample containers will be removed from the bags, filled with the sample, and then double bagged in new resealable storage (i.e., Ziploc®) bags before placement into the cooler to ensure that the sample containers do not contact the cooler materials while transporting the samples. The cooler will be filled with regular wet ice, double bagged in LDPE resealable storage (i.e., Ziploc®) bags, to maintain the samples at the required temperature per the analytical method. The samples, ice, and chain-of-custody (COC) will be contained in separate LDPE (i.e., Ziploc®) bags.

All containers for laboratory analysis of non-PFAS compounds, will be stored in **separate coolers** in a different portion of the field vehicle. At each location, all samples that will be analyzed for PFAS compounds will be collected before samples collected for other analytes (e.g., PAHs and VOCs). The sampler will then change gloves before retrieving sample containers for non-PFAS samples.

1.4. Preferential Sampling Order

Soil borings will be advanced starting in areas expected to be least contaminated and advancing to areas expected to be more contaminated.

1.5. Decontamination of Reusable sampling Equipment

Laboratory-supplied PFAS-free deionized water will be used for decontamination. A PFAS-free bucket (i.e., steel or HDPE***) will be used to hold the wash solution (Bucket 1). The wash solution will consist of PFAS free water and Alconox or Liquinox. Sampling equipment will be scrubbed in Bucket 1 using a polyethylene or polyvinylchloride (PVC) brush to remove particulates. Sampling equipment will then be rinsed with PFAS-free water and the equipment will then be transferred to a second bucket (Bucket 2) where it will be triple rinsed with PFAS-free water. Equipment will be decontaminated between collection of each sample and at the beginning and at the end of each sampling day.

Methanol can be used as a final rinse on any reusable sampling equipment. After the methanol rinse, the equipment then has to air dry before use.

****Most typical 5 gallon hardware store buckets are HDPE, look on the bottom of the bucket for "HPDE" printed by the recycle triangle on the bottom of the bucket.*

1.6. QA/QC Samples

In addition to the investigative samples, the following QA/QC samples will be collected:

- One trip blank will accompany each cooler containing samples for PFAS analyses. The trip blank will be analyzed for PFAS.
- One equipment rinsate blank will be collected and analyzed for PFAS each day. The equipment rinsate blank will be created by passing laboratory-supplied PFAS-free water over the decontaminated field equipment to access the adequacy of the decontamination process.
- One container blank will be collected for each project and analyzed for PFAS. The container blank will be created by filling an unused sampling container with PFAs-free water. <u>The container blank should be prepared after leaving the site.</u>

A. Purpose

The objective of this Standard Operating Procedure (SOP) is to establish a consistent method and format for the use and control of documentation generated during field activities. Field notes, records, and photographs are intended to provide sufficient information that can be used to recreate the field activities and collection of environmental data. The information placed in these documents and/or records should be factual, detailed, and free of personal opinions.

A.1. Scope and Applicability

This SOP is applicable to Phase I Environmental Site Assessments (ESAs), Phase II ESAs, remedial investigations, and Response Action Plan (RAP) implementation. Documentation includes Field Report Form, additional field forms that are part of method SOPs, and photographs.

A.2. Personnel Responsibilities

The project manager (or designee) is responsible for properly preparing field personnel to perform the field work and to oversee that field documentation is collected in accordance with this SOP, site-specific or project-specific planning documents, and other applicable SOPs.

Field personnel are responsible for understanding and implementing this SOP during field activities, as well as completing appropriate Field Report Form to properly document the field activities. Field observations should be discussed with the project manager on a daily basis. If conditions change from initial expectations, a call should also be made to the project manager. Field personnel should document field activities and record field measurements as they occur and complete documentation prior to leaving the site. Field personnel are responsible for tracking the location of field documentation. Field personnel are responsible for preserving original documentation until it is provided to the project manager and placed into the permanent file or archived. Field personnel are responsible for distributing copies (or electronically preserving copies) of the documentation in a timely manner.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP), if applicable.

C. Referenced SOPs

- None

D. Equipment and Supplies

- Field Report Form (see Attachment A) or field logbook
- Waterproof and/or indelible ink pens
- Cell phone camera or digital camera

E. Procedure

This SOP primarily addresses documentation using the Field Report Form (see Attachment A) or field logbook. However, procedures discussed in this SOP are applicable to other types of field documentation collected. Other field records and forms (e.g., soil boring logs, Chain-of-Custody records, water sample collection records, soil vapor monitoring forms) are discussed in the specific SOP associated with that particular activity and are not described in this SOP.

E.1. Field Report Form

Field personnel will keep accurate written records of their daily activities in chronological order on a Field Report Form that will be sufficient to recreate the project field activities without reliance on memory. Entries should be legible and written in black, waterproof or indelible ink. Each page should be numbered sequentially, dated, and signed by the field author. There should be no blank lines on a page. If only part of a page is used, the remainder of the page should have an "X" drawn over it. The completion of each day's work and the end of the field project should be clearly indicated with "END DAY" or "END FIELD INVESTIGATION."

If pre-printed adhesive labels or other added information are glued or taped onto a Field Report Form, the note taker should sign the addition. The signature should begin on the addition and extend onto the Field Report Form page so that the addition cannot be removed without detection.

At a minimum the following information should be recorded for <u>each project</u>:

- Site/project name
- Site location
- Site project number
- Name of project manager
- Full name of Field Report Form author
- Names of other Braun Intertec personnel on site and their role (full name and initials)
- Name of subcontractors performing work for Braun Intertec (or whose work Braun Intertec is monitoring) and the full name and phone number of their site superintendent

At a minimum, the following information should be recorded <u>each day</u>:

- Date
- Purpose of the day's activities
- Pertinent weather conditions (temperature, precipitation events, wind direction and speed, general air quality, particularly any ambient odors). Significant weather changes during the day should be noted
- Full name and initials of Field Report Form author, if different from previous day
- Full name and initials of other Braun Intertec personnel on site and their role, if different from previous day
- Documentation of exclusion zone setup and decontamination procedures, if applicable
- Record safety related monitoring information, including the time and location of the measurements or observations
- If not Level D, record the Personal Protective Equipment (PPE) level in which work is conducted and change in levels and the reason for the change

- Names, phone numbers, and affiliation of all site visitors and their reason for visiting, as well as their time of arrival(s) and departure(s). The project manager should be notified immediately if regulators (e.g., Minnesota Pollution Control Agency [MPCA], Environmental Protection Agency [EPA], Occupational Safety & Health Administration [OSHA]) visit the site. [Note: "all site visitors" means those who are inspecting or observing our work or the work we are overseeing. It is not intended to include unrelated site activities or personnel.]
- Persons contacted, name, and reason for contact, and decisions made. If the person contacted is not Braun Intertec personnel, also record the phone number.

E.2. Environmental Media Sampling Data

The information below should be recorded on specific forms if they are required by the data collection method SOP, but use of the form should be documented on the Field Report Form. The following information should be recorded:

- A chronological description of field observations and sampling events (i.e., date and time)
- Sampling locations (referenced/scaled drawings or global positioning system [GPS] coordinates, if not logged) should be identified. The project manager should provide the sample nomenclature system to the field personnel for consistency and continuity on sites with multiple rounds of data collection.
- Specific data associated with sample acquisition (e.g., field parameter measurements, field screening data, and HASP monitoring data)
- Source of samples, matrix, sample identification, sample container types and preservatives (including ice), field quality assurance/quality control sample collection, preparation, and origin
- Conditions that could adversely impact samples, such as smoke, wind, rain, or dust
- Make, model, and serial number of field instruments should be recorded in the Field Report Form or in a separate calibration log along with calibration data
- Deviations from the work plan and/or SOPs
- Sketches or scaled diagrams
- Process diagrams
- Waste generated and management methods (i.e., investigation derived waste [IDW]).

E.3. Sketches and Scaled Diagrams

Draw a site map using accurate measurements or make notes on a photocopy of an existing site map. The site map should include:

- Site boundaries (or features such as street curbs, fence lines, etc., that can later be related to site boundaries)
- Street names or other references that can be related to a site location map
- Investigation and well locations with dimensions to site landmarks
- Major structures with dimensions
- North arrow
- Scale
- Date
- Initials of field personnel

E.4. Photographs

Subject

Photographs should be taken to document existing conditions pertinent to the subject evaluation or remediation at a project site. Except when specifically required, it is unnecessary to photograph processes that are described by SOPs, but rather photograph the results of the process. **Note: Some restrictions may apply regarding Site photographic documentation.**

Composition

The three most common mistakes to avoid in providing photographic documentation are (1) too few photographs, (2) poor quality photographs, and (3) lack of subject identification in photographs. Photographic documentation should tell the story with as little need for narrative as possible.

When photographing several similar subjects or details that are not necessarily well identified in an establishing shot, such as a test excavations or test excavation spoil piles, it is recommended that you place a clip board with an identifying description in at least the first in the sequence of photographs of that subject or detail.

Scale

Where there are insufficient objects of widely known scale in a photograph, one should be placed in the photograph to provide scale. Some examples include a coin, ruler, clipboard, or cell phone.

Photographic Log

The following information should be recorded in the Field Report Form or field logbook:

- Site name, location, and field task
- Name of photographer
- Date and time the photograph was taken (verify the date/time stamp is correct if using a digital camera)
- Sequential number of the photograph
- Brief description of the subject of the photograph
- Site plan or site sketch showing the location from which the photograph was taken and the direction the photographer was facing.

E.5. Additional Field Forms/Records

Additional field records may be required for some field events. As an example, these may include soil boring logs during drilling, well construction and development records, groundwater purge and sample collection records, water level measurement records, instrument calibration records, sample container labels, sample container security tags and seals, Chain-of-Custody forms, field equipment calibration and maintenance logs and commercial shipping manifests. Use of these records described in the SOPs associated with the particular activity.

Prior to beginning field activities, field personnel will coordinate with the project manager, or designee, to determine which SOPs will be used and identify additional field forms that are required. These additional records will be maintained in a field file throughout the duration of the field activities. Copies of the records will be forwarded to the project manager (or designee) on a daily basis, if practical to do so.

E.6. Corrections

If an error is made in an entry in the field records, corrections will be made by drawing a SINGLE straight line through the error, entering the correct information, initialing, and dating the change. Materials that obliterate the original information, such as correction fluids, tapes or markers are prohibited. If the reason for the change is not obvious, provide a brief explanation.

E.7. Data and Records Management

Field records should be forwarded to the project manager or designated staff on a daily basis, if practical. The project manager should review progress and results in detail on a daily basis and evaluate the quality of the documentation. The field personnel should scan the field records and place them in the project folder in OnBase. This preserves documentation in the event that the Field Report Form is lost, stolen, or damaged. Copies of the field notes should be maintained in accordance with the Braun Intertec Records Retention Policy and Procedures. Photographs should be uploaded to the EnCon DRAFTS project folder as soon as possible.

Individual logbooks may be assigned to large projects. These logbooks will be returned to the project manager at the completion of field work and archived with the project file. Logbooks assigned to individual personnel for recording multiple project information from multiple projects should be provided to the designated EnCon project assistant for archiving when the logbooks are filled. Each logbook should have a table of contents (TOC) and be kept up to date by the personnel to which the book is assigned.

The TOC for each logbook should list the project names and locations, project numbers, inclusive dates and logbook page numbers.

E.8. Quality Assurance/Quality Control

All personnel that perform field work will be trained in the use of this SOP. Project managers or project staff who use the field notes for interpreting data and preparing reports should provide immediate feedback to those recording field information to reinforce conformance with the SOP and correct deficiencies. Periodic random audits of all field personnel documentation will be performed by the quality assurance (QA) manager or designees.

F. References

U.S. Environmental Protection Agency, Region 4, Science and Ecosystem Support Division, Athens, Georgia, Operating Procedure: Logbooks, SESDPROC-010-R3, October 31, 2007.

BRAUN INTERTEC

Field Report Form

Project No.:

Date:

Project Name:

Personnel:

Location:

Time On Site:

Time Off Site:

☐ Photos taken and documented.

Project Manager:

Other Braun Intertec Staff:

Weather (temperature, wind speed and direction, etc.):

Other Personnel (subcontractors, site superintendent, etc.; include time on site and time off site):

PPE and Field Equipment Used (e.g., PID; include ID numbers, calibration information, etc.):

Work Completed (include field scope, unexpected issues, action items, log of communication, and site sketch):

Signature:

BRAUN INTERTEC

Field Report Form

Project No.:		Date:	
Project Name:		Personnel:	
Location:		Project Manager:	

Work Completed (include field scope, unexpected issues, action items, log of communication, and site sketch):

Signature:

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to determine the elevation of monitoring well casing tops as well as the ground surface elevation of borings and soil probes (survey locations). These measurements assist in determining the groundwater flow direction and provide vertical control.

B. Health and Safety

The use of the laser level should be in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP). Care should be taken not to look into the laser source.

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation

D. Equipment and Supplies

- Survey gear (tripod, laser detector, laser level, and rod)
- Spare batteries for the laser level (4 D-size, must be Duracell)
- Survey Level Notes form (see Attachment A)
- Site map
- Well keys
- 9/16-inch socket for at-grade wells

E. Procedure

E.1. Prior to Leaving Office

- Prior to leaving the office, try to determine the known elevation of an object near the site that will be the benchmark (e.g., a fire hydrant). It is not critical to have a benchmark with a known elevation, but it is helpful for referencing elevations of regional groundwater or ground surfaces.
- Turn on the laser level to verify the batteries are good. Replace if necessary.

E.2. In the Field

1. If not previously selected, choose a survey benchmark at the site. The top nut of a fire hydrant makes an excellent benchmark. If a fire hydrant is not available, choose a permanent site feature which will not settle, change elevation, or be removed during later stages of the project. If the site was previously surveyed, use the same benchmark and re-survey one or two well casings to verify consistency between the surveys. Be sure to add the benchmark to the site map if it is not already shown.

2. Assume the elevation of the site benchmark is 100.00 feet if the elevation is not known.

3. Set up the laser level and tripod in a position that can view as many survey locations as possible. Push the legs of the tripod firmly into the ground and level the tripod as well as possible. Turn on the laser level, it will automatically level itself and activate the laser. If it cannot level itself, reposition the tripod and try again.

4. Turn on the laser detector. Place the rod on the benchmark as vertically as possible. Slide the detector up and down on the rod until the detector meets the laser beam. When the detector produces a solid tone record the measurement as the Back Sight (BS) to the nearest 0.01 foot on the Survey Level Notes form (Attachment A). Record the measurement in the BS column of the form and then add the measurement to the elevation of the benchmark; this is the instrument height or HI. The instrument height will be unchanged for all subsequent measurements.

5. Place the rod on the northern-most edge of the top of the survey location.

    a) Slide the detector up and down on the rod until the detector produces a solid tone. Record the measurement as a Front Sight (FS) to the nearest 0.01 foot.
    b) Subtract the recorded measurement from the instrument height; this is the elevation of the survey target location. Repeat for all necessary survey target locations.

E.3. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.4. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

BRAUN INTERTEC

Survey Level Notes

Project No.:		Date:	
Project Name:		Personnel:	
Location:		Equipment:	
Benchmark:			

Survey Location	BS (+)	HI	FS (-)	Elevation

BS = Back Sight, HI = Height of Instrument, FS = Front Sight, TOC = Top of Casing, GS = Ground Surface

Notes/Observations:

A. Purpose

The objective of this Standard Operating Procedure (SOP) is to establish a consistent method and format for visual identification and description of soil samples collected in the field. This SOP is applicable to soil samples collected during completion of soil borings (see SOP 203 – Soil Boring Observation and Sampling) and test trench excavations (see SOP 211 – Test Pit and Test Trench Observation and Sampling).

B. Health and Safety

Field work should be performed in accordance with the Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 203 – Soil Boring Observation and Sampling
- SOP 207 – Use of Hand Auger
- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 210 – Soil Stockpile Sampling
- SOP 211 – Test Pit and Test Trench Observation and Sampling
- SOP 301 – Water Level Measurement

D. Equipment and Supplies

- Soil boring or test trench log forms (see SOP 203 – Soil Boring Observation and Sampling, SOP 207 – Use of Hand Auger or SOP 211 – Test Pit and Test Trench Observation and Sampling)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Field Guide for Soil and Stratigraphic Analysis, V. 2, Midwest Geosciences Group Press (Field Guide)
- (Optional, but preferred) Munsell® Soil Color Book or Munsell® Soil Color Pages (Soil Color Chart)

E. Procedure

As soil samples are collected in the field, a visual identification and description will be completed as described below. The Standard Practice for Description and Identification of Soils (American Society for Testing and Materials [ASTM] D2488-17) was used to prepare this SOP, and soil descriptions should follow that document as applicable.

When visually describing soils in the field, the following information should be provided at a minimum; however, more detailed descriptions are encouraged.

Prepare the soil description **in the order shown**, separated by commas. All field personnel should have a laminated copy of the Field Guide and use it for classification of soil.

E.1. Main Soil

A description of the main soil group name using the United Soil Classification System (USCS) nomenclature (e.g., gravel, sand, silt, clay, silty sand, clayey sand, organic soil, etc.).

E.2. Group Symbol

List the Group Symbol in parenthesis after the main soil group name. Group symbols include the following:

- SP = Well Graded Sand/Poorly Graded Sand
- SP-SM = Poorly Graded Sand with Silt
- SP-SC = Poorly Graded Sand with Clay
- SM = Silty Sand
- SC = Clayey Sand
- ML = Silt; Silt with Sand
- CL = Lean Clay; Lean Clay with Sand
- CH = Fat Clay
- GP = Well Graded Gravel/Poorly Graded Gravel
- GP-SM = Poorly Graded Gravel with Silt
- GP-SC = Poorly Graded Gravel with Clay
- GM= Silty Gravel
- GC = Clayey Gravel
- OL = Organic Clay
- OH = Organic Silt
- PT = Peat

E.3. Grain Size for Sand and Gravel

If the soil is coarse-grained (i.e., sand or gravel), include a brief description of the predominant particle grain size(s) (e.g., fine, medium, coarse) (see Field Guide).

E.4. Inclusions

Describe the percentage by volume of the soil type(s) present in the sample using ASTM adjectives based on the percentages present within the sample:

- Trace = < 5%
- Few = 5 to 10%
- Little = 10 to 25%
- Some = 30 to 45%
- Mostly = 50 to 100%

Note that whichever soil type is 50% or more of the sample will be the main soil type for Section E.1.

E.5. Unusual Materials or Debris

Note the presence of any unusual materials or debris (e.g., bricks, glass, wood). Include the specific depth interval of the occurrence of unique material in the description or in the Remarks. See SOP 203 – Soil Boring Observation and Sampling, SOP 207 – Use of Hand Auger, SOP 210 – Soil Stockpile Sampling, and SOP 211 – Test Pit and Test Trench Observation and Sampling for additional information.

Waste/debris terminology should be as specific and descriptive as possible (e.g., concrete and glass vs. demolition debris). Category names of waste/debris should not be used. Imprecise or incorrect terminology may cause undue concern among regulators. Several important distinctions should be drawn:

- **Wood:** The term wood should not be used alone. Differentiate between tree/brush waste and lumber. To the extent feasible, lumber should be further qualified as unadulterated or treated and the type of treatment described (e.g., painted, green treated, brown treated, creosote, etc.).
- **Debris:** The term debris should not be used alone. Most often, the term is used to refer to demolition debris; however, the distinction should be drawn between demolition debris consisting of road/paving demolition debris and building demolition debris.

    - Note and carefully describe the presence of concrete pieces or blocks, bricks, bituminous/ asphalt, recycled gravel, pipe, or tubing.
    - Asbestos is more frequently associated with building demolition debris; although, it can also be present with road/paving materials, particularly in cementitious utility conduits.
    - Household waste or garbage should be noted as such if present.

- **Sizes/Amounts:** Qualitative terms like small, medium, large, etc., should be avoided in favor of dimensions (i.e., inches, feet, etc.), unless they are defined by ASTM or other commonly understood conventions. When reasonable, descriptions of sizes and approximate volumes should be quantitative (e.g., “3 to 4 feet” or “less than 1 %”) rather than qualitative (e.g., “large”) or semi-quantitative (e.g., “several,” or “a few”).

E.6. Color

Describe the color of the main soil group (e.g., brown, gray, etc.). Preferably, the color should be identified using a Soil Color Chart. The Soil Color Chart is a good resource for characterization of color at sites with complicated geology. The soil color should be described for moist samples along with the color code from the Soil Color Chart in parentheses. If the soil sample contains layers or patches of varying colors (e.g., mottled), this should be noted and representative colors shall be described. If the color described is for dry soils, this must be noted on the log.

Mottling

Mottling is a patchwork of different colors in mineral soil (usually orange or rust against a background of grey or blue) which indicates periods of anaerobic (wet) conditions. If mottling is present, note the fraction of the sample that is mottled (e.g., 1/2 mottled and the color of the mottle).

E.7. Moisture

Describe the overall moisture of the soil sample using the terms dry, moist, or wet (do not use the term “saturated”):

- Dry = absence of moisture, dusty, dry
- Moist = damp, but no visible water
- Wet = visible water; usually soil is below the water table or perched water

E.8. Consistency

If the soil is fine-grained (i.e., clay or silt), describe the consistency based on finger pressure:

- Very soft = thumb will penetrate soil more than 1 inch
- Soft = thumb will penetrate soil about 1 inch
- Firm = thumb will penetrate soil about 1/4 inch
- Hard = thumb will not indent soil, but thumbnail will easily make a mark
- Very hard = thumbnail will not indent soil

E.9. Staining

Indicate if the soil appears to have staining, for example from petroleum or chemical contamination.

E.10. Odor

Indicate any odors that are present such as organic or unusual odors. Soils that have a significant amount of organic content usually have a distinct color and odor. If the odor is of decaying vegetation, state that there is an "organic odor" present. If the odor is unusual (petroleum, herbicides, chemicals) describe the odor intensity (strong, moderate, mild, no odor) and a general descriptor. However, do not use specific chemical names to describe the odor. For example, stating that "a strong petroleum-like odor is present from 2 to 3 feet bgs" is correct; however, stating that the soil "has a gasoline odor" is NOT correct.

Note: When smelling soil, do not inhale deeply or repeatedly; the chemicals present may represent a health risk.

E.11. Structure

Describe any structures present in the soil sample as follows:

- Stratified = alternating layer of varying materials or color layers at least 1/4 inch or greater, note thickness.
- Laminated = alternating layer of varying materials or color layers less than 1/4 inch thick, note thickness.
- Fissured = Breaks along definite planes of fracture with little resistant to fracturing.
- Slickensided = Fracture planes appear polished or glossy.
- Blocky = cohesive soil that can be broken down into angular lumps which resist further breakdown.
- Lensed = Inclusions of small pockets of different soils such as small lenses of sand scattered in a mass of clay, note thickness.
- Homogeneous = same color and appearance throughout.

E.12. Plasticity

Describe the plasticity of the soil sample as follows:

- Nonplastic = A 1/8-inch (3-mm) thread cannot be rolled at any water content.
- Low = The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
- Medium = The thread is easily rolled and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
- High = It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

E.13. Cementation

Note if any cementation is present.

E.14. Fill

If the soil is fill or probable fill, note in brackets (e.g., [fill], [probable fill]).

E.15. Examples

The following are examples of correct visual soil classifications:

- Poorly graded sand with silt (SP-SM), fine- to medium-grained, light brown, moist.
- Silty sand (SM), mostly sand with some low plasticity fines and trace gravel, sand is fine- to medium-grained, dark brown (10YR 3/3), moist, firm, homogeneous.
- Clay (CL), mostly fines with trace sand, soft, gray (7.5YR 5/1), wet, laminated, moderate chemical odor(s), medium to high plasticity, [fill].
- Silty sand (SM), medium- to coarse-grained, 25-30% debris—concrete 4-6" pieces, glass <1" pieces, very dark brown, moist [fill].

E.16. Groundwater

If groundwater is encountered, note the depth to water in the log (refer to SOP 301 – Water Level Measurement).

E.17. Collecting Soil Samples

If soil samples are collected for laboratory analysis, refer to the appropriate SOPs including SOP 203 – Soil Boring Observation and Sampling, SOP 207 – Use of Hand Auger, SOP 208 – Soil Grab Sample Collection, SOP 209 – Soil Composite Sample Collection, SOP 210 – Soil Stockpile Sampling, and SOP 211 – Test Pit and Test Trench Observation and Sampling.

E.18. Geotechnical Logs

To ensure consistent logs across Braun Intertec disciplines, soil samples will be collected and classified by a Braun Intertec Geotechnical Engineer. The Geotechnical Engineer's log is a supplement to the field log and is not meant to be a replacement for the field log.

Place one or more representative portions of each two-foot interval into sealable moisture-proof containers (jars or quart-sized polyethylene sealable bags) without ramming or distorting any apparent stratification. Seal the containers to prevent evaporation of soil moisture.

Affix labels to the containers indicating job designation, boring number, and sample depth. If there is a soil change within the interval, collect a soil sample for each stratum and note its depth.

Deliver the samples to a Braun Intertec soil classification lab. Include a copy of the soil boring log form.

E.19. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.20. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

A. Purpose

This Standard Operating Procedure (SOP) describes procedure for screening soil potentially contaminated with volatile organic chemicals, such as petroleum, and/or hazardous substances that can be ionized within the energy range of the photoionization detector (PID) lamp being used. The purpose of the bag headspace procedure is to assist with site soil characterization of organic chemical contamination, soil sample selection for laboratory analysis, and soil management during excavation.

A.1. Scope and Applicability

This procedure should be used during field activities where bag headspace procedures are required by regulatory guidance or site-specific work plans. This procedure is used for soil characterization and not for health and safety monitoring.

A.2. Summary of Method

A quart-size polyethylene bag with a tight sealing closure is filled with soil (approximately 1 cup) and immediately closed leaving air in the top portion of the bag (headspace). Organic vapors are allowed to accumulate in the headspace for approximately 10 minutes at room temperature. The bag is opened slightly and the tip of the PID probe is inserted to the middle of the headspace. The highest PID response observed is recorded in the field notes.

A.3. Definitions

Background Readings: The PID measurement of ambient air and bag headspace reading without soil in the bag.

Ionization energy (IE): The energy required to displace an electron and "ionize" a compound. Used more commonly than the old, but equivalent, term Ionization Potential (IP).

Photoionization Detector (PID): The PID is a portable, nonspecific, vapor/gas detector employing the principle of photoionization to detect and measure real-time concentrations of a variety of chemical compounds, both organic and inorganic, in air.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 201 – Classification of Soil
- SOP 205 – Calibration of MiniRAE PID

D. Equipment and Supplies

- Quart-size polyethylene sealable bags
- PID with appropriate lamp (10.6 or 11.7 electron volts [eV])
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Personal Protective Equipment (PPE)

E. Procedure

E.1. Preparation

PID lamps with two different light energy (in electron volts or eV) are available for use. The 11.7-eV lamp measures the broadest range of compounds at lower sensitivity; while the 10.6-eV lamp is responsive to most commonly-studied VOCs and has higher sensitivity. The standard lamp used is 10.6 eV unless otherwise specified by the technical project manager.

Calibrate the PID onsite at least daily to yield total organic vapors in parts per million (ppm) using an isobutylene standard. If field personnel are at multiple project locations in one day, calibrate the PID upon arrival to each project location. See SOP 205 – Calibration and Operation of MiniRAE PID for calibration procedures. Record the date and results of the daily calibration.

E.2. Collection

- Visually examine the soil for staining or sheens. Note observations in field logbook. Describe the type and general amount of debris, if present, in the field logbook (see SOP 201 – Classification of Soil).
- Do not intentionally smell the soil for odors, but note unintentional olfactory indication of contamination in the field logbook.
- Collect soil samples in increments according to instructions established by the project manager or the site-specific work plan.
- **Soil samples for laboratory analysis should not be collected from the sealable bag used for headspace analysis.**
- While wearing proper PPE (Nitrile gloves at a minimum), field personnel should fill approximately one-quarter of a quart-size polyethylene sealable bag with a tight sealing closure (about 1 cup of soil), leaving air in the upper portion of the sealable bag (the volume ratio of soil: headspace should be 1:3). Close the quart-size polyethylene sealable bag immediately, making sure all soil is clear from the path of the bag's seal. Break apart the soil while vigorously shaking the bag for 15 seconds, avoiding puncturing a hole in the bag or tearing apart the zipper.
- Allow the headspace to develop in the sealable bag at room temperature (e.g., approximately 50 °F or greater) for 10 to 20 minutes. If the temperature is below approximately 50 °F, allow the headspace to develop within a heated vehicle or building. Record the ambient temperature during headspace screening.
- Vigorously shake the sealable bag again for 15 seconds. Open the sealable bag slightly, enough for the end of the PID probe tip to enter the bag and insert the tip to the middle of the headspace, avoiding contact with the soil and/or potential moisture from condensation in the sealable bag. Watch the PID screen for the highest reading (ppm). The maximum reading should appear in less than 5 seconds. Record the maximum PID reading reached in the field notes. Record the actual PID reading, do not round the number.
- In addition to screening a soil sample, a background PID headspace reading should be established in the field. Under the same conditions as the screened soil sample (heated vehicle or building, etc.), take an empty quart-size polyethylene sealable bag, puff it up with air, and insert the probe of the PID in the same way as the soil sample. Watch the screen of the PID for the highest PID reading (ppm). Record the maximum PID reading reached in the field notes. Record the actual PID reading, do not round the number.

E.3. Cautions

PIDs provide non-specific measurement of the presence of organic compounds including the following: aromatics, ketones and aldehydes, amines and amides, chlorinated hydrocarbons, sulfur compounds, saturated and unsaturated hydrocarbons, and alcohols. The light energy in eV emitted by the PID lamp must be greater than the IE of the compound(s) of interest. However, 11.7-eV lamps should only be used when compounds with IEs over 10.6 eV are expected and are the primary contaminants. Examples include carbon tetrachloride, methylene chloride, chloroform, and 1,1,1-trichloroethane.

Consult the NIOSH Guide to Chemical Hazards for ionization energies for most common contaminants. The PID will not measure the following: radiation, air (N_2, O_2, CO_2, H_2O), natural gas (methane, ethane, propane), acid gases (HCl, HF, HNO_3), common toxics (CO, HCN, SO_2), freons, ozone, hydrogen peroxide, polychlorinated biphenyls (PCBs), or greases.

E.4. Interferences

Excessive moisture in the air or dust on the PID lamp and sensor housing can cause a false positive response on the PID. This problem can be demonstrated by a "drift" upward of the measurement or could be a sharp response to inserting the probe either into an empty sealable bag or into a sealable bag filled by blowing air into it. See SOP 205 – Calibration and Operation of MiniRAE PID for steps to take to resolve this.

E.5. Data and Records Management

Field data should be recorded and managed in accordance with SOP 101 – Field Notes and Documentation. Documentation should include the following:

- Calibration: date and result
- Maintenance performed, if any
- Background readings: ambient air and quart-size sealable bag
- Ambient air temperature at which headspace screened
- Sample identification information per sample method SOP
- General observations: condensed moisture in the bag, unusual odors associated with the soil sample and/or ambient air

E.6. Quality Assurance/Quality Control

Field personnel should check the PID maintenance log before beginning each new job to make sure that scheduled maintenance is current. Erratic PID responses in the field should be evaluated, and field maintenance performed or the PID should be replaced. The PID should be calibrated daily in the field.

Ambient air quality at the work site should be checked and recorded, as should a headspace sample of an empty sealable bag. All quality assurance (QA) checks should be documented in the field logbook.

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

F. References

Minnesota Pollution Control Agency, Soil Sample Collection and Analysis Procedures, Field Screening Procedures. Guidance Document 4-04, c-prp4-04. Petroleum Remediation Program, Minnesota Pollution Control Agency; St. Paul, MN, September 2008.

NIOSH, Pocket Guide to Chemical Hazards, NIOSH Publications; Cincinnati, OH, September 2007.

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to describe procedures to be used to conduct and document soil boring observations and sampling either from a direct-push probe or drill rig.

B. Health and Safety

Field work should be performed in accordance with the Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures and the site-specific health and safety plan (HASP).

In addition to potential exposure to hazardous materials, observing drilling of soil borings presents safety risks due to working near drilling equipment.

One of the biggest risks during probe sampling is the use of utility knives to cut open the plastic sleeves that hold soil collected by the probe. Instruct the probe operator to cut the sleeves open. Do not cut the sleeves open yourself.

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 201 – Classification of Soil
- SOP 202 – Organic Vapor Screening
- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 311 – Groundwater Sample Collection
- SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe
- SOP 702 – Management of Investigation Derived Waste

D. Equipment and Supplies

- Soil Boring Log form (see Attachment A)
- Global Positioning System (GPS) unit or measuring tape
- Photoionization detector (PID) with appropriate lamp (see SOP 202 – Organic Vapor Soil Screening)
- Soil sampling equipment (see SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Groundwater sampling equipment (see SOP 311 – Groundwater Sample Collection)
- Soil vapor sampling equipment (see SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe)
- Waterproof and/or indelible ink pens
- Cell phone camera or digital camera
- Personal Protective Equipment (PPE)
- 55-gallon drum, if necessary

E. Procedure

E.1. Underground Utility Locates

Perform underground utility clearance in accordance with the Braun Intertec Corporate Utility Clearance Process.

Ensure that utilities are marked and the soil borings are located a safe distance from any buried utility.

E.2. Boring Location and Numbering

A day or two before the field work, review the written scope of work with the project manager. The scope should define the boring numbering scheme, boring locations, depths, sample intervals, and types of samples to be collected. Make sure that all required field equipment is prepared and in good working condition.

If required, determine the appropriate place to dispose of cuttings or provide an appropriate container per SOP 702 – Management of Investigation Derived Waste. If necessary, ensure that steel drums are provided to collect either the soil cuttings or excess removed groundwater.

During many projects, boring locations will be marked by Braun Intertec personnel, such as the CAD Staker, before the field event begins. In other cases, the responsibility to identify boring locations is left to field personnel on the day of the event. In either case once on site, identify the boring locations with the driller (or drilling subcontractor). Ensure that utilities are marked and that all proposed soil borings are located a safe distance from any buried utility. Review planned sampling procedures to ensure they meet the scope of work. In particular, review sample intervals and water sampling depths, if appropriate.

If the marked boring location must be changed, it is critical that the new location is clear of underground utilities. In some cases, utility marking does not apply to new locations and the work cannot proceed until new locations have been cleared. Use a measuring tape or GPS unit to document soil boring locations relative to the original marked location. This also may be necessary if a boring location must be modified due to refusal or if additional borings are advanced based on field observations (i.e., step out borings). If boring locations were not previously located with a GPS unit, make arrangements for proper location either on the day of the event or later.

E.3. Drilling

The driller or probe operator will collect soil samples from the sample intervals and provide the samples to the field personnel. It is the responsibility of the driller or probe operator to decontaminate the sampler and reusable sampling equipment to minimize cross-contamination using a brush in a detergent and water wash, followed by a clean water rinse between intervals.

Field personnel are responsible for making field observations of the soil, screening soil samples for volatile organic vapors, and collecting soil or water samples both for laboratory analysis and geotechnical classification by a Braun Intertec Geotechnical Engineer.

E.4. Soil Description

Note the surface composition (e.g., concrete, asphalt, grass, etc.). Indicate the material at the surface of the borehole (e.g., concrete, asphalt, grass, gravel) and the thickness of this material in inches in the top section of the soil boring log form.

The driller will bring the sampler to the surface and open it at the request of field personnel. Record the length of sample recovered in inches. Describe the soil type, color, stratification, and conditions of the soil samples recovered (see SOP 201 – Classification of Soil).

E.5. Soil Screening

Don new disposable gloves. Collect a small sample of the soil from each two-foot interval (or less) for organic vapor screening in the field using a photoionization detector (PID) (SOP 202 – Organic Vapor Soil Screening). Record the results of the vapor screening in the PID column of the soil boring log form.

E.6. Soil Sampling

Collect soil samples for chemical analysis in the field as soon as possible after retrieval. To collect soil samples for chemical analyses as specified in the project-specific work plan or Sampling and Analysis Plan, refer to SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection.

As samples are collected for laboratory analysis, note the sample name, sample depth, time collected, and analytical test(s) in the analytical samples column and the remarks column of the boring log form. For example:

- GP-1 (8-10') @ 10:15 – DRO, GRO and VOCs
- ST-3 (2-4') @ 10:45 – RCRA Metals

E.7. Groundwater Sampling

Groundwater Sampling from a Borehole Advanced by a Drill Rig

The drilling operator will advance the auger to the specified depth and prepare for groundwater collection. The operator may use one of the two following methods:

- In the case of shallow groundwater and a fairly competent soil formation, the operator advances the auger to the desired depth for groundwater sampling. All drilling equipment is removed from the borehole. Groundwater samples are collected from inside the open borehole.
- In the case of a less competent soil formation, the operator advances the auger to the desired depth for groundwater sampling. A length of PVC pipe with a five- or ten-foot screened portion on the bottom is extended down the open borehole. All drilling equipment is removed from the borehole. After an appropriate period of time, groundwater samples are collected from inside the screened portion of the PVC pipe.

Groundwater Sampling from a Probe Borehole

The sampling probe operator will advance the probe to the depth you specify and prepare the sampler for groundwater collection. The operator may use one of the two following methods:

- In the case of shallow groundwater and a fairly competent soil formation, the sampling probe is advanced to the desired depth for groundwater sampling. All sampling probe equipment is removed from the probe hole. A length of PVC pipe with a five- or ten-foot screened portion on the bottom is extended down the open hole. Groundwater samples are collected from the screened portion of the PVC pipe.
- In some cases the operator advances a special sampling probe to the desired depth for groundwater sampling. The tip of the probe will be an "expendable point" which is snugly attached to the probe. Inside the probe is a stainless steel screen section. The sampling probe is pulled up, releasing the expendable point and exposing the screen. Groundwater samples are collected from the screened portion of the stainless steel screen.

Groundwater Sample Collection

Refer to SOP 311 – Groundwater Sample Collection for procedures for collecting groundwater samples.

As samples are collected for laboratory analysis, note the boring identifier, time collected, and analytical test(s) in the analytical samples column and the remarks column of the boring log form.

E.8. Soil Vapor Sampling

Refer to SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe for details on collecting the soil vapor sample.

As samples are collected for laboratory analysis, note the boring identifier, time collected, and analytical test in the Remarks section of the Soil Boring Log.

E.9. Geotechnical Logs

To ensure consistent logs across Braun Intertec disciplines, samples of soil cores will be collected and classified by a Braun Intertec Geotechnical Engineer. The Geotechnical Engineer's log is a supplement to the field log and is not meant to be a replacement for the field log.

Place one or more representative portions of each interval into sealable moisture-proof containers (e.g., resealable bags) without ramming or distorting any apparent stratification. Seal the container to prevent evaporation of soil moisture.

Label the containers indicating job designation/project number, boring number, and sample depth. If there is a soil change within the interval, collect a soil sample for each stratum and note their depths.

Deliver the samples to a Braun Intertec soil classification lab. Include a copy of the soil boring log form.

E.10. Documentation

Logs of borings are required in investigation reports. Use the Soil Boring Log form (Attachment A). Descriptions of soil samples collected in the field are described in SOP 201 – Classification of Soil.

Photographs will be taken of the boring location in accordance with SOP 101 – Field Notes and Documentation. A photographic log should be included with the field notes. If there is something specific field personnel would like the viewer to note, be sure it is specified in the description.

E.11. Backfilling/Restoration

The boring will be backfilled with bentonite grout or reused soil cuttings, if appropriate, as allowed or required by the well code.

E.12. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.13. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

BRAUN INTERTEC

Soil Boring Log

Project Number:		Latitude:	.	Boring ID:	☐
Project Name:		Longitude:	.	Personnel:	
Project Location:		Elevation:		Weather:	

Drill Company:		Sample Method:		Total Depth (ft):	
Drill Rig ID:		Surface Cover:		Refusal Depth (ft):	
Drill Method:		Surface Thickness:		☐ Permanent well installed.	

Drilling	Date & Time
Start:	
Finish:	
Backfill:	
☐ Cuttings ☐ Chips ☐ Grout	

Groundwater	Depth (ft)	Date & Time
While Drilling:		
End of Drilling:		
Temporary Well:		
Well Recheck:		

Temporary Well & GW Sampling	
Material & Size:	
Screen Top (ft):	
Screen Bottom (ft):	
☐ Check Ball ☐ Bailer ☐ Pump	

Depth (ft)	Recovery (in)	PID (ppm)	**Description** Soil group name, USCS symbol, grain size (f/m/c), amt. of gravel/sand/fines, inclusions, debris, color, moisture (d/m/w), consistency, staining, odor, structure, plasticity, geologic interpretation (fill/native/etc.)	Water & Well	Analytical Samples	**Remarks** Sample ID, times, analyses; odors, debris (%), staining; temp well details, etc.

BRAUN INTERTEC

Soil Boring Log

Project Number: _____ Boring ID: _____

Depth (ft)	Recovery (in)	PID (ppm)	**Description** Soil group name, USCS symbol, grain size (f/m/c), amt. of gravel/sand/fines, inclusions, debris, color, moisture (d/m/w), consistency, staining, odor, structure, plasticity, geologic interpretation (fill/native/etc.)	Water & Well	Analytical Samples	**Remarks** Sample ID, times, analyses; odors, debris (%), staining; temp well details, etc.

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to provide the procedure to calibrate a MiniRAE 3000 or MiniRAE Lite Photoionization Detector (PID). Proper calibration of the PID will help produce consistent and defensible field measurements. In addition, this SOP describes procedures to identify and address simple issues related to dust accumulation on the lamp and internal housing.

B. Health and Safety

The use of the MiniRAE 3000 or MiniRAE Lite PID should be in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 202 – Organic Vapor Soil Screening

D. Equipment and Supplies

- MiniRAE 3000 or MiniRAE Lite PID with appropriate lamp
- Clean moisture filter
- Isobutylene span gas (100 parts per million [ppm])
- Regulator
- Polyethylene tubing with T-connection
- Bound Calibration Record (in PID case)
- Isopropanol cleaner and Q-tips
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens

E. Procedure

E.1. Prior to Leaving Office

Prior to leaving the office, ensure that the PID has power and the span gas canister is full.

Attach the regulator to the 100 ppm isobutylene span gas. The regulator has a gauge on it to show how much span gas remains in the canister. The gauge should show more than 100 pounds per square inch (PSI) of gas. If not, replace the canister with a new one.

E.2. To Turn On

Check the probe tip for dirt or other obstructions. Clean as necessary.

Check the moisture filter for visible dirt. Replace as necessary.

Screw the probe tip and filter assembly onto the PID.

There are three buttons on the screen face of the PID:

- MODE (Φ)
- **Y/+**
- **N/-**

There is one button on the body of the instrument:

- LIGHT

Press and hold the center MODE button for a few seconds, then release. The screen will flash through a series of screens. Screens will display:

RAE
SYSTEMS

PGM-7320
VOL 01.01

MINIRAE 3000
SN 952-001736

Self test….

Test Passed!

Ready…Start Sampling?

Press the **Y/+** key.

An audible whirring sound will begin, which is the air pump inside the PID.

Note: If the screen displays "Lamp" alarm, the internal lamp has failed to light. Wait for several minutes until it lights. If the "Lamp" display remains, turn off the PID, and retry turning on the instrument.

E.3. To Calibrate

Press and hold the MODE (Φ) and **N/-** buttons at the same time for approximately two (2) seconds. The screen will display:

ENTER PASSWORD _____

Do not enter a password. Press MODE (Φ), or enter, again. The screen will give the options of:

CALIBRATION
ZERO CALIB (highlighted)
SPAN CALIB

Press the **Y/+** key to select Zero Calibration. Be sure the PID is in "zero" (i.e., fresh) air.

Press the **Y/+** key again to start the zero air calibration. Zeroing starts a 30 second countdown. When complete the screen says:

Zeroing Is Done!
Reading = 0.0 PPM

Then the screen will give the options of:

Calibration
Zero Calib
Span Calib (highlighted)

Press **Y/+** to select Span Calibration. The screen will display:

C. Gas = Isobutylene
Span = 100 ppm
Please apply Gas 1

Attach the regulator to the 100 ppm isobutylene span gas. The regulator has gauge on it to show how much span gas remains in the canister. The gauge should show more than 50 PSI gas. If not, do not use it because the calibration may not work, replace the canister with a new one. Attach one end of the polyethylene tubing to the top of the regulator. Tubing should have a T-joint on it to provide span gas at atmospheric pressure during calibration. Attach the other end of the tubing to the PID probe. Push in and twist the control button on the regulator until the gas can be heard escaping the canister.

As soon as the tubing is in place, the PID may begin a 30 second countdown. Press "start" if the countdown does not begin automatically. After 30 seconds the screen will display:

Span 1 is done
Reading ___.___ppm.

Turn off the span gas by pressing and twisting the control button on the regulator until the gas does not escape from the canister any longer.

Wait for the reading to drop as fresh air enters the tubing. If the reading does not drop below 1.0 ppm, repeat the calibration. If it does drop below 1.0 ppm, record the lowest number displayed as the Ambient Air Reading in the Calibration Log. Turn the span gas back on and wait for the reading to stabilize. If the reading is not within ±5 ppm of 100 ppm, repeat the calibration. If the reading is within ±5 ppm of 100 ppm, turn off the gas and record the number displayed as the Span Gas Reading on the Calibration Log.

Release the tubing from the PID probe and regulator. Unscrew the regulator from span gas canister.

Complete the calibration information in the bound Calibration Record. Also note in field notes that the calibration was completed.

If the calibration does not complete normally, or if the instrument will not produce the expected readings during the calibration verification, note the failure and attempted remedy on the Calibration Record. After attempting a remedy, repeat the calibration. If the calibration does not produce the expected result contact the office to obtain instructions for other potential remedies or to obtain a replacement PID. Do not use a PID that does not calibrate properly.

E.4. To Turn Off

Press and hold the MODE (Φ) button. The instrument will count down for 5 seconds. The lights and/or alarm may flash and sound during the countdown. Release the MODE (Φ) button when the screen displays:

UNIT OFF!

E.5. Interference and Cleaning

Excessive moisture in the air can cause dust on the PID lamp and sensor housing to produce a false positive response on the PID due to current leakage across the electrodes. This problem can be demonstrated either by a "drift" upward of the measurement or a sharp response to inserting the probe either into an empty sealable bag or into a sealable bag filled by blowing air into it. Dust on the lamp and sensor is the primary reason for these responses. The sensor has two electrodes. With clean dry air and sensor components, no current can leak across the air space between the two electrodes. However, even microscopic dirt accumulations on the electrodes and Teflon parts can promote leakage. A sensor may appear to be clean, but may be dirty enough to cause current leakage.

If field personnel are observing false positive responses with the PID, they must perform a humidity response test. The humidity response test includes exhaling gently into an empty sealable bag and then inserting the probe tip into the bag. The PID should show little to no response from this test. If the PID reads more than 5 ppm, the lamp and sensor may need cleaning. Record the results of the humidity response test in the field logbook.

Take the following steps to attempt to resolve the high ambient PID readings. After each step, repeat the humidity response test. If the humidity response test passes (i.e., < 5 ppm reading), record the action in the field notes and proceed with using the PID. If the humidity response test does not pass, proceed to the next step:

- Replace or temporarily remove the moisture filter – The case should have a spare moisture filter. Discard the used filter and connect the new filter to the probe tip.
- Clean the PID lamp and sensor.

    1. Unscrew the large silver sensor cover from the front of the PID. Be careful, in some cases, the white-plastic sensor detector or lamp inside the cover may be loose. Take care not to drop them.
    2. Carefully remove the white plastic sensor detector from the PID housing. It may be necessary to hold the edges of the sensor detector and use a gentle rocking motion to remove it.

    Note: Never touch the lamp surface or the gold-colored sensors with your fingers.

    3. Dip a clean cotton swab into the isopropanol cleaner. Gently swab the flat surface of the lamp and the gold-colored electrodes on the back of the sensor detector.
    4. Let the cleaner evaporate from the components in the air for about five minutes.

5. Replace the sensor detector and screw the cover back onto the PID. Re-connect the probe.
6. Allow the PID to run several minutes until the ambient reading returns to 0.

- Stop using the PID and obtain a different PID to complete the work. The PID must be professionally serviced.

E.6. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.7. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

F. References

Addressing PID Instruments Moisture Sensitivity: Humidity Effect on PID Instruments, Technical Note TN-163, RAE Systems by Honeywell; San Jose, CA, February 2014.

A. Purpose

The purpose of the water level measurements Standard Operating Procedure (SOP) is to provide a description of the methods used to measure water levels in piezometers, monitoring, and recovery wells.

A.1. Summary of Method

Collection of water level measurements consists of decontaminating the water level measuring equipment, testing the equipment, lowering the water level probe into the well until a response is noted, verifying results, and finally recording the results in a field logbook or field report form. See SOP 701 – Decontamination of Sampling Equipment for proper decontamination procedures.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

The collection of water level measurements can pose a hazard to human health unless appropriate precautions are taken. Potential hazards include, but are not limited to:

- Exposure to contaminants present in the fluid being measured.
- Exposure to decontamination solutions.
- Exposure to hazardous substances being removed as part of the decontamination procedure.
- Hand injuries associated with sharp edges and pinch points on wells and associated well piping and covers.

Proper personal protective equipment (PPE) should be selected based on the physical and chemical characteristic of the contaminant and decontamination solutions used.

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 302 – LNAPL Level Measurement
- SOP 701 – Decontamination of Sampling Equipment

D. Equipment and Supplies

- Hand tools (such as wrenches or sockets for at grade wells)
- Electronic water lever indicator
- Well keys, if necessary
- Water level monitoring record form (Attachment A)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Cell phone camera or digital camera
- Decontamination equipment (see SOP 701 – Decontamination of Sampling Equipment)
- PPE

E. Procedure

The following procedures are to be used, in the order listed, when collecting water level measurements:

- Prior to mobilizing to the site, turn on water level indicator and immerse the end of the water level indicator (i.e., water level probe) in a glass of tap water to check probe batteries. Note the instrument response as the probe contacts the water. If no response occurs, replace the batteries and try again or use an alternate piece of equipment if available.
- Once on-site, don appropriate PPE as prescribed by the HASP.
- Decontaminate the probe and entire cable length in accordance with SOP 701 – Decontamination of Sampling Equipment. Unless stated otherwise in the work plan, proceed from the wells least likely to be contaminated to those closest to the source area. Do not use the water level indicator in wells that are suspected to have, or have documented, free product. Use a product probe if light non-aqueous phase liquid (LNAPL) or free product is known or suspect. See SOP 302 – LNAPL Level Measurement.
- Lower the probe into the well by pulling the cable from the hand-held reel until the light comes on or the buzzer sounds.
- Move the cable up and down fractionally while looking/listening for a response from the probe. Note the exact length of cable to the 100th of a foot extended from the tip of the probe to the notch or highest point (or north side) of the well casing when the probe begins to be audible or light is visible. Record the cable length, well number, and time and date of the measurement in the field notes or water level record. The water level measurement should be repeated a second time. If the two measurements are different, repeat as necessary until results are consistent.

E.1. Cautions

Failure to follow proper water level measurement and/or decontamination procedures may result in the following:

- Cross-contamination between sampling points and/or sites. Cross-contamination would invalidate results, introduce new contaminants to an environment, or impact a previously unaffected sampling location.
- Decreased equipment performance due to foreign objects or incompatible materials on equipment surfaces or corrosion due to acidic environments.

E.2. Interferences

Factors that may interfere with water level measurement procedures include:

- The formation of ice in cold temperatures will prevent proper operation of equipment and may damage internal components of equipment when expansion occurs.
- Obstructions in the well due to down-hole equipment, defects in well piping, or other foreign objects.
- Access to the well through the well-head or access ports may limit the size of the probe that may be used.

E.3. Data and Records Management

Water level measurements should be recorded in the field form included as Attachment A in accordance with SOP 101 – Field Notes and Documentation. If water level measurements are completed in accordance with a site-specific HASP, work plan, or other related document, reference to the appropriate document should be made in the field form. Any deviations from the procedures outlined in this document or in a site-specific document should be described in detail in a field form, otherwise referencing existing procedures is sufficient. The sampler should note if there is pumping from a nearby well, dewatering, or other activity that may influence the elevation of the groundwater at the site.

E.4. Quality Assurance/Quality Control

The probe should be tested to verify proper operation of the equipment prior to its first use of the day, per the procedures outlined above. Water level measurements should be repeated as a means of verifying results, per the procedures outlined above.

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Water Level Monitoring Record

Project Name: _____ Project Number: _____

Date: _____ Field Personnel: _____ Instrument Used: _____

Well No.	Time	MP Elevation (feet)	Water Level Below MP (feet)	Water Level Elevation (feet)	Previous Water Level Below MP	Remarks

Note: For your convenience, the following abbreviations may be used.

P = Pumping I = Inaccessible D = Dedicated Pump ST = Steel Tape ES = Electric Sounder MP = Measuring Point WL = Water Level

A. Purpose

This Standard Operating Procedure (SOP) describes requirements for monitoring well development. Well development is necessary to remove any foreign materials (water, grout, mud) introduced during the drilling process. In addition, monitoring well development is used to ensure removal of fine-grained sediments from the vicinity of the well screen. This allows free flow of water from the formation into the well and reduces the turbidity of water during sampling events that may affect the quality of subsequent groundwater samples.

Note: Wells with measurable levels of light non-aqueous phase liquid (LNAPL) should not be developed unless all of the development water is contained. If LNAPL is observed in the development water, check with the project manager prior to proceeding with well development.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 301 – Water Level Measurement
- SOP 316 – Calibration of Water Meters
- SOP 701 – Decontamination of Sampling Equipment
- SOP 702 – Management of Investigation Derived Waste

D. Equipment and Supplies

Development with a Pump

- Clean submersible pump, peristaltic pump, Waterra actuator or other inertial pump
- Appropriate new tubing or tubing dedicated to the well (do not use tubing provided by a subcontractor unless it can be confirmed to meet QC requirements of the Sampling and Analysis Plan)
- Surge block

Development with a Bailer

- Disposable bailer
- New polypropylene rope or cord

All Development

- Electronic water level indicator (see SOP 301 – Water Level Measurement)
- Multiple parameter or individual parameter water quality meters for temperature, pH, specific conductance, and/or turbidity (as required by Sampling and Analysis Plan). A YSI 556 meter is common, but other meters may be used. The YSI 556 does not measure turbidity.
- Spare batteries for pump equipment or stabilization instruments
- Decontamination products (see SOP 701 – Decontamination of Sampling Equipment)
- Hand tools (such as wrenches or sockets for at grade wells or knife for cutting tubing/rope)
- Well keys (if necessary)
- Purge bucket
- Graduated cylinder or bottle with a known volume
- 55-gallon drums, if necessary

- Well Development Record (Attachment A)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Cell phone camera or digital camera
- Waterproof and/or indelible ink pens
- Personal Protective Equipment (PPE)

E. Procedure

1. Discuss with the project manager the appropriate method for developing the well. The development method may be pumping, bailing, or some combination of both methods.

2. Determine the appropriate place to discharge the water or provide an appropriate container per SOP 702 – Management of Investigation Derived Waste.

3. Calibrate and verify the accuracy of the water quality meter(s) per SOP 316 – Calibration of Water Meters.

4. Don appropriate PPE, as prescribed by the HASP.

5. Locate the desired monitoring well using a current Site Map. Note the following information in the Well Development Record (Attachment A):

   - Date
   - Time
   - Project location
   - Well identification number (common and unique)
   - Well development sequence
   - Name of field personnel
   - Development method and equipment
   - Any other field observations such as damage or evidence of tampering with the well casing, standing water, etc.

6. Remove the lock, well cover and well cap.

7. Measure the depth to the water level (DTW) from the top of the well casing to the nearest 0.01 foot using a water level indicator in accordance with SOP 301 – Water Level Measurement. Record the measurement on the Well Development Record.

8. Measure the total well depth (WD) of the well from the top of the casing using the water level indicator. Record this measurement.

9. Calculate the length of the water column (WC) in the well using the following equation:

   WD − DTW = WC (feet)

10. Calculate the well volume using the following equation:

    WC × *X* = Well Volume (gallons)

    Where *X* is the conversion factor for the volume of water in a well casing of a certain diameter per linear foot (gallons per foot) as follows:

Casing Diameter (in)	*X* (gal/ft)
2	0.16
4	0.65
6	1.5

E.1. Well Development with a Pump

1. Lower a decontaminated pump and tubing into the well so that the pump or tubing intake is approximately two or three feet above the bottom of the well, within the screened portion. Operate the pump at a fairly high flow rate during development, even if it exceeds the recharge rate (i.e., overpumping). If the well runs dry, stop, allow the well to recharge, and begin pumping again. The pumping rate used during development is commonly greater than the pumping rate that will be used during purging prior to sampling. You may want to bail water out of well until it begins to be relatively sediment free before installing the pump for well development.

2. Begin purging the monitoring well. Once the water reaches the ground surface record the start time on the data sheet. Direct the discharge to a 5-gallon bucket.

3. Record the initial pH, temperature, specific conductivity, turbidity, color, clarity and odor of an aliquot of pumped water on the Well Development Record. If available, measure the turbidity with a meter.

4. Adjust the pumping rate to provide sufficient yield from the screened interval. As the 5-gallon bucket fills with water, discharge or containerize the water as appropriate.

5. Use a graduated cylinder or bottle with a known volume to calculate the discharge rate. This can be done by timing how long it takes to fill a 1,000-mL sample container in seconds. Calculate the discharge rate using the following equation:

$$\frac{1{,}000\ \text{mL}}{\_\_\_\_\ \text{s}} \times \frac{1\ \text{L}}{1{,}000\ \text{mL}} \times \frac{60\ \text{s}}{1\ \text{min}} = \_\_\_\_\ \text{LPM (Liters per minute)}$$

    The discharge rate in LPM can be converted to gallons per minute (GPM) using the following equation:

$$\_\_\_\_\ \text{LPM} \times \frac{1\ \text{gal}}{3.8\ \text{L}} = \_\_\_\_\ \text{GPM (gallons per minute)}$$

    The discharge rate can be used to calculate the time required to remove one well volume from the well in minutes or second.

$$\frac{\_\_\_\_\ \text{Well Volume (gallons)}}{\_\_\_\_\ \text{GPM}} = \_\_\_\_\ \text{min per well volume}$$

$$\_\_\_\_\ \text{min per well volume} \times \frac{60\ \text{s}}{1\ \text{min}} = \_\_\_\_\ \text{s per well volume}$$

6. If the well cannot be overpumped, development should include surging by raising and lowering the pump through the water column or by removing the pump and raising and lowering a surge block through the water column. Surging, which creates two directional flow in and out of the well, prevents sand bridging in the sand pack, which would allow finer particles to enter the well. Please note that wells installed in fine grain geologic units (clay, silt) should be minimally surged during development as vigorous well development in fine grain units can actually increase the turbidity of the well.

7. For fast recharging wells, 10 well volumes of water should be removed at a minimum from the well during development. For slow recharging wells, the well should be pumped dry at least 3 times. Remove water until a clear and sediment-free discharge is obtained and the measured turbidity is less than 10 NTUs.

   Note that in fine grain geologic units it may not be possible to get the discharge to have a turbidity lower than 10 NTUs.

8. Record the total volume of water removed from the well in the Well Development Record.

9. For slow recharging wells, remove water until the well is dry. Allow the well to recharge at least 30 minutes and then pump the well dry again. Record the total amount of water removed from the well in the Well Development Record.

10. Decontaminate all equipment before proceeding to the next well or at the end of the day in accordance with SOP 701 – Decontamination of Sampling Equipment.

11. Following development, allow the well to equilibrate for at least three days before sampling.

E.2. Well Development with a Bailer

1. Lower the bailer into the water column, allow it to fill, and then raise it out of the well. Raise the bailer out of the well by grasping a section of cord using each hand alternately. This bailer lift method is used so that bailer rope will not come into contact with the ground or other potentially contaminated surfaces.

2. Pour water from the bailer into a small water container and pour the remainder into a 5-gallon bucket. Measure the initial pH, temperature, and specific conductivity of the water in the small container and record this data in the Field Report Form, field logbook or Well Development Record. Also note the odor, color, and turbidity of the water. If available, measure the turbidity with a meter.

3. Periods of removing water from the well should be alternated with periods of gentle surging by allowing the bailer to fill and then lifting and lowering the bailer through the water column. Surging prevents sand bridging in the sand pack, which would allow finer particles to enter the well. Note that wells installed in fine grain geologic units (clay, silt) should be minimally surged during development as vigorous well development in fine grain units can actually increase the turbidity of the well.

4. Collect the development water in a 5-gallon bucket to measure the amount of water that has been removed from the well. When full or finished, development water will then be directed away from the well or it will be containerized.

   For fast recharging wells, 10 well volumes of water should be removed at a minimum from the well during development. For slow recharging wells, the well should be pumped dry at least 3 times. If a pump is going to be used after the surging with the bailer you can stop bailing after the water begins to be relatively sediment free and finish the development using the pump. Remove water until a clear and sediment-free discharge is obtained, the measured turbidity is less than 10 NTUs, and three consecutive rounds of field measurements stabilize or sufficient well volumes have been removed. Stabilized readings fall within the following ranges:

Parameter	Criteria
Conductance	± 5%
pH	± 0.1 pH unit
Temperature	± 0.1°C

   Note that in fine grain geologic units it may not be possible to get the discharge to have a turbidity lower than 10 NTUs. Record the amount of water removed from the well in the Well Development Record.

5. For slow recharging wells, remove water until the well is dry (i.e., a bailer returns less than 1/2 full). Allow the well to recharge at least 30 minutes and then bail the well dry again. Record the total amount of water removed from the well in the Field Report Form, field logbook or the Well Development Record.

6. Measure the final pH, temperature, and specific conductivity of the water and record in the Field Report Form, field logbook, or Well Development Record. Also note the odor, color, and turbidity of the water. If available, measure the turbidity with a meter.

7. Decontaminate all equipment before proceeding to the next well or at the end of the day in accordance with SOP 701 – Decontamination of Sampling Equipment.

8. Following development, allow the well to equilibrate for at least three days before sampling.

E.3. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.4. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the Sampling and Analysis Plan should be followed.

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Well Development Record

Project Name/Location:						Date:		Well ID:	
Project Number:						Field Personnel:			
Depth to Water, ft. (DTW):			Well Depth, ft. (WD):			Casing Diameter, in.:			
Water Column (WC), ft (WD - DTW):			X (casing conversion), gal/ft: *2" = 0.16 4" = 0.65 6" = 1.5*						
Well Volume, gal: WC x X =									
Development Equipment Used:						Pump Intake, ft:			
Start Time, hrs:			Water Quality Meter Used:			Calibrated Today? Y N			
	Time	Depth to Water (ft)	Pump Rate* (gpm)	Volume Pumped (gal)	Temp (°C)	pH	Spec. Cond. ( )	Turbidity (NTU)	Other (color, odor, sheen)
0				0					
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
* Pump Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes)									
Stabilization Criteria					± 0.1° C	± 0.1 unit	± 5%	<10 NTU OR ±5%	
Calculated Criteria									
Stop Time:									
Duration, min:			Purged Dry?			Y N			
Total Volume Purged (gal):			No. of Well Volumes Purged = Total Volume Purged / Well Volume =						
Notes:									

Well development criteria: Continue development until a turbidity reading of 10 NTUs or less. If the turbidity reading cannot be reached the temperature, pH, specific conductance must meet the Stabilization Criteria, and, if available, the change in turbidity must be less than ±5%. Slow recharging wells should be purged dry 3 times.

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to describe procedures for documenting permanent monitoring well and piezometer installation. Installation of permanent wells or piezometers allows direct comparison of water levels, light non-aqueous phase liquid (LNAPL) thickness, and water quality at the same location and depth over time.

Licensed Braun Intertec drillers or subcontracted drillers will perform the physical installation of wells and piezometers. In either case, field personnel must ensure that wells and piezometers are installed per site-specific work plans or Sampling and Analysis Plans. The specific drilling, sampling, and installation methodology will be determined prior to installation by reviewing the geologic characteristics of the site, the types of contaminants to be monitored, and local and state regulations. Specific project requirements described in applicable work plans take precedence over any general procedures described here.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

In addition to potential exposure to hazardous materials, observing the installation of wells and piezometers presents safety risks due to working near drilling equipment.

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 201 – Classification of Soil
- SOP 202 – Organic Vapor Soil Screening
- SOP 203 – Soil Boring Observation and Sampling
- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 303 – Monitoring Well Development
- SOP 701 – Decontamination of Sampling Equipment
- SOP 702 – Management of Investigation Derived Waste

D. Equipment and Supplies

- Monitoring Well/Piezometer Data Sheet (Above Grade) (see Attachment A)
- Monitoring Well/Piezometer Data Sheet (At Grade) (see Attachment B)
- Global Positioning System (GPS) unit or measuring tape
- Photoionization detector (PID) with appropriate lamp (see SOP 202 – Organic Vapor Soil Screening)
- Soil sampling equipment (see SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection)
- Soil Boring Log form (see SOP 203 – Soil Boring Observation and Sampling)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Cell phone camera or digital camera
- Personal Protective Equipment (PPE)
- 55-gallon drums, if necessary

E. Procedure

E.1. Disposition of Drill Cuttings, Excess Probe Soil and Removed Groundwater

Before the drilling begins, review the proper procedures for disposition of soil and groundwater in accordance with the work plan and SOP 702 – Management of Investigation Derived Waste. If necessary, ensure that steel drums are provided to contain soil cuttings and/or excess removed groundwater.

E.2. Underground Utility Locates

Perform underground utility clearance in accordance with the Braun Intertec Corporate Utility Clearance Process.

Ensure that utilities are marked and the monitoring well/piezometer is located a safe distance from any buried utility.

According to the Minnesota well code (confirm for your State), monitoring wells should be installed at least 10 feet horizontally from known underground utilities and 10 feet or more from all overhead power lines including high tower lines. Note: the ten feet separation from overhead power lines is measured from the outermost power line, not from the support pole.

E.3. Monitoring Well/Piezometer Location and Numbering

A day or two before the field work, review the applicable work plan with the project manager. The scope should define the drilling method, anticipated lithology, well construction materials and well screen slotting, type of filter pack and grout materials, monitoring well/piezometer numbering scheme, monitoring well/piezometer locations, depths, sample intervals, types of samples to be collected. Make sure that all required field equipment is prepared and in good working condition, and the appropriate well construction and completion materials have been delivered to the site.

Once on site, identify the boring locations with the driller (or drilling subcontractor). Ensure that utilities are marked and the monitoring well/piezometer is located a safe distance from any buried or overhead utility.

If the marked monitoring well/piezometer location must be changed, it is critical that the new location is clear of underground utilities. In some cases, utility marking does not apply to new locations and the work cannot proceed until new locations have been cleared. Use a measuring tape or GPS unit to document monitoring well/piezometer locations relative to the original marked location. This also may be necessary if a monitoring well/piezometer location must be modified due to auger refusal. If the final location of the monitoring well/piezometer were not previously located with a GPS unit, make arrangements for proper location either on the day of the event or later. The elevation of the top of the well casing of each monitoring well/piezometer should be surveyed by a licensed surveyor to 0.01 feet.

E.4. Drilling

Acceptable drilling techniques for the installation of permanent monitoring wells include rotary, cable tool, rotasonic, hollow-stem auger, and direct-push. If unconsolidated material is encountered, it may be necessary to drive steel casing during drilling to maintain borehole integrity. If more than one water-bearing unit will be drilled though, it may be necessary to install outer casing to prevent cross-contamination between water-bearing units.

The driller or probe operator will collect soil samples from the sample intervals and provide the samples to the field personnel. It is the responsibility of the driller or probe operator to decontaminate the sampler and reusable sampling equipment to minimize cross-contamination using a brush in a detergent and water wash, followed by a clean water rinse between intervals.

Field personnel are responsible for making field observations of the soil, screening soil samples for volatile organic vapors, and collecting soil or water samples both for laboratory analysis and geotechnical classification by a Braun Intertec Geotechnical Engineer.

E.5. Soil Description

Note the surface composition (i.e., concrete, asphalt, grass, etc.) and thickness of surface cover.

The driller will bring the sampler to the surface and open it at the request of field personnel. Record the percent recovery and the length of sample recovered in feet. Describe the soil samples recovered as to soil type, color, stratification, and conditions (see SOP 201 – Classification of Soil).

E.6. Soil Screening

Don new disposable gloves. Collect a small sample of the soil from each two-foot interval (or less) for organic vapor screening in the field using a photoionization detector (PID) (SOP 202 – Organic Vapor Soil Screening). Record the results of the vapor screening on the boring log form.

E.7. Soil Sampling

Refer to SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection for collection of soil samples for chemical analyses as specified in the applicable work plan.

As samples are collected for laboratory analysis, note the sample name, including depth, time collected, and analytical test in the Remarks section of the Boring Log.

For example:

- GP-1(8-10') @ 10:15 – DRO, GRO and VOCs
- ST-3 (2-4') @ 10:45 – RCRA Metals

E.8. Geotechnical Logs

To ensure consistent logs across Braun Intertec disciplines, samples of soil cores will be collected and classified by a Braun Intertec Geotechnical Engineer. The Geotechnical Engineer's log is a supplement to the field log and is not meant to be a replacement for the field log.

Place one or more representative portions of each two-foot interval into sealable moisture-proof containers (resealable bag) without ramming or distorting any apparent stratification. Seal the bag to prevent evaporation of soil moisture.

Label the containers bearing job designation, boring number and sample depth. If there is a soil change within the interval, collect a soil sample for each stratum and note its depth.

Deliver the samples to the soil classification lab in the Bloomington office. Include a copy of the soil boring log form.

E.9. Documentation

Logs of borings are required in investigation reports. Use the Boring Log Form included with SOP 203 – Soil Boring Observation and Sampling. Descriptions of soil samples collected in the field are described in SOP 201 – Classification of Soil. Photographs shall be taken of the monitoring well/piezometer location in accordance with SOP 101 – Field Notes and Documentation.

E.10. Monitoring Well/Piezometer Installation

E.10.a. Permits

All well/piezometers shall be constructed in accordance with applicable state water well code and any local regulations. Ensure that the applicable permits and registration have been acquired.

E.10.b. Decontamination

Ensure that the drilling equipment is decontaminated before starting each borehole (see SOP 701 – Decontamination of Sampling Equipment). Furthermore, the casing and well screen will be certified clean from the manufacturer and delivered to the site in a protective wrapping.

E.10.c. Field Notes

Careful notes must be taken during monitoring well installation. The following should be recorded on the Above Grade Monitoring Well/Piezometer Data Sheet (Attachment A) or At Grade Monitoring Well/Piezometer Data Sheet (Attachment B):

- Drilling method used
- Length of screen
- Length of casing
- Diameter and total depth of borehole
- Total depth of well
- Depth of screened interval, filter pack interval, bentonite seal interval, grout interval and surface seal interval
- Type, diameter (where applicable) and quantity of materials used to construct the well including manufacturing markings on pipe, casing, and screens
- Manufacturer type and quantity used of cements, bentonite, grout or additives.
- Depth to water and measuring point (e.g., ground surface or top of well casing)
- Map showing location of the monitoring well labeled with the monitoring well number
- Any deviations from the work plan

E.10.d. Well Casing and Screen

Wells and piezometers will be screened as specified in the applicable work plan. All well screen and well casing will be new and will be of adequate structural integrity. Note that some states have specific requirements for well materials, also ensure that the materials are compatible with site-specific geochemical conditions.

A threaded end cap will be placed on the bottom of the well screen and the screen should be lowered into the open borehole in a manner that minimizes the potential for cross-contamination. The well screen and casing will be placed in the center of the borehole. Well centralizers can be used, if necessary.

For above grade wells, solid well casing in 5-foot or 10-foot lengths will be threaded onto the well screen to complete the well to a height of approximately 2 feet above the ground surface. For at grade wells, the well casing will terminate at the ground surface. A threaded or watertight cap will be placed on the top of the casing. No PVC cement, glues, or solvents should be used to fasten the well casing joints, well screen joints, or end caps as these chemicals will compromise the integrity of the well.

E.10.e. Filter Pack and Bentonite Seal

Once the well screen and casing are placed in the borehole, filter pack material will be placed in the annulus between the borehole wall and the well screen to a depth at least 2 feet above the well screen or as specified by the work plan. Submerged wells and deep wells will require that the filter be extended further above the top of the screen.

Once the filter pack material has been placed, a bentonite seal is installed above the filter pack. Bentonite chips or pellets should be used for construction of water table wells. The chips or pellets should be placed in a manner that avoids bridging and void spaces, and be hydrated with clean, potable water to create a seal. A bentonite slurry placed by the tremie method should be used for construction of wells with totally submerged well screens. The bentonite seal should be between two feet and five feet thick (deeper wells, or submerged wells require a thicker seal).

Water used to prepare grout mixtures and drilling muds and to decontaminate equipment and well materials should be obtained from a potable water source stored in a clean container. Record the specific source of any water placed inside the monitoring well/piezometer during construction in the field report form or field logbook.

Verify placement of the filter pack and bentonite seal by measuring the depth to these materials using a weighted tape. Record these measurements in the Above Grade Monitoring Well/Piezometer Data Sheet or the At Grade Monitoring Well/Piezometer Data Sheet.

E.10.f. Grout

After the bentonite seal has been placed, the remainder of the borehole annulus will be grouted with neat cement or high solids bentonite grout. The grout will be placed with a tremie pipe from the bottom of the annular space to a depth of two feet below the ground surface.

The remaining annular space will be completed to the ground surface with concrete.

E.10.g. Above Grade Well

Above grade (stuck up) wells will be completed at least two feet above grade (see Attachment A). A steel protective casing with locking cap will be installed over the well casing to a depth of at least 3 feet below the ground surface. The well casing will have a sealing cap (J-plug). The protective casing will be cemented into place with a concrete pad at the ground surface. The concrete pad will be sloped away from the well to divert surface water. Bumper posts may also be installed to protect the well depending upon the location of the well.

E.10.h. At Grade Well

At grade well completions (flush mount) are only allowed in traffic areas (i.e., roadways, driveways, sidewalks, or parking lots), unless a variance has been received (confirm the rules for at grade versus above grade wells as the rules vary from State to State). The casing must be no lower than the surrounding grade and a manhole or vault must be installed around the well. The well casing will be fitted with a locking, water-tight cap. The well casing will be contained in a protective vault with a water-tight, bolted cover. The top of the vault will be no less than 2 inches above the ground surface. The vault will be installed in a concrete pad at least 4 inches thick and 4 feet square. The concrete pad will be sloped away from the well to divert surface water and to allow traffic movement and snow plowing.

E.10.i. Development

Prior to use, the well/piezometer should be developed to restore the natural hydraulic properties of the formation that were disturbed during drilling operations (See SOP 303 – Monitoring Well Development). Well development should occur at least 48 hours after installation.

E.10.j. Well Record

Following installation, the well driller will affix a unique well tag to the protective well casing. The driller will also prepare a report of the well construction and file the official well record with the State. A copy of the report and well record should be provided to Braun Intertec.

E.11. Data and Records Management

Field observations and measurements should be documented in accordance with SOP 101 - Field Notes and Documentation.

E.12. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

MONITORING WELL / PIEZOMETER DATA SHEET

(ABOVE GRADE)

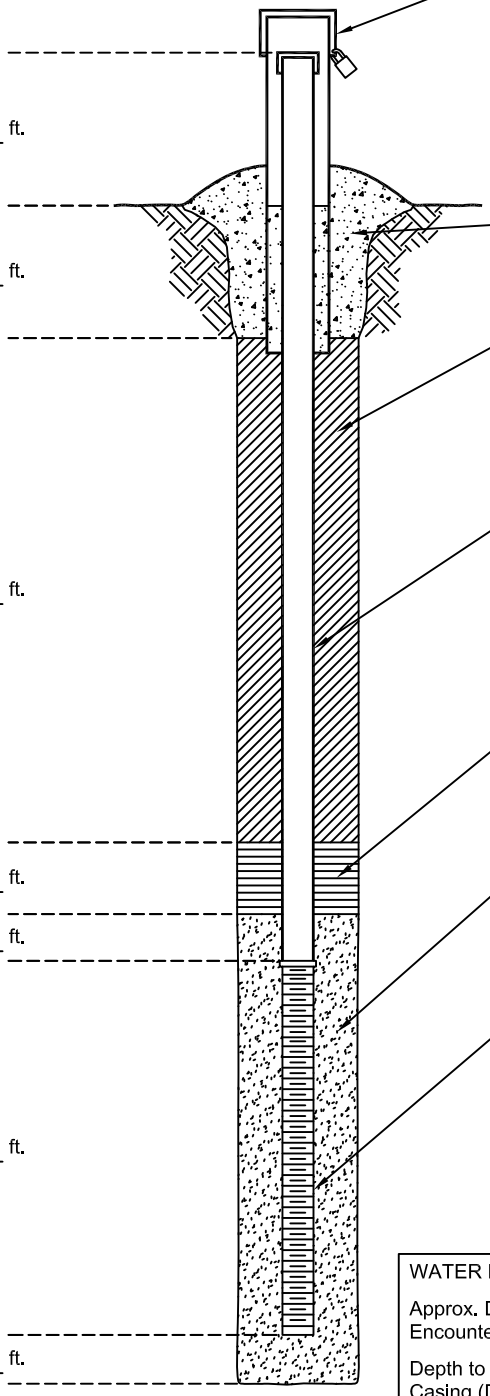
Unique Well Number _____ Boring / Well ID _____

Project Number _____ Project Name _____ Location _____

Well Location _____ Date of installation _____

Driller _____ Field Personnel _____ Weather _____

Drilling Method _____ Borehole Diameter _____



Casing Height Above Ground _____ ft.

Surface Seal Interval _____ ft. to _____ ft.

Grout Interval _____ ft. to _____ ft.

Seal Interval _____ ft. to _____ ft.

Filter Pack Above Screen _____ ft. to _____ ft.

Screen Interval _____ ft. to _____ ft.

Total Depth of Boring _____ ft.

PROTECTIVE CASING:

Type _____

Lock No. _____

BUMPER POST:

Installed Yes ☐ No ☐

SURFACE SEAL:

Concrete Surface Seal Yes ☐ No ☐

GROUT:

Type of Grout Material _____

Amount of Material Used (lb.) _____

Proportions: Bentonite _____ Cement _____

CASING:

Type _____

Diameter (in.) _____

Length bgs (ft.) _____

Cap / S-Plug Yes ☐ No ☐

SEAL:

Type of Seal Material _____

Amount of Material Used (lb.) _____

FILTER:

Type of Filter Material _____

Amount of Material Used (lb.) _____

SCREEN:

Type _____

Slot Size _____

Length (ft.) _____

Diameter (in.) _____

Cap / Plug on Bottom Yes ☐ No ☐

WATER LEVEL:

Approx. Depth to First Water Encountered During Drilling _____

Depth to Water From Top of Casing (Date / Time) _____

_____

_____

Completed By _____ Date _____ Reviewed By _____

BRAUN INTERTEC

MONITORING WELL / PIEZOMETER DATA SHEET

(AT GRADE)

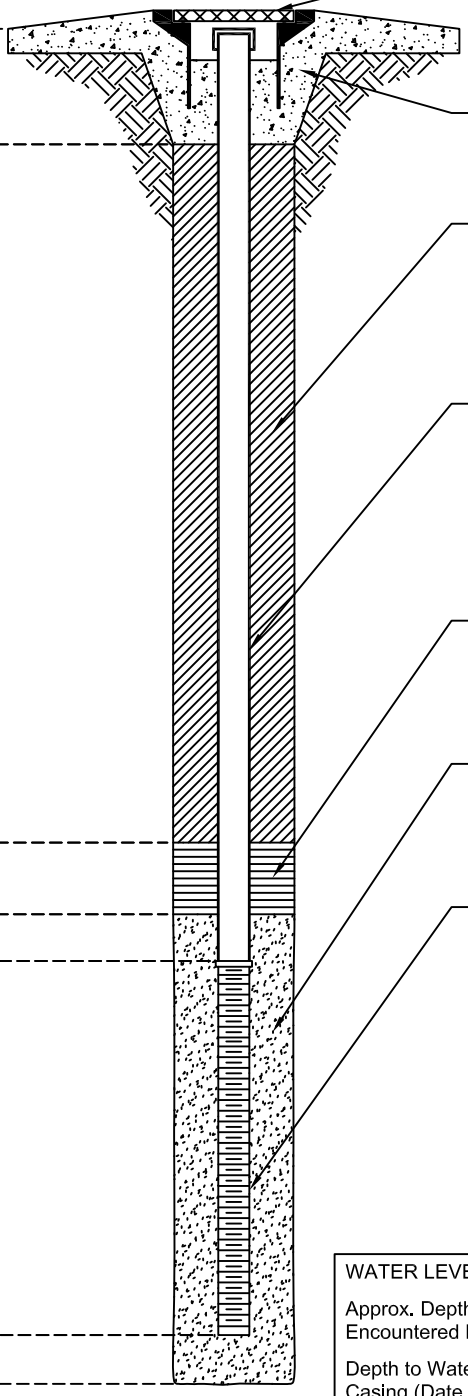
Unique Well Number _____ Boring / Well ID _____

Project Number _____ Project Name _____ Location _____

Well Location _____ Date of installation _____

Driller _____ Field Personnel _____ Weather _____

Drilling Method _____ Borehole Diameter _____



Surface Seal Interval _____ ft. to _____ ft.

Grout Interval _____ ft. to _____ ft.

Seal Interval _____ ft. to _____ ft.

Filter Pack Above Screen _____ ft. to _____ ft.

Screen Interval _____ ft. to _____ ft.

Total Depth of Boring _____ ft.

PROTECTIVE COVER:
Description _____
Lock No. _____

SURFACE SEAL:
Concrete Surface Seal Yes ☐ No ☐

GROUT:
Type of Grout Material _____
Amount of Material Used (lb.) _____
Proportions: Bentonite _____ Cement _____

CASING:
Type _____
Diameter (in.) _____
Length bgs (ft.) _____
Cap / S-Plug Yes ☐ No ☐

SEAL:
Type of Seal Material _____
Amount of Material Used (lb.) _____

FILTER:
Type of Filter Material _____
Amount of Material Used (lb.) _____

SCREEN:
Type _____
Slot Size _____
Length (ft.) _____
Diameter (in.) _____
Cap / Plug on Bottom Yes ☐ No ☐

WATER LEVEL:
Approx. Depth to First Water Encountered During Drilling _____
Depth to Water From Top of Casing (Date / Time) _____

Completed By _____ Date _____ Reviewed By _____

A. Purpose

This Standard Operating Procedure (SOP) provides guidelines for collection of groundwater samples for laboratory analytical testing. Groundwater samples can be collected from temporary wells (e.g., polyvinyl-chloride [PVC] casing pipe and screen installed in a soil boring) and from permanent monitoring wells. Groundwater samples can be analyzed for the presence of organic compounds, inorganic constituents, biological parameters, and radiological parameters.

Note: Wells with measurable levels of light non-aqueous phase liquid (LNAPL) are usually not sampled. Check with the project manager prior to proceeding with sampling.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 301 – Water Level Measurement
- SOP 308 – Trip Blanks
- SOP 309 – Field Filtering of Groundwater Samples
- SOP 312 – Well Purging and Stabilization
- SOP 316 – Calibration of Water Quality Meters
- SOP 602 – Chain-of-Custody Procedures
- SOP 603 – Sample Shipping
- SOP 701 – Decontamination of Sampling Equipment

D. Equipment and Supplies

- Pumping equipment (see applicable Sampling and Analysis Plan):
  - Low-flow submersible pump with appropriate tubing,
  - Peristaltic pump with appropriate tubing (polyethylene or silicon)
  - Inertial pump (e.g., Waterra, Solinst) with foot/check valve and appropriate tubing,
  - Tubing with bottom filling check valve (hand actuated), or
  - Bottom filling disposable bailer and rope (polypropylene or cotton)
- Appropriate laboratory-supplied containers and preservatives (see applicable Sampling and Analysis Plan)
- Sample container labels
- Trip blank, if necessary (see SOP 308 – Trip Blanks)
- Temperature blanks (one per sample cooler)
- Chain-of-Custody (COC) forms (see SOP 602 – Chain-of-Custody Procedures)
- Sample coolers
- Ice
- Gallon-size plastic bag
- Electronic water lever indicator (see SOP 301 – Water Level Measurement)
- Water quality meters (if purging and stabilization required by Sampling and Analysis Plan) and purge bucket
- Spare batteries for pump equipment

- Hand tools (such as wrenches or sockets for at grade wells or knife for cutting tubing/rope)
- Well keys, if necessary
- Groundwater Monitoring Data Sheet (see Attachment A)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Cell phone camera or digital camera
- Decontamination products (see SOP 701 – Decontamination of Sampling Equipment)
- Personal Protective Equipment (PPE)

E. Procedures

E.1. Prior to Leaving for the Field

- Several days before field work is scheduled to begin, call or email the laboratory to order sample containers. It is a good idea to order extra bottles to allow for breakage, extra samples, etc. If you are unsure of the required sample volumes or proper laboratory sample containers for specific analytical parameters, ask that a written description be included with the bottle order clarifying sample container requirements.
- Before you leave for the field, be sure that you have the appropriate sample containers (including appropriate preservative) and that extra containers are included, if requested.
- **Be sure you are aware of sample volume and container requirements (discuss with analytical laboratory or project manager if unsure).**
- Place ice into each sample cooler before collecting any samples. Double-bag the ice in sealable gallon bags or sealed garbage bags to avoid potential contact of water in the cooler with sample containers.
- Place a temperature blank in each cooler and under the ice.
- If some samples will be analyzed for gasoline range organics (GRO), benzene, ethylbenzene, toluene and xylenes (BETX), or volatile organic compounds (VOCs), include a trip blank in each cooler.

E.2. Prior to Groundwater Sample Collection

- Don appropriate PPE as prescribed by the HASP.
- Sample from the least to the most contaminated well or as specified in the Sampling and Analysis Plan.
- Measure the depth to groundwater either from the top of the well casing pipe or from the ground surface. Measure the depth to groundwater to the nearest 0.01 foot using an electronic water level indicator in accordance with SOP 301 – Water Level Measurement.
- Prior to sampling the well, purging and stabilization may be required by the Sampling and Analysis Plan (see SOP 312 – Well Purging and Stabilization).

E.3. Groundwater Sample Collection

There are several ways to bring groundwater to the surface for sample collection including pumps, bailers, check valves, etc. Follow the procedure below for the appropriate sampling device.

E.3.a. Submersible Pump for Sampling

When using a submersible pump ensure that the appropriate decontamination has been completed prior to sampling and between sampling points (see SOP 701 – Decontamination of Sampling Equipment). When sampling, direct a steady stream of water into the appropriate sample container(s) at a rate specified on the applicable Sampling and Analysis Plan.

E.3.b. Peristaltic Pump for Sampling

- Insert a length of new plastic tubing inside the well. Attach the top end of the tubing to a fitting on the peristaltic pump.
- Activate the pump to draw water into the tubing and direct the stream of water into appropriate sample container(s).
- For VOCs/GRO, the water for the sample cannot pass through the peristaltic pump body. Fill the sample vials for VOCs/GRO with water that has not passed through the pump body. Manually kink the tubing to temporarily prevent water from flowing back down the tubing, remove the tubing from the sampling point and pour the water into the sample containers after removing the kink in the tubing. Alternatively, the peristaltic pump may be reversed to push water out of the tubing into the sample containers.
- Once the sample containers are filled, remove the tubing and properly dispose (temporary well) or leave in well (permanent well) for future sampling.

E.3.c. Inertial Pump (Plastic Tubing with a Bottom Check Valve) for Sampling

- Insert a length of new or dedicated plastic tubing with a clean, bottom-mounted, stainless steel or plastic check/foot valve inside the temporary or permanent well.
- Manually or mechanically oscillate the tubing up and down. The tubing will fill with water as the ball repeatedly lifts and seats.
- Once the tubing is filled, either lift the tubing out of the well and pour the water into the sample containers or fill the sample containers from the top while the tubing is being oscillated.
- Once the sample containers are filled, remove the tubing and properly dispose (temporary well) or leave in well (permanent well) for future sampling.

E.3.d. Bailer for Sampling

- Attach an appropriate length of new polypropylene or cotton rope to a bailer.
- Lower the bailer slowly into the well, allow it to fill, and then lift it out while preventing the bailer or the rope from contacting any potentially contaminated surface, such as the ground. When using a bailer to remove the groundwater sample, take care to minimize agitation or aeration of the water as this could lead to the loss of volatiles and a non-representative sample.
- For sample collection, slowly pour the contents of the bailer into the appropriate sample container(s).

E.4. Guidelines for Filling Sample Containers:

- Containerize samples by order of the volatilization potential of the desired analytes. For example, volatile organic analysis (VOA) vials should be filled first, followed by semi-volatiles.
- For VOCs/GRO samples, fill the container to the top so that a positive meniscus is formed. Allow air bubbles to rise to the surface, carefully and quickly screw the cap onto the container and finger tighten. Invert the sample and tap it gently, looking for any air bubbles. If the sample contains air bubbles, open the container to add more water. If bubbles continue to form because the preservative is reacting with the sample matrix there are two options: 1) discard the sample with preservative, rinse the vial with sample water, discard the rinse water, and fill the container with unpreserved sample water or 2) collect the water sample in a new unpreserved sample container. The sample with preservative and the rinse water from the sample vial should be discarded with the purge water. Note that the allowable sample hold time is reduced from 14 days to 7 days for unpreserved samples. For unpreserved samples, make a note on the COC stating that the VOC sample is unpreserved and notify the technical project manager.
- For sample containers with preservative, be careful not to overfill the container, since this would dilute the preservative.
- If the sample analysis requires field filtering of the groundwater (e.g., samples for dissolved metals analysis) follow SOP 309 – Field Filtering of Groundwater Samples.
- Complete an appropriate sample container label on all containers. Include the following information: sample identification number, date and time of collection, field personnel, job site location, well number, preservation, and analysis requested. Complete the information related to sample collection and containers used on the bottom of the Groundwater Monitoring Data Sheet (Attachment A).
- Place all samples on ice in a cooler.

E.5. After Groundwater Sample Collection

- If groundwater sampling equipment is re-used between sampling points, refer to SOP 701 – Decontamination of Sampling Equipment for decontamination of groundwater sampling equipment.
- Water samples collected in the field should be recorded on the COC (see SOP 602 – Chain-of-Custody Procedures). Information recorded on the COC should be identical to the information listed on the sample container label(s).
- Arrange for pick-up/drop off of groundwater samples in laboratory-provided coolers to the analytical laboratory. If shipping of groundwater samples to the analytical laboratory is required, follow SOP 603 – Sample Shipping.

E.6. Data and Records Management

Observations should be documented on the Groundwater Monitoring Data Sheet, field report form or field logbook in accordance with SOP 101 – Field Notes and Documentation.

E.7. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

BRAUN INTERTEC

Groundwater Monitoring Data Sheet

Client Name:	Project Name:	Well # or Sample ID:
Contact:	Project Number:	Date:
Weather Conditions:		Field Personnel:

Well Information

Chronology:	Key Number:	Casing Locked: Y N
Casing Diameter, in:	X (casing conversion), gal/ft: *2" = 0.16, 4" = 0.65, 6" = 1.5*	Well Material:
Depth to Water (DTW), ft:	Well Depth (WD), ft:	Tubing Material:
Water Column (WC), ft (WD - DTW):	Well Volume, gal: WC x X =	
Equipment Used:	Pump Intake Depth, ft:	Purge Start Time:
Well Purging Procedure(s): Volume Purge Low-Flow Micropurge		

Stabilization Information

Water Meter Used:	Calibrated Today? Y N

	Time	Depth to Water (ft)	Purge Rate* ( )	Volume Purged ( )	Temp (°C)	Spec. Cond. (µS/cm)	pH	ORP** (mV)	D.O.** (mg/L)	Turbidity** (NTU)
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

* Purge Rate (GPM) = Volume (ml) * 0.00026 / Time (minutes)

** If required by sampling plan

Stabilization Criteria (difference in final three well volumes or final turbidity result)	**±0.1˚C**	**±5%**	**±0.1**	**±10 mV**	**±0.5 mg/L**	**±5% if >10 NTU**
Stabilization Criteria in units (conductivity and turbidity)						
Actual differences or turbidity in final 3 well volumes						

Stabilized: Y N	Purge Rate ( ):	**Comments/Observations:**
Purge Stop Time:	Purged Dry: Y N	
Duration, min:	Final Depth to Water (ft.):	
Total Volume Purged ( ):	No. of Well Volumes Purged = Total Volume Purged / Well Volume =	

Sample Collection

Sample Date:	Color:	Odor:
Sample Time:	Phases:	Sampling Method:
Field Filtered?: Y N	Filter Method:	Parameters Filtered:

ID	**Quantity**	**Vendor**	**Sample Parameter**	**Material**	**Type**	**Volume**	**Pres.**

Duplicate Collected Here?	Y	Duplicate ID:	

A. Purpose

This Standard Operating Procedure (SOP) provides guidelines for sampling water supply wells. A pump is typically already installed in the water supply well to be sampled. If not, refer to SOP 311 – Groundwater Sample Collection for groundwater sample collection procedures. Groundwater samples can be analyzed for the presence of organic compounds, inorganic constituents, biological parameters, and radiological parameters.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 308 – Trip Blanks
- SOP 309 – Field Filtering of Groundwater Samples
- SOP 311 – Groundwater Sample Collection
- SOP 312 – Well Purging and Stabilization
- SOP 316 – Calibration of Water Meters
- SOP 602 – Chain-of-Custody Procedures
- SOP 603 – Sample Shipping
- SOP 701 – Decontamination of Sampling Equipment

D. Equipment and Supplies

- Field Report Form or field logbook (see SOP 312 – Well Purging and Stabilization)
- Personal Protective Equipment (PPE)
- Thermometer
- Filtering apparatus (if applicable)
- Appropriate sample containers and preservatives (see applicable Sampling and Analysis Plan)
- Sample container labels
- Chain-of-Custody (COC) form (see SOP 602 – Chain-of-Custody Procedures)
- Temperature blanks (one per sample cooler)
- Trip blank, if necessary (see SOP 308 – Trip Blanks)
- Sample coolers
- Ice
- Waterproof and/or indelible ink pens
- Large resealable bags (e.g., 1- or 2-gallon Ziplocs) or garbage bags
- Decontamination products (see SOP 701 – Decontamination of Sampling Equipment)
- Hand tools (such as wrenches or sockets or knife for cutting tubing)
- Spare batteries for equipment or instruments
- Paper towels
- Purge bucket and stabilization instruments, such as a water quality meter (if required by Sampling and Analysis Plan)
- Cell phone camera or digital camera
- Groundwater Monitoring Data Sheet

E. Procedures

E.1. Bottle Order and Cooler Preparation

Several days before field work is scheduled to begin, call or email the laboratory to order sample containers. It is a good idea to order extra bottles to allow for breakage, extra samples, etc. If you are unsure of the required sample volumes or proper laboratory sample containers for specific analytical parameters, ask that a written description be included with the bottle order clarifying sample container requirements.

Before you leave for the field, be sure that you have the appropriate sample containers (including appropriate preservative) and that extra containers are included, if requested. **Be sure you are aware of sample volume, hold time and container requirements (discuss with analytical laboratory or project manager if unsure).**

Place ice into each sample cooler before collecting any samples. Double-bag the ice in sealable gallon bags or sealed garbage bags to avoid potential contact of water in the cooler with sample containers.

Place a temperature blank in each cooler and under the ice. If some samples will be analyzed for gasoline range organics (GRO), benzene, ethylbenzene, toluene and xylenes (BETX), or volatile organic compounds (VOCs), include a trip blank in each cooler.

E.2. Prior to Water Supply Sample Collection

- Don appropriate PPE as prescribed by the HASP.
- If stabilization parameters are required by the work plan, calibrate the stabilization instruments according to the manufacturers' instructions (see SOP 312 – Well Purging and Stabilization).

E.3. Supply Water Sample Collection

Water supply well samples will be collected directly from a designated water tap. This tap should be as close to the well head as the plumbing system reasonably allows and prior to any water treatment systems (such as water softeners, pressure tanks, filter units or chlorinators), if possible.

- Locate the tap to be used for purging and sample collection. Inspect the tap: remove aeration or the filter if present.
- Draw a diagram of the plumbing, including the area sampled. Note the sample collection point(s).
- If a hose is used to divert purged water away from the well site, connect it to the tap.
- Place the end of hose or the tap into a graduated bucket and turn the tap on for a slow, but steady, flow that minimizes aeration or disturbance of the water to be collected. Determine the purge rate in gallons per minute and record.
- There are two criteria that may be used for determining when purging is complete depending on the requirements of the work plan: 1) temperature, or 2) stabilization parameters. Note: The purpose of purging is to obtain a groundwater sample that is representative of the formation water.

If temperature is used to determine when to collect a sample:

- Purge the water supply well, taking a temperature reading every 2 minutes.
- The temperature should change as stagnant water from the water column in the well is purged and formation water enters the system.
- When the temperature has stabilized (less than 1 degree variation) for three successive readings purging is considered complete. Record the total gallons removed.

If stabilization parameters are required:

- Prior to sample collection, record successive pH, conductivity, and temperature readings at 5-minute intervals until stabilization is achieved, as described in SOP 312 – Well Purging and Stabilization.
- Use longer time intervals if the purged volume appears to be inadequate for the well sampled.
- Once the well has been stabilized, purging is considered complete. Record the total gallons removed.

Once purging is complete:

- If a hose has been used to divert water, disconnect it from tap.
- Collect samples from the same tap used to purge the well. Follow the sampling guidelines outlined in Section E.4. below.

E.4. Guidelines for Filling Sample Containers

- Containerize samples by order of the volatilization potential of the desired analytes. For example, volatile organic analysis (VOA) vials should be filled first, followed by semi-volatiles.
- For VOCs/GRO samples, fill the container to the top so that a positive meniscus is formed. Allow air bubbles to rise to the surface, carefully and quickly screw the cap onto the container and finger tighten. Invert the sample and tap it gently, looking for any air bubbles. If the sample contains air bubbles, open the container to add more water. If bubbles continue to form because the preservative is reacting with the sample matrix, discard the sample with preservative, rinse the vial with sample water, discard the rinse water, and fill the container with unpreserved sample water. The sample with preservative and the rinse water from the sample vial should be discarded with the purge water. Note that the allowable sample hold time is reduced from 14 days to 7 days for unpreserved samples. For unpreserved samples, make a note on the COC stating that the VOC sample is unpreserved and notify the technical project manager.
- For sample containers with preservative, be careful not to overfill the container, since this would dilute the preservative.
- If the sample analysis requires field filtering of the groundwater (e.g., samples for dissolved metals analysis) follow SOP 309 – Field Filtering of Groundwater Samples.
- Complete an appropriate sample container label on all containers. Include the following information: sample identification number, date and time of collection, sampling personnel, job site location, well number, preservation, and analysis requested.
- Place all samples on ice in a cooler.

E.5. After Water Supply Sample Collection

- If supply water sampling equipment is re-used between sampling points, refer to SOP 701 – Decontamination of Sampling Equipment for decontamination of groundwater sampling equipment.
- Water samples collected in the field should be recorded in the field log (see SOP 101 – Field Notes and Documentation) and on the COC (see SOP 602 – Chain-of-Custody Procedures). Information recorded in the field log and on the COC should be identical to the information listed on the sample container label(s). Additionally, note how many water sample containers were filled for each uniquely identified water sample.
- Arrange for pick-up/drop off groundwater samples in laboratory provided coolers to the analytical laboratory. If shipping of groundwater samples to the analytical laboratory is required, follow SOP 603 – Sample Shipping.

E.6. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.7. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

A. Purpose

The purpose of the Chain-of-Custody (COC) Standard Operating Procedure (SOP) is to control environmental samples from the time they are collected until custody of the samples is accepted by the laboratory sample custodian. COC documentation serves three main purposes:

- Communicates the analytical instructions from the sampler to the analytical laboratory.
- Provides a permanent record of samples provided to the laboratory.
- Documents that samples were handled only by authorized personnel and were not available for tampering prior to analysis.

A.1. Scope and Applicability

Although few environmental samples will ever be used in criminal or civil litigation cases, most samples are collected in support of government-regulated activities. In addition, it is possible that the results of the sample analyses will be used in future litigation even if none was contemplated at the time the samples were collected. Therefore, it is important that a record of sample possession (i.e., COC) be maintained, so that control of the samples from the time of collection to the time of sample laboratory check-in can be demonstrated.

Laboratory-related sample control is described in laboratory operating and quality-control documents and is not discussed in this standard operating procedure (SOP).

This procedure should be used for control of environmental samples that include, but are not limited to those of groundwater (see SOP 311 – Groundwater Sample Collection), surface water (see SOP 314 – Surface Water Sampling), soil (see SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection), air (see SOP 402 – Indoor Air Sampling), soil vapor (see SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe and SOP 405 – Sub-Slab Soil Vapor Sampling), and waste.

A.2. Summary of Method

Environmental samples are collected using methods specified in the work plan or other SOPs. The samples are collected in sampling containers for the desired analyses, preserved as appropriate, and a label is affixed to each container specifying the project name and number, sample identification, date and time of collection, and sample collector. The information is entered onto the COC form and the desired analyses are indicated on the form, which also serves as the analytical request. Sample custody (possession) is maintained individually until the samples are delivered to the laboratory sample check-in. Transfer of custody is documented on the COC form by printed name, signature, date and time.

A.3. Personnel Qualifications and Responsibilities

The sampler is responsible for understanding, implementing and documenting activities related to this SOP during field activities. The sampler is responsible for transmitting a copy of field notes that have not been forwarded to the project manager or designee, as well as a copy of the COC form(s) immediately after sample check-in. If there is more than one sampler, the lead field sampler assumes these responsibilities.

A.4. Definitions

Chain-of-Custody Procedure: A procedure whereby a sample or set of samples is maintained under physical possession or control.

Custody: Samples and data are considered to be in your custody when:

- They are in your physical possession,
- They are in your view, after being in your physical possession,
- They are in your physical possession and then locked in a room or vehicle so that tampering cannot occur, or
- They are kept in a secured area, with access restricted to authorized personnel only.

Chain-of-Custody Form: Form used to record sample identification information, test(s) requested, result reporting instructions, and sample custody.

Sample: A portion of an environmental or source matrix that is collected and used to characterize the matrix.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

Department of Transportation (DOT), United States Postal Service (USPS), and Federal Aviation Administration (FAA) shipping/labeling regulations must be followed for shipped samples.

C. Referenced SOPs

- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 314 – Surface Water Sampling
- SOP 402 – Indoor Air Sampling
- SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe
- SOP 405 – Sub-Slab Soil Vapor Sampling

D. Equipment and Supplies

- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof or indelible ink pens
- Sample labels
- Custody seals
- Chain-of-Custody (COC) forms (see SOP 602 – Chain-of-Custody Procedure)

E. Procedure

E.1. General Guidelines

- Keep the number of people involved in collecting and handling samples and data to a minimum.
- Only personnel associated with the project should handle samples and data.
- Always document the transfer of samples and data from one person to another on the COC form.
- Always accompany samples and data with the COC form.
- Samples should be uniquely identified, legibly, in permanent ink.
- Fill out the COC form as completely as possible. The sample identification information on the sample containers must match the COC form.
- Use a separate COC form for each cooler.

E.2. Completing COC Form

The COC form should be filled out by the sampler or designee as the samples are being collected and containerized.

E.3. Securing Samples

If you cannot maintain personal possession of the samples prior to sample check-in, they may be secured. A locked vehicle is considered controlled access (i.e., secured). A cooler sitting on the tailgate of a pickup truck or under an unlocked topper, out of direct view of the custodian is not secure. An unsecured cooler in a locked hotel room is also not within controlled access as hotel staff have access to the room. In this case, the cooler could be padlocked or custody seals could be used to secure the samples or cooler.

E.4. Data and Records Management

The original COC form is maintained by the laboratory in accordance with their file retention guidance. A copy of the record should be provided to the project manager or designee with a copy of the sampling field notes by the sampler immediately after sample check-in.

E.5. Quality Assurance Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

The project manager or designee should review the COC form as soon as possible after sample check-in to verify that the information on the COC form is correct.

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to describe the procedure used for proper packaging methods and shipment of samples by overnight carrier via Chain-of-Custody (COC) procedures (see SOP 602 – Chain-of-Custody Procedures).

A.1. Scope and Applicability

If samples cannot be delivered to the laboratory in person and must be shipped, the following procedures should be used.

This procedure should be used for shipping of environmental samples that include, but are not limited to those of groundwater (see SOP 311 – Groundwater Sample Collection), surface water (see SOP 314 – Surface Water Sampling), soil (see SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection), air (see SOP 402 – Indoor Air Sampling), soil vapor (see SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe and SOP 405 – Sub-Slab Soil Vapor Sampling), and waste.

A.2. Summary of Method

Environmental samples are collected using methods specified in the work plan or other SOPs. The samples are collected in sampling containers for the desired analyses, preserved as appropriate, and a label is affixed to each container specifying the project name and number, sample identification, date and time of collection, and sample collector. The information is entered onto the COC form and the desired analyses are indicated on the record, which also serves as the analytical request. Sample custody (possession) is maintained individually until the samples are delivered to the laboratory sample check-in. Transfer of custody is documented on the COC form by printed name, signature, date, and time.

A.3. Personnel Qualifications and Responsibilities

The sampler is responsible for understanding, implementing, and documenting activities related to this SOP during field activities. The sampler is responsible for transmitting a copy of field notes that have not been forwarded to the project manager or designee, as well as a copy of the COC form(s) immediately after samples are shipped. If there is more than one sampler, the lead sampler assumes these responsibilities.

A.4. Definitions

Chain-of-Custody Procedure: A procedure whereby a sample or set of samples is maintained under physical possession or control.

Custody: Samples and data are considered to be in your custody when:

- They are in your physical possession.
- They are in your view, after being in your physical possession.
- They are in your physical possession and then locked up so that tampering cannot occur.
- They are kept in a secured area, with access restricted to authorized personnel only.

Chain-of-Custody Form: Form used to record sample identification information, test(s) requested, result reporting instructions and sample custody.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

Department of Transportation (DOT), United States Postal Service (USPS), and Federal Aviation Administration (FAA) shipping/labeling regulations must be followed for shipped samples.

C. Referenced SOPs

- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 308 – Trip Blanks
- SOP 314 – Surface Water Sampling
- SOP 402 – Indoor Air Sampling
- SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe
- SOP 405 – Sub-Slab Soil Vapor Sampling
- SOP 602 – Chain-of-Custody Procedures

D. Equipment and Supplies

- Sample coolers or similar shipping containers (solid or liquid samples)
- Sturdy cardboard boxes (steel air canister)
- Protective wrapping and packaging materials
- Ice
- Appropriate laboratory-supplied containers and preservatives (when applicable)
- Sample labels
- Temperature blanks (one per sample cooler)
- Trip blanks, if necessary (see SOP 308 – Trip Blanks)
- Gallon-size plastic bags
- Waterproof and/or indelible ink pens
- COC forms (see SOP 602 – Chain-of-Custody Procedure)
- Custody seals
- Clear packing tape
- Shipping labels for the exterior of the shipping container
- Bill of lading for selected carrier

E. Procedure

E.1. General Guidelines

- Sample containers with solids or liquids should be placed inside of sealable plastic bags to reduce the potential for cross contamination, breakage, and melted ice getting into the samples.
- The drain plug on the cooler, if present, should be taped shut from the inside and outside.
- A layer of protective material such as bubble wrap should be placed in the bottom of the cooler.

E.2. Cooler Guidelines

- If possible, place all contents of the cooler into a large plastic bag that is tied or taped shut to avoid melted ice from leaking out of the cooler during shipping.
- Sample containers should be placed upright in the cooler, and protective material such as bubble wrap should be placed around the sample containers. Do not stack glass containers or lay them on their side, as doing so increases the chance of them breaking.
- Fill the cooler no more than 50 percent with sample containers. Fill all the remaining void space in the cooler with protective material and ice to avoid breakage during transport. At least 1/3 of total cooler space should be taken up by ice. When in doubt, use more ice.
- Ice that is double bagged in sealable plastic bags should be distributed over the top of the samples.
- Additional protective material should then be added to the cooler.
- Ensure that a temperature blank bottle and trip blank (if needed) is in each cooler and included on the COC form.
- Total weight must be less than 30 pounds.

E.3. Air Canister Guidelines

- If possible, reuse the cardboard box provided by the laboratory. If not possible, use a sturdy cardboard box to contain the air canister and associated regulator.
- Include bubble wrap as necessary to reduce movement of the canister and regulator during shipment.
- Use clear packing tape to secure the box during shipment.

E.4. COC Guidelines

- The sampler should relinquish the samples by signing and indicating the date and time that the samples were relinquished to the shipper. The shipping company agent is not required to sign the COC form.
- Field personnel should retain a copy of the COC form and attach it to the field notes.
- The COC form should be placed in a sealable plastic bag and taped to the inside of the cooler lid or placed inside the cardboard box. At least one COC form should be placed in each cooler that is sent to the laboratory.

E.5. Custody Seal Guidelines

- Close the top of the cooler and rotate/shake the cooler to verify that the contents are packed so that they do not move. Add additional protective material if needed and reclose.
- Place one custody seal on the front and on the back of the cooler in such a way that the opening of the cooler will destroy the seal. If shipping air canisters, place the custody seal where the cardboard box flaps meet.
- Tape the cooler or the cardboard box shut with clear packing tape, wrapping all the way around each end. Be sure to tape over the custody seals.

E.6. Shipping Guidelines

- Samples sent by private carrier (UPS, FedEx, etc.) will be accompanied by a bill of lading or other shipping document. Shipping documentation should be saved as part of the permanent record. DOT, USPS, and FAA shipping/labeling regulations must be followed. The contents should be described on the shipping documents as "non-hazardous environmental samples" unless the samples are known to be hazardous such as methane gas samples. If hazardous, contact the laboratory for special shipping instructions. Fill out the correct shipping paperwork with the correct shipping address for the laboratory and tape to the top of the cooler or shipping box. Wrap packing tape around the entire cooler or shipping box. Retain copies of all shipment records as provided by the shipper.
- The cooler or shipping box should be shipped to "Laboratory Sample Receiving" marked "Deliver to addressee only," and the laboratory should be notified of its approximate delivery date and time.
- Deliver the cooler or have the cooler picked up by an overnight carrier that guarantees 24-hour delivery. Consideration should be given to the expected delivery date and the weather. The preferred carriers are shown below in order of preference.
  - Contract shipper such as Speedee (Minnesota only).
  - UPS through Braun Intertec Document Center or front desk (Minneapolis only).
  - UPS through retail outlet.
  - FedEx – may require an explanation stating the container is non-hazardous or the canister is not a cylinder, contains air, is non-flammable, and is not under pressure.
  - US mail – no special marking required.

E.7. Data and Records Management

The original request for COC form is maintained by the laboratory in accordance with their file retention guidance. A copy of the record should be provided to the project manager or designee with a copy of the sampling field notes by the field personnel immediately after sample check-in.

E.8. Quality Assurance Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

The project manager or designee should review the COC form as soon as possible after sample check-in to verify that the information on the COC form is correct.

A. Purpose

The purpose of the Standard Operating Procedure (SOP) is the procedure of decontaminating reusable equipment involved in soil, groundwater, and soil vapor activities. Reusable equipment must be properly decontaminated to provide chemical analysis results which are reflective of the actual concentrations present at sampling locations, and to minimize the potential for cross-contamination between sampling locations and the transfer of contamination off-site.

Applicable soil SOPs include SOP 203 – Soil Boring Observation and Sampling, SOP 208 – Soil Grab Sample Collection, SOP 209 – Soil Composite Sample Collection, SOP 210 – Soil Stockpile Sampling, and SOP 211 – Test Pit and Test Trench Observation and Sampling.

Applicable water SOPs include SOP 301 – Water Level Measurement, SOP 302 – LNAPL Level Measurement, SOP 303 – Monitoring Well Development, SOP 304 – Slug Testing, SOP 309 – Field Filtering of Groundwater Samples, SOP 310 – Monitoring Well and Piezometer Installation, SOP 311 – Groundwater Sample Collection, SOP 312 – Well Purging and Stabilization, SOP 314 – Surface Water Sampling, and SOP 316 – Calibration of Water Meters.

The applicable soil vapor SOP includes SOP 405 – Sub-Slab Soil Vapor Sampling.

Be sure to follow the site-specific sampling plan that may require special cleaning or rinsing methods, and/or special handling and disposal of wash and rinse water (also see SOP 702 – Management of Investigation Derived Waste). Additional rinses with solvents such as hexane, acetone, or acid may be required by the site-specific sampling plan, but are not covered in this SOP.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

Nitrile gloves should be worn during decontamination activities to reduce the incidence of skin contact with potentially contaminated soil/groundwater and to reduce the risk of cross-contamination. In certain situations, long-sleeved rubber gloves may be needed to prevent contact.

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 203 – Soil Boring Observation and Sampling
- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 210 – Soil Stockpile Sampling
- SOP 211 – Test Pit and Test Trench Observation and Sampling
- SOP 301 – Water Level Measurement
- SOP 302 – LNAPL Level Measurement
- SOP 303 – Monitoring Well Development
- SOP 304 – Slug Testing
- SOP 309 – Field Filtering of Groundwater Samples
- SOP 310 – Monitoring Well and Piezometer Installation
- SOP 311 – Groundwater Sample Collection
- SOP 312 – Well Purging and Stabilization
- SOP 314 – Surface Water Sampling
- SOP 316 – Calibration of Water Meters

- SOP 405 – Sub-Slab Soil Vapor Sampling
- SOP 702 – Management of Investigation Derived Waste

D. Equipment and Supplies

- Clean tap water (for washing and rinsing soil sampling equipment)
- Distilled or deionized water (for washing and rinsing groundwater sampling equipment)
- Clean container for wash water (bucket, spray bottle, etc.)
- Phosphate-free detergent (i.e., Alconox or Liquinox in bulk containers or individual packets)
- Scrub brush (soil sampling equipment decontamination)
- Paper towels
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Personal Protective Equipment (PPE)

E. Procedures

E.1. Soil Sampling Equipment

E.1.a. Hand Tools

Hand tools used for sampling include shovels, hand trowels, hand augers, etc. Before collecting each new soil sample, clean the equipment as follows:

- Remove loose or attached soil from the tool with a gloved hand, paper towel, or brush.
- Wash and brush the tool in a solution of phosphate-free detergent in tap water.
- Rinse the tool with tap water.
- Inspect for remaining particles or surface film, and repeat cleaning and rinsing procedures if necessary.

E.1.b. Direct-Push Sampling Equipment and Split Spoon Sampler

The drilling contractor is responsible for cleaning reusable sampling equipment; however, field personnel must ensure that proper procedures are followed. Prior to collecting each sample the reusable sampling equipment should be cleaned as follows:

- Remove loose or attached soil from the sampler components.
- Wash the sampler components in a solution of phosphate-free detergent in tap water.
- Rinse the sampler components with tap water.
- Inspect for remaining particles or surface film, and repeat cleaning and rinsing procedures if necessary.

E.1.c. Drill Rig Auger Flights

The drilling contractor is responsible for providing clean auger equipment; however, field personnel must ensure that proper procedures are followed. Prior to each use the auger flights should be cleaned as follows:

- Remove loose or attached soil from the auger flight.
- Wash the auger flight with a pressure washer and clean tap water.
- Inspect for remaining particles or surface film, and repeat cleaning and rinsing procedures if necessary.

E.2. Groundwater Sampling Equipment

E.2.a. Groundwater Measuring and Sampling Equipment

This procedure applies to all reusable equipment that will be placed into a well (including water level indicators, transducers, slugs, groundwater sample equipment, and pumps). Groundwater measuring and sampling equipment should be decontaminated after use at each well or sampling point as follows:

- Wash the exterior with a solution of phosphate-free detergent in distilled or deionized water.
- Rinse with distilled or deionized water.
- Inspect for remaining particles or surface film and repeat cleaning and rinsing procedures if necessary.
- Do not wipe dry.

E.3. Product Interface Probe

The product interface probe is only used in wells that may contain light non-aqueous phase liquid (LNAPL). Prior to each use the product interface probe should be cleaned as follows:

- After fluid levels in each well are measured, wipe the probe and tape with a paper towel.
- After returning to the office, clean the probe and tape in a solution of phosphate-free detergent and tap water. Allow the probe and tape to soak in the solution up to 24 hours, if possible.

E.4. Vapor Sampling Equipment

E.4.a. Vapor Pins® – Used for Sub-Slab Soil Gas Sampling

This office-only procedure applies solely to the Vapor Pin® itself that will be used to obtain a soil gas sample. Once the Vapor Pin® has been used it will be brought back to the office and cleaned as follows:

- Remove the silicone sleeve and discard.
- Wash the Vapor Pin® in a hot water and phosphate-free detergent wash.
- Bake in an oven to a temperature of 130°C (266°F) for at least one hour.

E.5. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.6. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

A. Purpose

In the process of collecting environmental samples during field investigation activities, several different types of waste may be generated. These wastes are referred to as investigation derived waste (IDW). Some of these waste materials may be hazardous wastes and must be properly managed in accordance with Environmental Protection Agency (EPA) regulations. Materials which may become IDW requiring proper management include:

- Used Personal Protective Equipment (PPE) such as gloves, boots, Tyvek® clothing, spent respirator cartridges, etc.
- Disposable sampling equipment including bailers, filters, rope, sleeves from soil probes, tubing, sealable plastic bags, etc.
- Soil cuttings from drilling, probing, hand augering, or test trenching.
- Drilling mud or water used for rotary drilling.
- Groundwater obtained through well development or purging.
- Light non-aqueous phase liquid (LNAPL) combined with groundwater obtained through well development or purging.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation

D. Equipment and Supplies

Some or all of the following materials may be needed for the proper management of IDW:

- Plastic or galvanized tubs or pails
- Plastic garbage bags
- 55-gallon drums
- Drum wrench
- Roll-off dumpster
- Poly-sheeting (10 mil or thicker)
- Self-adhesive labels and permanent marker
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- PPE

E. Procedure

E.1. Characterization of IDW

IDW must be characterized in accordance with applicable state and federal hazardous waste regulations. In some cases, wastes are hazardous waste regardless of test results (i.e., listed hazardous wastes). Characterization of IDW includes activities performed before, during, and after the wastes are generated. IDW characterization may include:

- **Historical Research** – A Phase I Environmental Site Assessment (ESA), Phase II ESA, prior analytical data, and/or environmental permits can provide information regarding potential and existing

contaminants of concern. In cases where prior investigations and/or analytical data are not available, additional steps should be taken to properly characterize IDW.

- **Visual and Olfactory Observations** – Some contaminants of concern can be detected using visual and/or olfactory observations such as the presence of staining and odors, respectively. However, visual and olfactory observations should only be used as a qualitative determination regarding the presence or absence of contamination.
- **Field Screening** – Field screening equipment such as a photoionization detector (PID), Draeger tubes, and/or colorimetric tubes can provide an approximation of the magnitude of contamination present. Appropriate field screening equipment should be selected based on historical research and applicable site-specific work plans.
- **Laboratory Analysis** – Analytical data provides the highest degree of accuracy regarding the magnitude of contamination present. Analytical parameters should be selected based on historical research and analytical data from site investigations. Disposal facilities may require toxicity characteristic leaching procedure (TCLP) analysis if elevated contaminants are present in IDW.

E.2. Temporary Storage of IDW

IDW may require temporary storage pending characterization. Containers should be selected based on the physical and chemical characteristics of the contaminants of concern being investigated using available characterization data. Other considerations include weather conditions, security of the storage facility, mobility of the container, and duration of storage. Commonly used waste disposal containers include 55-gallon drums, garbage bags, and roll-off dumpsters. IDW containers must be labeled with the following information:

- Date of generation
- Description of contents
- Emergency contact information

IDW may also be stockpiled on site by placing the material on polyethylene sheeting or an impermeable surface such as asphalt or concrete, covering the material with polyethylene sheeting, and anchoring polyethylene sheeting to prevent infiltration of contaminants of concern from precipitation.

When containing IDW in drums, solids and liquids must be kept in separate drums. Each drum should be labeled with:

- “Braun Intertec” and a contact phone number,
- A unique identification number,
- Date(s) material was containerized,
- Source locations (if applicable), and
- Collector’s initials.

Secure the drum cover and take precautions to ensure that the drum will not be disturbed.

Appropriate characterization must precede disposal of contained materials. The site-specific Sampling and Analysis Plan or project manager will determine the appropriate testing based on the anticipated contaminants of concern in the IDW and the anticipated disposal method.

E.3. Disposal of IDW

IDW should be managed as described in Attachments A and B or as determined by the project manager and/or the site-specific Sampling and Analysis Plan. Field personnel should consult with the project manager to assess if leaving IDW on-site has the potential to endanger human health or the environment. More conservative IDW management methods may be appropriate if the client does not own the property where field activities are performed and during winter conditions.

Information regarding IDW requiring off-site disposal should be recorded in the field logbook or on the field report form, including the drum number or stockpile identifier, a description of the waste including location generated and estimated volume, and a list of samples collected for characterization of the IDW.

If the IDW is classified as non-hazardous waste or petroleum, or as potentially hazardous, it should be disposed of promptly where permitted (see Attachment A and Attachment B).

If the IDW is classified as hazardous waste, it must be labeled, stored, handled, transported and treated/disposed according to state and federal hazardous waste regulations and the generator's classification (large, small, or very-small quantity generator).

In all cases, IDW must be properly disposed in 90 days or fewer. Braun Intertec field personnel should not sign waste profiles or shipping documents on behalf of clients or as an "agent" for clients unless a formal agreement has been executed with the client.

E.4. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.5. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

F. References

United States Environmental Protection Agency, July 3, 2014, Region 4, Science and Ecosystem Support Division Operating Procedure, Management of Investigation Derived Waste, SESDPROC-202-R3, Athens, GA.

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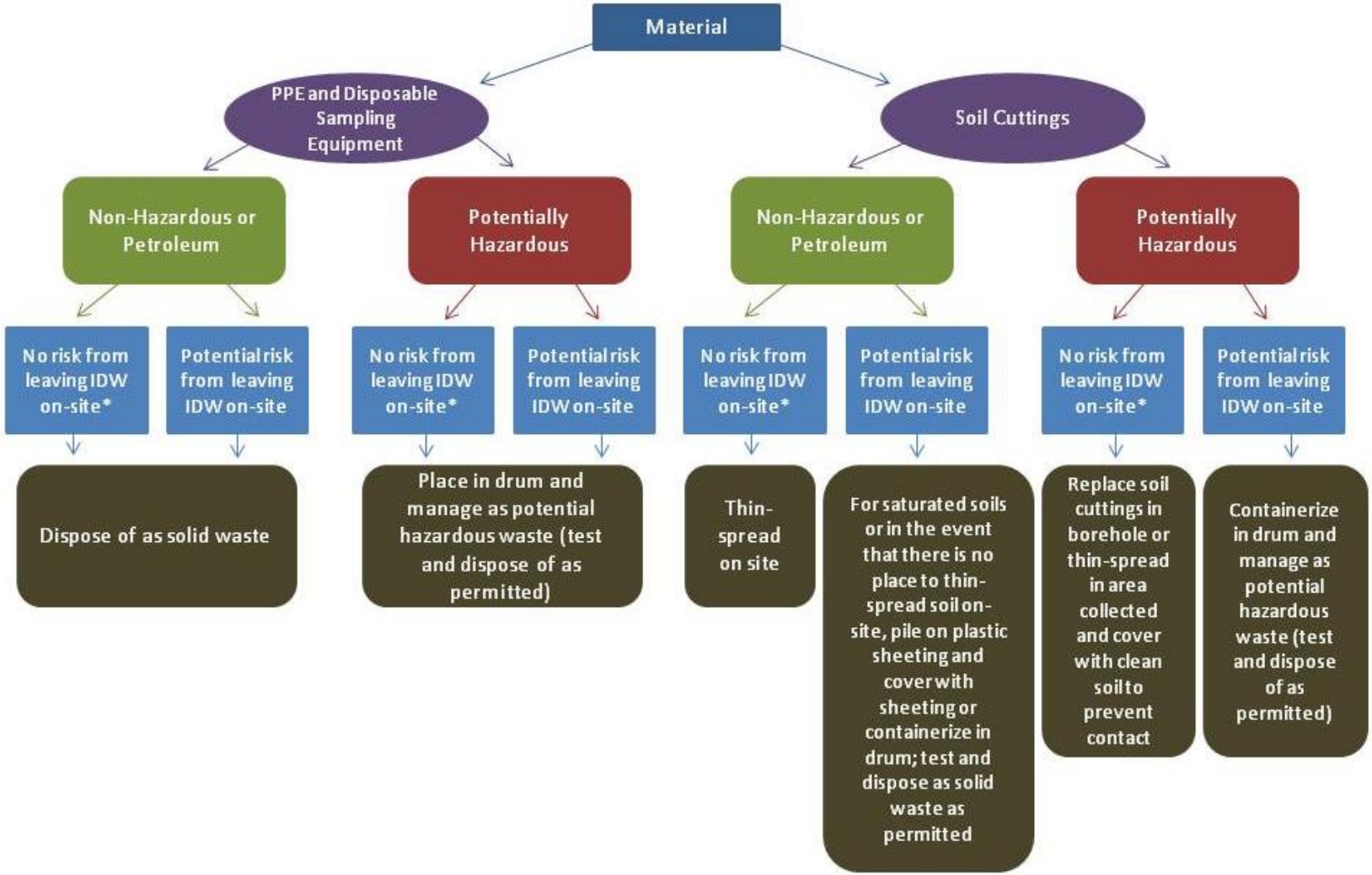
Attachment A
Management of Solid Investigation Derived Waste



* Management method for IDW at sites with no known areas of significant contamination and no known hazardous waste issues and where leaving IDW on-site will not endanger human health or the environment. Use more conservative method if the site history or regulatory status warrants. Field personnel should consult with the project manager before thin-spreading soil.

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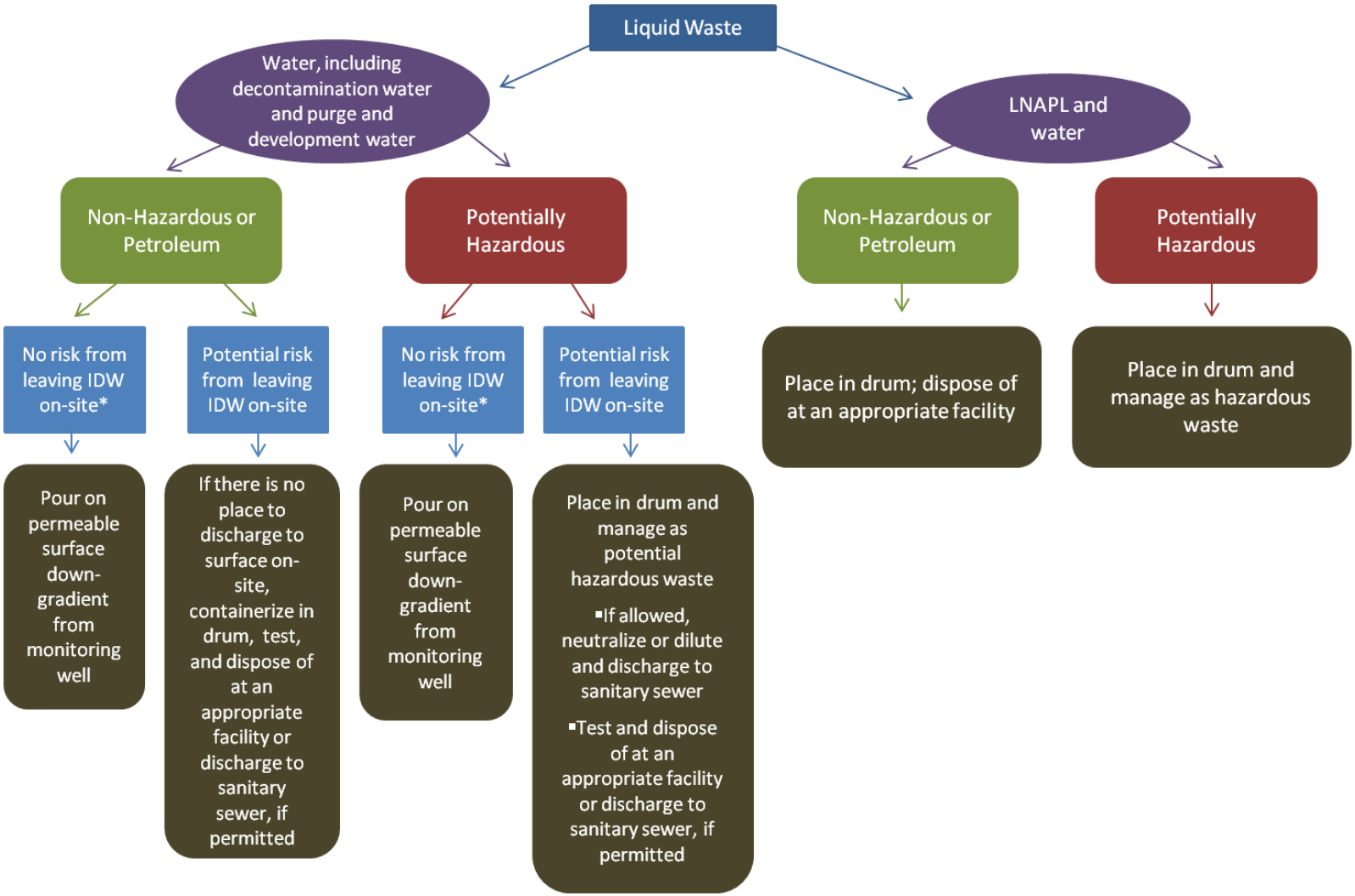
Attachment B
Management of Liquid Investigation Derived Waste



* Management method for IDW at sites with no known areas of significant contamination and no known hazardous waste issues and where leaving IDW on-site will not endanger human health or the environment. Use more conservative method if the site history or regulatory status warrants. Field personnel should consult with the project manager before pouring liquids on permeable ground surfaces.

Appendix G

References

Minnesota Department of Natural Resources; 2017; Geologic Atlas of Sherburne County, Minnesota, County Atlas Series C-32, Part B, Hydrogeology Report.

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