National Aeronautics and
Space Administration
Lyndon B. Johnson Space Center
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020

January 15, 2024

Reply to Attn of: RE-25-008

Mr. JohnDavid Nance, Bureau Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Subject: Response to Approval with Modifications for the PFAS Well Completion Report

On March 29, 2024, NASA submitted the *NASA PFAS [per- and polyfluoroalkyl substances] Well Completion Report* to the NMED Hazardous Waste Bureau. NMED approved the report with modifications on November 5, 2024 and directed NASA to respond to one comment by January 31, 2025.

This submittal provides a response table of NMED's comment and NASA's response as Enclosure 1. Printed replacement pages for the one comment are provided as Enclosure 2. A CD-ROM is provided as Enclosure 3 and includes electronic copies of the response table, redline-strikeout report, and final report.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments concerning this submittal, please contact Antonette Doherty of my staff at 575-202-5406.

Timothy Davis

Digitally signed by Timothy Davis
Date: 2025.01.15 11:33:33 -07'00'

Timothy J. Davis
Chief, Environmental Office

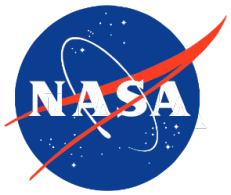
3 Enclosures

cc:
Mr. Gabriel Acevedo
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Comments for Approval with Modification of PFAS Site Investigation Well Completion Report

NMED Comment Number	NMED Comments	NASA Revisions/Responses/Discussion
1. Section 7.3.2, Definition of Site-Specific Capture Zone, Page 16	**Permittee Statement:** "For both wells, a 10/20 silica sand filter pack was installed from the bottom of the borehole to approximately 7 ft above each monitoring well screen with an additional 3 ft of 30/65 fine silica sand." **NMED Comment:** NMED noted that the boring logs that include well completion logs for 100-001-GW and 600C-005-GW that are included in Appendix A, Monitoring Well Installation and Sampling Documentation, indicate 30/65 silica sand was installed to 7 ft above the well screens and three feet of 10/20 sand was installed above the noted filter pack, and does not agree with the Permittee statement or respective "Monitoring Well Construction Sheets" for each well. Revise the well completion information on the boring logs for 100-001-GW and 600C-005-GW for accuracy and provide revised replacement boring logs.	Concur. Well completion information on the boring logs for 100-001-GW and 600C-005-GW (Appendix A) have been revised for accuracy and replacement boring logs provided. Text in Section 4.1 revised to read, "For both wells, a 10/20 silica sand filter pack was installed from the bottom of the borehole to approximately 10 ft above each monitoring well screen with an additional 3 ft of 30/65 fine silica sand. A 7-ft bentonite seal composed of bentonite chips was placed above the filer pack and allowed to hydrate before grouting the annulus with bentonite-cement grout slurry to grade for well 600C-005-GW. A 5-ft bentonite seal composed of bentonite chips was placed above the filer pack and allowed to hydrate before grouting the annulus with bentonite-cement grout slurry to grade for well 100-001-GW." Additionally, NASA has revised the well diagram for 100-001-GW boring log showing the grout extending to 260 ft with filter sand starting there as stated in the field notes and well construction sheet as opposed to 255 ft as shown on the original boring log well diagram. Both well construction sheets have also been revised to reflect correct elevations and depths of seals and tops of filter packs.

National Aeronautics and Space Administration



PFAS Site Investigation Well Completion Summary Report

for Wells 100-001-GW and 600C-005-GW

March 2024

Revised January 2025

NM8800019434

NASA Johnson Space Center White Sands Test Facility

PFAS Well Completion Summary Report

March 2024

Revised January 2025

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Timothy Davis

Digitally signed by Timothy Davis
Date: 2025.01.15 11:34:04 -07'00'

Timothy J. Davis
Chief, NASA Environmental Office

See Electronic Signature
Date

National Aeronautics and Space Administration

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White Sands Test Facility
12600 NASA Road
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www.nasa.gov

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List of Acronyms

AOPC(s)	Area(s) of Potential Concern
bgs	Below Ground Surface
Cascade	Cascade Environmental
CFR	Code of Federal Regulations
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ft	Foot/feet
gal	Gallon(s)
GMP	Groundwater Monitoring Plan
gpm	Gallons Per Minute
HDPE	High-Density Polyethylene
IDW	Investigation Derived Waste
mi	Mile(s)
NAD83	North American Datum 1983
NASA	National Aeronautics and Space Administration
NAVD83	North American Vertical Datum 1983
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
PFAS	Per- and Polyfluoroalkyl Substances
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SI	Site Investigation
Tetra Tech	Tetra Tech, Inc
WSTF	White Sands Test Facility

1.0 Introduction and Purpose

As part of an agency-wide effort to identify areas of potential concern (AOPCs) at the National Aeronautics and Space Administration (NASA) centers/facilities, per- and polyfluoroalkyl substances (PFAS) a preliminary assessment was conducted at Johnson Space Center White Sands Test Facility (WSTF) in 2022 by Tetra Tech, Inc (Tetra Tech) for NASA. The ensuing WSTF Preliminary Assessment Report (NASA, 2023a) identified 12 AOPCs for further PFAS investigation at WSTF.

- AOPC 1 – Building 112 Former Fire Station
- AOPC 2 – Building 104 WSTF Fire Station
- AOPC 3 – Former 100 Area Burn Pit, Overflow Area, and Fire Department Training Area
- AOPC 4 – 100 and 600 Area Sewage Lagoons and Hazardous Waste Management Unit (HWMU)
- AOPC 5 – 200 Area Laboratories, Sewage Lagoons, and Former Burn Pits
- AOPC 6 – 700 Area Landfill
- AOPC 7 – Bureau of Land Management Area Soil Pile
- AOPC 8 – Groundwater Treatment Systems
- AOPC 9 – Various Current and Former Wastewater Impoundments in the 300/400 Areas and second Tracking and Data Relay Satellite System (TDRS) (Solid Waste Management Unit [SWMU] 33, SWMU 48, and Area of Concern 51)
- AOPC 10 – Building 114 Former Photo Shop
- AOPC 11 – Jet Propellant Remote Test Areas
- AOPC 12 – Building 634 Pesticide Storage

These areas were selected based on known historical and suspected use of aqueous film-forming foam, other sources of PFAS, and PFAS data previously collected at WSTF. From the preliminary assessment report, a WSTF PFAS Site Investigation Sampling and Analysis Plan (SAP) (Field Sampling Plan/Quality Assurance Project Plan) (NASA, 2023b) was developed. As part of the site investigation (SI), two conventional monitoring wells were installed. One monitoring well was installed at AOPC 3 and the other at AOPC 11. The well identification numbers proposed in the SAP (A03-MW-01 and A11-MW-01) were renamed as 100-001-GW and 600C-005-GW respectively to align with the WSTF well naming convention.

Well 100-001-GW was installed at AOPC 3 to evaluate groundwater underlying the former 100 Area Burn Pit, Overflow Area, and former 100 Area Fire Department Training Area. The well was installed within the footprint of the former 100 Area Burn Pit and downgradient of the former 100 Area Fire Department Training Area. Well 600C-005-GW was installed at AOPC 11, downgradient and to the west of the Jet Propellant (JP) Remote Test Areas to evaluate groundwater underlying the area.

Groundwater data from monitoring wells 100-001-GW and 600C-005-GW will be incorporated into the NASA WSTF Groundwater Monitoring Plan (GMP) as indicated in NASA's response to NMED's Approval with Modifications of the 2021 GMP Update (NASA, 2021). Additionally, data from wells 100-001-GW and 600C-005-GW will further characterize the hydro-stratigraphy in the area and monitor groundwater elevation data.

This report provides a summary of field activities associated with the drilling and installation of groundwater monitoring wells 100-001-GW and 600C-005-GW. Site field activities were conducted from July 17 through August 15, 2023, September 12-14, 2023, and October 10, 2023. A report documenting the entire PFAS site investigation conducted by Tetra Tech during these dates will be submitted as a courtesy under separate cover once the final report has been received by NASA.

1.1 Location and Description

1.2 Facility

WSTF is in Doña Ana County, New Mexico, 18 miles (mi) northeast of Las Cruces, New Mexico, and 65 mi north of El Paso, Texas (Figure 1.1). Construction at WSTF was initiated in 1964 at a location within the White Sands Missile Range adjacent to the San Andres Mountains. Through an inter-agency agreement between the Army and NASA (Department of Defense, 1982), the Department of the Army provided NASA use of the land currently occupied by WSTF. Access to the facility is provided by a paved road that intersects U.S. Highway 70 one mi west of Organ, New Mexico, and leads 6 mi north to WSTF.

1.3 Well Locations

1.3.1 100-001-GW

Well 100-001-GW is located in the SE1/4 of the NW1/4 of Section 2, Township 21 S, Range 3 E, within the WSTF 100 Area (Figure 1.2). The 100 Area, developed in 1964, is in the southern portion of the WSTF industrial area. Buildings and structures within the 100 Area include office facilities for administrative, management, and engineering activities, an emergency center (fire department and clinic), security facilities, heavy equipment maintenance and related facilities, vehicle maintenance facilities, construction facilities, warehouse facilities, trade/fabrication shops, storage buildings, waste accumulation areas, a fuel station, a cafeteria, a fitness center, and an auditorium (NASA, 2016b).

1.3.2 600C-005-GW

Well 600C-005-GW is located in the SE1/4 of the SW1/4 of Section 6, Township 21 S, Range 3 E, within the WSTF 600 Area (Figure 1.3). The 600 Area was developed in the mid-1960s. The industrial portion of the 600 Area is located adjacent to the west of the 100 Area; however, many of the buildings and support structures are in the portion of WSTF that extends approximately 3 mi toward the western boundary of the Facility, which encompasses the 600 Area (NASA, 2016a). The 600 Area is currently used for support of the WSTF water supply system, the groundwater monitoring well network, and the groundwater remediation systems (Plume Front Treatment System and Mid-plume Interception and Treatment System).

2.0 Regulatory Timeline

The wells were installed in accordance with Resource Conservation Recovery Act (RCRA) Permit (NMED, 2023a) and the Abbreviated Drilling Work Plan (NASA, 2023c) approved by NMED with adjustments to the proposed well depths based upon lithology and field observations. Permits to drill for non-consumptive purposes were submitted to the New Mexico Office of the State Engineer and approved prior to drilling activities (Appendix A).

The time to complete both wells was estimated at approximately five months from initiation of the first borehole through the receipt and validation of groundwater samples collected using the newly installed sampling systems. The original due date for the completion reports was February 28, 2024 (NMED, 2023b). Due to delays in subcontractor document delivery, NASA submitted a request for extension of time on January 18, 2024 (NASA, 2024) to extend the due date for the well completion reports to March 29, 2024. NMED approved the request for extension on February 6, 2024 (NMED, 2024b).

3.0 Drilling

Drilling at 100-001-GW (Figure 1.2) began on August 6, 2023, and the borehole was completed to the total depth of 345 feet (ft) below ground surface (bgs) on August 13, 2023. Drilling at 600C-005-GW (Figure 1.3) began on July 25, 2023, and the borehole was completed to the total depth of 419 ft bgs on July 31, 2023.

3.1 Drilling Method

Cascade Environmental (Cascade), a New Mexico licensed drilling contractor, was subcontracted to perform drilling services at WSTF to install the two monitoring wells. The boreholes were drilled using the air rotary casing advance drilling method. The system was equipped with a cyclone for the collection of drill cuttings. No water was used during drilling, well construction and development.

Grab samples of drill cuttings were collected as they came off the shaker table and compiled over 10-ft intervals. Lithologies were determined by washing and screening the recovered cuttings, and representative samples were placed in chip trays for later, detailed characterization using a binocular microscope. No groundwater samples were able to be collected during drilling due to the use of drilling mud.

3.2 Lithology

Soil lithology was recorded at each borehole during drilling and soil samples were collected at selected depths from each borehole for laboratory analysis of PFAS, in accordance with the SAP (NASA, 2023b). The lithology was recorded to supplement the conceptual site model and to guide the depth and placement of well screens. At 100-001-GW, the lithology generally consisted of unconsolidated sediments (sand and gravel) until andesite bedrock (Orejon Andesite) was encountered at approximately 100 ft bgs, consistent with previously recorded geologic information for this area. At well 600C-005-GW, the lithology was composed of unconsolidated sediments (sand, gravel, and silty clay) and is consistent with previously recorded geologic information for this area. Boring logs for 100-001-GW and 600C-005-GW are provided in Appendix A.

4.0 Well Construction

4.1 Well Design and Completion

Both wells were constructed with nominal 4-inch inner diameter Schedule 80 polyvinyl chloride casing and 0.020-inch slotted stainless-steel well screen and riser pipe. For well 100-001-GW, a 20-ft length of screen was used (installed from 230 to 250 ft bgs) and for well 600C-005-GW, a 15-ft length of screen was used (installed from 394 to 409 ft bgs). The difference in screen lengths was to allow greater recharge in 100-001-GW because of anticipated lower hydraulic conductivity in 100 Area.

For both wells, a 10/20 silica sand filter pack was installed from the bottom of the borehole to approximately 10 ft above each monitoring well screen with an additional 3 ft of 30/65 fine silica sand. A 7-ft bentonite seal composed of bentonite chips was placed above the filter pack and allowed to hydrate before grouting the annulus with bentonite-cement grout slurry to grade for well 600C-005-GW. A 5-ft bentonite seal composed of bentonite chips was placed above the filter pack and allowed to hydrate before grouting the annulus with bentonite-cement grout slurry to grade for well 100-001-GW. The surface completions for both wells consisted of stick-up risers inside stainless steel protective casings with locking caps and a Type II Portland Cement surface seal. As-built well construction diagrams are provided in Appendix A.

4.2 Screen Placement Justification

The locations of the screens were selected based upon lithology and field observations. For 100-001-GW, a clearly defined subsurface aquifer (water table) was not encountered at approximately 180 ft bgs as anticipated, and drilling continued to 345 ft bgs for lithologic logging purposes. The borehole was left open overnight and groundwater recharge occurred through fractures in the bedrock. The static water level was measured at 185 ft bgs after drilling. A review of the lithologic logs determined that a screen interval of 230 to 250 ft bgs would straddle the most productive water bearing fractures.

At 600C-005-GW, the water table was initially identified at approximately 398 ft bgs and 15 ft well screen was placed at 394 to 409 ft bgs, to straddle the top of the water table. After installation, the water table was measured at 382 ft bgs due to hydraulic pressure.

5.0 Well Development

Well development was conducted by Cascade using surging, bailing, and pumping procedures to remove sediments that accumulated in the well during the installation process. During well development, a minimum of three well volumes were removed from each well and groundwater parameters (pH, specific conductivity, temperature, and turbidity) were measured until the parameter readings did not vary by more than 10 percent.

Following completion of the well, a Grundfos®[1] electric pump was used to develop each well. The pump was decontaminated prior to deployment into each well. Well development operations at 600C-005-GW began on August 9, 2023 and were completed on August 10, 2023. A total of 300 gallons of groundwater were pumped from 600C-005-GW during development activities. Well development operations at 100-001-GW began on August 13, 2023 and were completed on August 15, 2023. A total of 217 gallons of groundwater was pumped from 100-001-GW during development activities. Well development data sheets are provided in Appendix A. Decontamination fluids and developed groundwater were containerized and disposed of as investigation-derived waste (IDW).

6.0 Groundwater Sampling

NASA selected a QED Environmental Systems, low-flow, purgeable bladder pump sampling system for installation in each well. Each newly installed well was fitted with a dedicated PFAS-free bladder pump (QED Well Wizard®[2] model P1101HM-Z) with air and discharge ports and dedicated high-density polyethylene (HDPE) tubing. The bladder pump sample inlets were set at the midpoint of each well screen. A pump specification sheet is included in Appendix A.

Groundwater samples were collected from well both wells on September 13, 2023 by Tetra Tech and analyzed by Pace Analytical Services. Groundwater sampling data sheets are provided for both wells in Appendix A. All analytical data were validated in accordance with the logic provided in the Department of Defense (DOD) *General Data Validation Guidelines, Revision 1* (DOD, 1982) and the *Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual Table B-15* (DOD, 2020). The laboratory analytical results and data validation reports are provided in Appendix B.

[1] Grundfos is a registered trademark of Grundfos Holding A/S.
[2] Well Wizard is a registered trademark of Q.E.D Environmental Systems, Inc.

7.0 Survey

Wells 100-001-GW and 600C-005-GW were surveyed for top-of-casing and ground surface elevations and spatial coordinates by Libbin Underwood Engineering & Surveying, a New Mexico-licensed surveyor on September 15, 2023. Coordinates for well locations are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983 (NAD83). Vertical data for well elevations are referenced the North American Vertical Datum 1988 (NAVD88). The well surveyor report is included in Appendix C.

8.0 Investigation-Derived Waste Management, Characterization, and Disposal

In accordance with the PFAS SI SAP (NASA, 2023b), soil and aqueous IDW consisting of drill cuttings, purge water, well development water, and decontamination water were containerized during the SI. Approximately 40 cubic yards (yd^3) of soil IDW (drill cuttings) were generated during drilling activities and containerized into two 25-yd^3 roll-off containers. Approximately 1,650 gallons of aqueous IDW were generated and containerized in two water storage frac tanks. Of that, approximately 525 gallons were generated during the drilling, development, and purging of the two newly installed monitoring wells. The remaining volume was generated during the SI sampling activities.

Soil and aqueous samples collected from the IDW storage containers were analyzed for PFAS, N-Nitrosodimethylamine, and waste characterization parameters required by the disposal facilities, including toxicity characteristic leaching procedure volatile organic compounds, semi-volatile organic compounds, metals, and diesel and gasoline range organics.

All soil and aqueous IDW were transported off-site for disposal by Clean Harbors Environmental Services. The soil IDW was found to be non-detect for PFAS and was transported via Clean Harbors Environmental Services to the Rhino Environmental Services facility in Otero County, New Mexico for disposal. The aqueous IDW showed detections of PFAS and was transferred from the water storage frac tanks into five 330-gallon HDPE totes (approximately 12,100 pounds of bulk weight) and transported via Clean Harbors Environmental Services to the Clean Harbors facility in LaPorte, Texas for incineration. IDW management documentation is included in Appendix D. Non-hazardous contact wastes and debris (e.g., disposable personal protective equipment) were managed in accordance with the 20.9 New Mexico Administrative Code (NMAC), Solid Waste Regulations. Petroleum-contaminated hazardous debris associated with equipment maintenance and spill prevention were managed in accordance 20.4.1.300 NMAC and 40 CFR 262.17, and properly treated and disposed of at a permitted Resource Conservation and Recovery Act Treatment, Storage, and Disposal Facility. All wastes were managed in accordance with NASA procedures and applicable federal and state regulations.

9.0 References

Adoption of 40 CFR Part 262, Environmental Improvement Board, 20.4.1.300 NMAC (12-1-18).

Department of Defense (DOD). (1982, February 24). *Agreement Between the Department of Defense and The National Aeronautics and Space Administration for Operation of the NASA White Sands Test Facility at White Sands Missile Range, New Mexico Contract No. DACA47-9-75-145*. White Sands Missile Range, NM.

DOD. (2020, May). *Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15*. Environmental Data Quality Workgroup. Washington, DC.

Department of Defense/Department of Energy (DOE). (2021). Consolidated Quality Systems Manual (QSM) for Environmental Laboratories. DOD Quality Systems Manual Version 5.4. Washington, DC.

NASA Johnson Space Center White Sands Test Facility. (2016a, July 7). *Abbreviated Investigation Work Plan for the 600 Area Perched Groundwater.* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2016b, August 30). *Response to Approval with Modifications SWMUs 1, 3, and 15 Investigation Report (100 Area Burn Pit, 100 Container Storage Area, and 600 Area Burn Pit).* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2021, December 21). *Response to Approval with Modifications of NASA WSTF Groundwater Monitoring Plan Update for 2021*. Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2023a, July) *Final Per- and Polyfluoroalkyl Substances Preliminary Assessment Report for White Sands Test Facility.* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2023b, July) *Draft Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) Per- and Polyfluoroalkyl Substances Site Inspection for White Sands Test Facility.* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2023c, June*) NASA Johnson Space Center White Sands Test Facility Abbreviated Drilling Work Plan for the Installation of Monitoring Wells in the WSTF 100 and 600 Areas. Final.* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2024, January 18). *Request for Extension of Time for Submittal of the Report Documenting the Well Installation and Sampling of Well A03-MW-01 and A11-MW-01.* Las Cruces, NM.

NMED Hazardous Waste Bureau. (2023a, March 28). *RCRA Permit EPA ID # NM8800019434*. Santa Fe, NM.

NMED Hazardous Waste Bureau. (2023b, May 23*). Approval with Modifications Abbreviated Drilling Work Plan for the Installation of Monitoring Wells in the WSTF 100 and 600 Areas.* Santa Fe, NM.

NMED Hazardous Waste Bureau. (2024, February 6). *Request for Extension of Time for Submittal of the Report Documenting the Well Installation and Sampling of Well A03-MW-01 and A11-MW-01.* Santa Fe, NM.

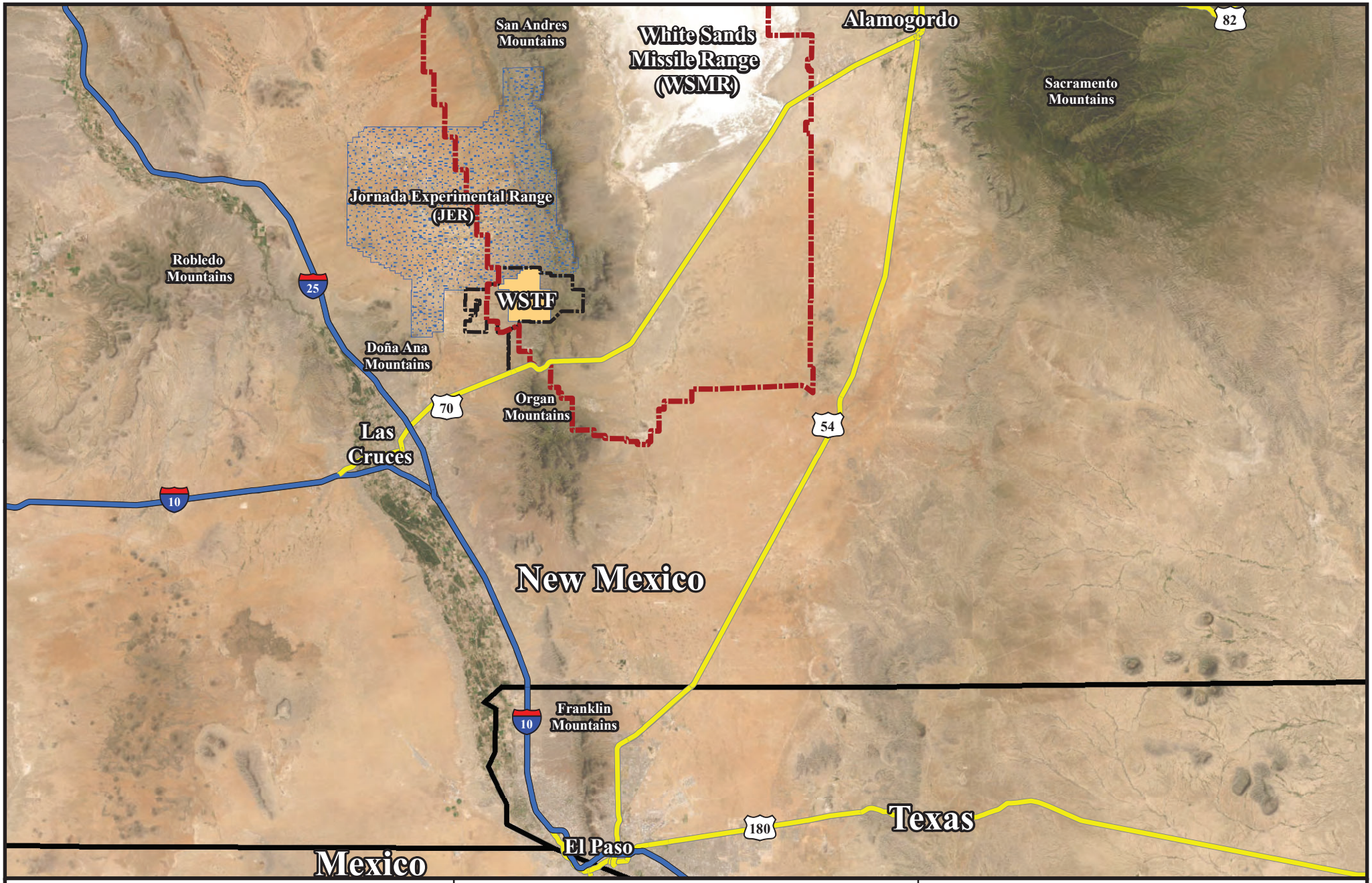
Solid Waste, New Mexico Environmental Improvement Board, 20.9 NMAC (8-2-07).

Tetra Tech. (2024, January – Internal Draft). *Per- and Polyfluoroalkyl Substances Site Inspection Report for White Sands Test Facility.* Pittsburgh, PA.

Figures

Figure 1.1 **WSTF Location Map**

(SEE NEXT PAGE)



WSTF Location Map

NASA Johnson Space Center
White Sands Test Facility
Las Cruces, New Mexico

Coordinate System:
NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet

G:\Projects\environmental\PMR\2023\1stQuarter

- WSMR Boundary
- WSTF Boundary
- WSTF Industrial Area
- Jornada Experimental Range (JER)

1 in = 12 miles

Miles
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N
W E
S

March 2024

Figure 1.2 **100-001-GW Well Location Map**

(SEE NEXT PAGE)



N
W E
S

1 in = 233 ft

Ft
0 50 100 200

March 2024

Prepared by: srees

Monitoring Well Location

Well 100-001-GW Location

NASA Johnson Space Center
White Sands Test Facility Las Cruces, New Mexico

Coordinate System:
NAD 1983 HARN StatePlane New Mexico Central FIPS 3002 Feet

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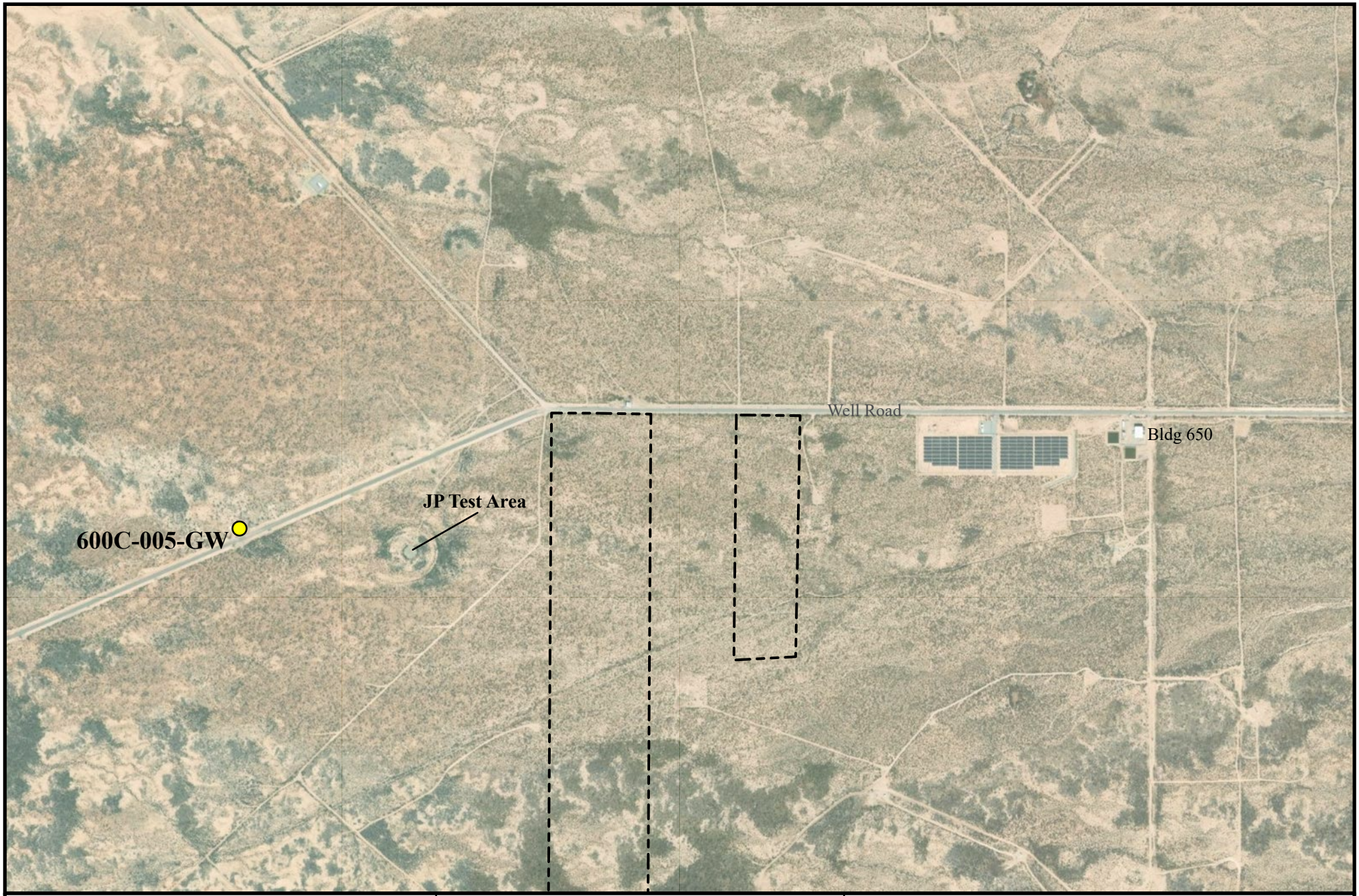
Figure 1.3 600C-005-GW Well Location Map

(SEE NEXT PAGE)



1 in = 1,000 ft

0 250 500 1,000 Ft

N
W E
S

March 2024

Prepared by: srees

Monitoring Well Location

WSTF Boundary

Well 600C-005-GW Location

NASA Johnson Space Center
White Sands Test Facility Las Cruces, New Mexico

Coordinate System:
NAD 1983 HARN StatePlane New Mexico Central FIPS 3002 Feet

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Appendix A
Monitoring Well Installation and Sampling Documentation

Mike A. Hamman, P.E.
STATE ENGINEER

District 4 Office
1680 Hickory Loop Suite J
Las Cruces, NM 88005-6598
Phone: (575) 524-6161
Fax: (575) 524-6160

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER

Trn Nbr: 747701
File Nbr: LRG 18480

Jun. 13, 2023

NASA JOHNSON SPACE CENTER WHITE SANDS TEST FACILITY
TIMOTHY DAVIS
P.O. BOX 20
LAS CRUCES, NM 88004

Greetings:

Your approved copy of the above numbered permit to drill a well for non-consumptive purposes is enclosed. You must obtain an additional permit if you intend to use the water. It is your responsibility to provide the contracted well driller with a copy of the permit that must be made available during well drilling activities.

Carefully review the attached conditions of approval for all specific permit requirements.

* If use of this well is temporary in nature and the well will be plugged at the end of the well usage, the OSE must initially approve of the plugging. If plugging approval is not conditioned in this permit, the applicant must submit a Plugging Plan of Operations for approval prior to the well being plugged. The Plugging Record must be properly completed and submitted to the OSE within 30 days of the well plugging.
* If the final intended purpose and condition requires a well ID tag and meter installation, the applicant must immediately send a completed meter report form to this office.
* The well record and log must be submitted within 30 days of the completion of the well or if the attempt was a dry hole.
* This permit expires and will be cancelled if no well is drilled and/or a well log is not received by the date set forth in the conditions of approval.

Appropriate forms can be downloaded from the OSE website www.ose.state.nm.us.

Sincerely,

Alice Amend
Water Resources Professional
(575)524-6161

Enclosure
explore

File No. LRG-18480

4-26038 SG

NEW MEXICO OFFICE OF THE STATE ENGINEER

WR-07 APPLICATION FOR PERMIT TO DRILL

A WELL WITH NO WATER RIGHT

(check applicable box):

For fees, see State Engineer website: http://www.ose.state.nm.us/

Purpose:	☐ Pollution Control And/Or Recovery	☐ Ground Source Heat Pump
☐ Exploratory Well*(Pump test)	☐ Construction Site/Public Works Dewatering	☐ Other(Describe):
☒ Monitoring Well	☐ Mine Dewatering	

A separate permit will be required to apply water to beneficial use regardless if use is consumptive or nonconsumptive.

*New Mexico Environment Department-Drinking Water Bureau (NMED-DWB) will be notified if a proposed exploratory well is used for public water supply.

☐ Temporary Request - Requested Start Date: 7-1-2023 Requested End Date: 8-1-2023

Plugging Plan of Operations Submitted? ☐ Yes ☒ No

RECEIVED
2023 JUN -8 AM 10:59
STATE ENGINEER OFFICE
LAS CRUCES, NEW MEXICO

1. APPLICANT(S)

Name: Cascadr Drilling L.P.	Name: NASA Johnson Space Center, White Sands Test Facility
Contact or Agent: check here if Agent ☑ Mark Green	Contact or Agent: check here if Agent ☐ Tomothy Davis
Mailing Address: 3621 HWY 47	Mailing Address: P.O. Box 20
City: Peralta	City: Las Cruces
State: NM Zip Code: 87042	State: NM Zip Code: 88004
Phone: ☐ Home ☒ Cell Phone (Work): 505.991.3511	Phone: 575.524.5024 ☒ Home ☐ Cell Phone (Work):
E-mail (optional): mgreen@cascade-env.com	E-mail (optional): Timothy.j.davis@nasa.gov

FOR OSE INTERNAL USE Application for Permit, Form WR-07, Rev 07/12/22

File No.: LRG-18480	Trn. No.: 747701	Receipt No.:
Trans Description (optional): LRG-18480-POD2&3		
Sub-Basin: LRO	PCW/LOG Due Date: 6-12-2024	

2. WELL(S) Describe the well(s) applicable to this application.

Location Required: Coordinate location must be reported in NM State Plane (NAD 83), UTM (NAD 83), or Latitude/Longitude (Lat/Long - WGS84).
District II (Roswell) and District VII (Cimarron) customers, provide a PLSS location in addition to above.

☒ NM State Plane (NAD83) (Feet) ☐ UTM (NAD83) (Meters) ☐ Lat/Long (WGS84) (to the nearest 1/10th of second)
☐ NM West Zone ☐ Zone 12N
☐ NM East Zone ☐ Zone 13N
☐ NM Central Zone

Well Number (if known):	X or Easting or Longitude:	Y or Northing or Latitude:	Provide if known: -Public Land Survey System (PLSS) (*Quarters or Halves , Section, Township, Range*) OR - Hydrographic Survey Map & Tract; OR - Lot, Block & Subdivision; OR - Land Grant Name
A03-MW-01 LRG-18480-POD2	~~548355~~ as AA	per email ~~1530396~~ AA	32°30'26.44"N, 106°36'26.85"W Sec. 2, Tw3.21S, R.03E
A11-MW02 LRG-18480-POD3	~~551331~~ AA	~~1539339~~ AA	32°30'54.35"N, 106°40'26.91"W Sec. 6, Tw3.21S, R.03E

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STATE ENGINEER OFFICE
LAS CRUCES, NEW MEXICO

NOTE: If more well locations need to be described, complete form WR-08 (Attachment 1 – POD Descriptions)
Additional well descriptions are attached: ☒ Yes ☐ No **If yes, how many** 2

Other description relating well to common landmarks, streets, or other:

A03-MW01 is 210' 15' of 4" SS screen .020 A11-MW-02 is 475' 20' of 4" SS screen

Well is on land owned by: NASA Johnson Space Center, White Sands Test Facility

Well Information: NOTE: If more than one (1) well needs to be described, provide attachment. Attached? ☒ Yes ☐ No
If yes, how many 2

Approximate depth of well (feet): 205	Outside diameter of well casing (inches): 4.5
Driller Name: Cascade Drilling L.P.	Driller License Number: WD1664

3. ADDITIONAL STATEMENTS OR EXPLANATIONS

A03-MW01 is 210' 15' of 4" SS screen .020 A11-MW-02 is 475' 20' of 4" SS screen .020 slot. both sanded with 12/20 sand and sealed with 3/8" bentonite grout. then grouted in place with 20% High solids bentonite grout to 20' and topped off with 20' of cement bentonite grout 6 gal of water with 3 to 5% bentonite powder mixed onsite. both welled will have 304SS screen and sumps then SCH 80 flush thread PVC to 2.5' above ground serfsace.

4. SPECIFIC REQUIREMENTS: The applicant must include the following, as applicable to each well type. Please check the appropriate boxes, to indicate the information has been included and/or attached to this application:

Exploratory:	**Pollution Control and/or Recovery:**	**Construction De-Watering:**	**Mine De-Watering:**
Is proposed well a future public water supply well? ☐ Yes ☐ NO If Yes, an application must be filed with NMED-DWB, concurrently. ☐ Include a description of the requested pump test if applicable.	☐ Include a plan for pollution control/recovery, that includes the following: ☐ A description of the need for the pollution control or recovery operation. ☐ The estimated maximum period of time for completion of the operation. ☐ The annual diversion amount. ☐ The annual consumptive use amount. ☐ The maximum amount of water to be diverted and injected for the duration of the operation. ☐ The method and place of discharge. ☐ The method of measurement of water produced and discharged. ☐ The source of water to be injected. ☐ The method of measurement of water injected. ☐ The characteristics of the aquifer. ☐ The method of determining the resulting annual consumptive use of water and depletion from any related stream system. ☐ Proof of any permit required from the New Mexico Environment Department. ☐ An access agreement if the applicant is not the owner of the land on which the pollution plume control or recovery well is to be located.	☐ Include a description of the proposed dewatering operation, ☐ The estimated duration of the operation, ☐ The maximum amount of water to be diverted, ☐ A description of the need for the dewatering operation, and, ☐ A description of how the diverted water will be disposed of. **Ground Source Heat Pump:** ☐ Include a description of the geothermal heat exchange project, ☐ The number of boreholes for the completed project and required depths. ☐ The time frame for constructing the geothermal heat exchange project, and, ☐ The duration of the project. ☐ Preliminary surveys, design data, and additional information shall be included to provide all essential facts relating to the request.	☐ Include a plan for pollution control/recovery, that includes the following: ☐ A description of the need for mine dewatering. ☐ The estimated maximum period of time for completion of the operation. ☐ The source(s) of the water to be diverted. ☐ The geohydrologic characteristics of the aquifer(s). ☐ The maximum amount of water to be diverted per annum. ☐ The maximum amount of water to be diverted for the duration of the operation. ☐ The quality of the water. ☐ The method of measurement of water diverted. ☐ The recharge of water to the aquifer. ☐ Description of the estimated area of hydrologic effect of the project. ☐ The method and place of discharge. ☐ An estimation of the effects on surface water rights and underground water rights from the mine dewatering project. ☐ A description of the methods employed to estimate effects on surface water rights and underground water rights. ☐ Information on existing wells, rivers, springs, and wetlands within the area of hydrologic effect.
Monitoring ☒ The reason and duration of the monitoring is required.			

ACKNOWLEDGEMENT

I, We (name of applicant(s)), Shawn Cain
Print Name(s)

affirm that the foregoing statements are true to the best of (my, our) knowledge and belief.

Applicant Signature

Applicant Signature

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2023 JUN -8 AM 10:49
STATE ENGINEER OFFICE
LAS CRUCES, NEW MEXICO

ACTION OF THE STATE ENGINEER

This application is:

☑ approved ☐ partially approved ☐ denied

provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare and further subject to the attached conditions of approval.

Witness my hand and seal this 13th day of June 20 23, for the State Engineer,

Mike A. Hamman, P.E, STATE ENGINEER, State Engineer

By BY Alice Amend
Water Resources Professional

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STATE OF NEW MEXICO
STATE ENGINEER

FOR OSE INTERNAL USE

Application for Permit, Form WR-07 Version 07/12/22

File No.: LRG-18480 Trn No.: 747701

NEW MEXICO STATE ENGINEER OFFICE
PERMIT TO EXPLORE

SPECIFIC CONDITIONS OF APPROVAL (Continued)

17-Q The State Engineer retains jurisdiction over this permit.

17-R Pursuant to section 72-8-1 NMSA 1978, the permittee shall allow the State Engineer and OSE representatives entry upon private property for the performance of their respective duties, including access to the ditch or acequia to measure flow and also to the well for meter reading and water level measurement.

LOG The Point of Diversion LRG 18480 POD2 must be completed and the Well Log filed on or before 06/12/2024.

LOG The Point of Diversion LRG 18480 POD3 must be completed and the Well Log filed on or before 06/12/2024.

ACTION OF STATE ENGINEER

Notice of Intention Rcvd:	Date Rcvd. Corrected:
Formal Application Rcvd: 06/08/2023	Pub. of Notice Ordered:
Date Returned - Correction:	Affidavit of Pub. Filed:

This application is approved provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare of the state; and further subject to the specific conditions listed previously.

Witness my hand and seal this 13 day of Jun A.D., 2023

Mike A. Hamman, P.E., State Engineer

By: Alice Amend

STATE OF NEW MEXICO STATE ENGINEER

Trn Desc: LRG 18480 POD2-3

File Number: LRG 18480
Trn Number: 747701

OFFICE OF THE STATE ENGINEER/INTERSTATE STREAM COMMISSION – LAS CRUCES OFFICE

OFFICIAL RECEIPT NUMBER: 4 - 26038 DATE: 6-8-23 FILE NO.:

TOTAL: $10.00 RECEIVED: Ten DOLLARS ☐ CASH: ☑ CHECK NO: Money Order - 28397724254

PAYOR: Cascade Drilling L.P ADDRESS: 3621 Hwy 47 CITY: Peralta

STATE: NM ZIP: 87042 RECEIVED BY: S. Garay

INSTRUCTIONS: Indicate the number of actions to the left of the appropriate type of filing. Complete the receipt information. **Original** to payor; **pink** copy to Program Support/ASD; and **yellow** copy for Water Rights. If a mistake is made, void the original and all copies and submit to Program Support/ASD as part of your daily deposit.

A. Ground Water Filing Fees

___	1.	Change of Ownership of Water Right	$ 2.00
___	2.	Application to Appropriate or Supplement Domestic 72-12-1 Well	$ 125.00
___	3.	Application to Repair or Deepen 72-12-1 Well	$ 75.00
___	4.	Application for Replacement 72-12-1 Well	$ 75.00
___	5.	Application to Change Purpose of Use 72-12-1 Well	$ 75.00
___	6.	Application for Stock Well/Temp. Use	$ 5.00
___	7.	Application to Appropriate Irrigation, Municipal, or Commercial Use	$ 25.00
___	8.	Declaration of Water Right	$ 1.00
___	9.	Application for Supplemental Non 72-12-1 Well	$ 25.00
___	10.	Application to Change Place or Purpose of Use Non 72-12-1 Well	$ 25.00
___	11.	Application to Change Point of Diversion and Place and/or Purpose of Use from Surface Water to Ground Water	$ 50.00
___	12.	Application to Change Point of Diversion and Place and/or Purpose of Use from Ground Water to Ground Water	$ 50.00
___	13.	Application to Change Point of Diversion of Non 72-12-1 Well	$ 25.00
___	14.	Application to Repair or Deepen Non 72-12-1 Well	$ 5.00
2	15.	Application for Test, Expl. Observ. Well	$ 5.00
___	16.	Application for Extension of Time	$ 25.00
___	17.	Proof of Application to Beneficial Use	$ 25.00
___	18.	Notice of Intent to Appropriate	$ 25.00

B. Surface Water Filing Fees

___	1.	Change of Ownership of a Water Right	$ 5.00
___	2.	Declaration of Water Right	$ 10.00
___	3.	Amended Declaration	$ 25.00
___	4.	Application to Change Point of Diversion and Place and/or Purpose of Use from Surface Water to Surface Water	$ 200.00
___	5.	Application to Change Point of Diversion and Place and/or Purpose of Use from Ground Water to Surface Water	$ 200.00
___	6.	Application to Change Point of Diversion	$ 100.00
___	7.	Application to Change Place and/or Purpose of Use	$ 100.00
___	8.	Application to Appropriate	$ 25.00
___	9.	Notice of Intent to Appropriate	$ 25.00
___	10.	Application for Extension of Time	$ 50.00
___	11.	Supplemental Well to a Surface Right	$ 100.00
___	12.	Return Flow Credit	$ 100.00
___	13.	Proof of Completion of Works	$ 25.00
___	14.	Proof of Application of Water to Beneficial Use	$ 25.00
___	15.	Water Development Plan	$ 100.00
___	16.	Declaration of Livestock Water Impoundment	$ 10.00
___	17.	Application for Livestock Water Impoundment	$ 10.00

All fees are non-refundable.

C. Well Driller Fees

___	1.	Application for Well Driller's License	$ 50.00
___	2.	Application for Renewal of Well Driller's License	$ 50.00

D. Reproduction of Documents

___ @ 0.25¢ $_____

___ Map(s) $_____

E. Certification $_____

F. *Credit Card Convenience Fee $_____

G. Other _____ $_____

Comments:

_____

_____

_____

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OFFICE OF THE STATE ENGINEER
1680 HICKORY LOOP, STE. J
LAS CRUCES, NM 88005-6598

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Tetra Tech
661 Andersen Drive
Pittsburgh, PA 15320
Telephone: (412)-921-7090

WELL NUMBER: 600C-005-GW

CLIENT NASA
PROJECT NAME NASA WSTF PFAS SI
PROJECT NUMBER 112G09033
PROJECT LOCATION White Sands Test Facility, Las Cruces, NM
DATE STARTED 7/25/23 **COMPLETED** 7/31/23
GROUND ELEVATION 4416.08 ft **HOLE SIZE** 11.75" inches
DRILLING CONTRACTOR Cascade
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary with Casing Hammer (ARCH)
AT TIME OF DRILLING 398.00 ft / Elev 4018.08 ft
LOGGED BY Liz Heness **CHECKED BY** Marvin Dunbar
AT END OF DRILLING 382.00 ft / Elev 4034.08 ft
NOTES Northing : 168059.66 meters Easting: 460152.37 meters
AFTER DRILLING 382.00 ft / Elev 4034.08 ft

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						Casing Top Elev: 4419.03 (ft) Casing Type: Steel
			SP		POORLY GRADED SAND, (SP) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, trace gravel, no odor, some caliche	Type II Portland Cement; Bentonite Grout
10					10.0 4406.1	
			SP		POORLY GRADED SAND WITH GRAVEL, (SP) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, trace gravel, no odor, gravel dark to medium gray limestone	
20					20.0 4396.1	
			SP-SM		POORLY GRADED SAND WITH SILT, (SP-SM) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, no odor, some silty clay	
35						

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Notes: Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983 (NAD83). Vertical data for well elevations are referenced in North American Vertical Datum, 1988 (NAVD88)

(Continued Next Page)

Tetra Tech
661 Andersen Drive
Pittsburgh, PA 15320
Telephone: (412)-921-7090

WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
35			SP-SM		POORLY GRADED SAND WITH SILT, (SP-SM) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, no odor, some silty clay *(continued)*	
60.0					4356.1	
			SM		SILTY SAND, (SM) light tannish brown to gray, poorly graded, subangular, fine grained, dry, loose, non plastic, no odor	

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(Continued Next Page)

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CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
75			SM		SILTY SAND, (SM) light tannish brown to gray, poorly graded, subangular, fine grained, dry, loose, non plastic, no odor *(continued)*	
80					80.0 4336.1	
			SM		POORLY GRADED SAND WITH CLAY, (SM) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, trace gravel, no odor, some limestone pebbles with caliche	
85						
90					90.0 4326.1	
			GW-GM		WELL GRADED GRAVEL WITH SILT, (GW-GM) light tannish brown to gray, well graded, fine to coarse grained, dry, loose, non plastic, no odor	
95						
100						
105						
110						
115						

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(Continued Next Page)

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PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
115			GW-GM		WELL GRADED GRAVEL WITH SILT, (GW-GM) light tannish brown to gray, well graded, fine to coarse grained, dry, loose, non plastic, no odor *(continued)*	
130					130.0 4286.1	
			CL-ML		LEAN CLAY, SILTY CLAY, (CL-ML) light tannish brown to gray, poorly graded, fine to medium grained, dry, loose, some sand, no odor, some clay pebbles	

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(Continued Next Page)

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CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
155					LEAN CLAY, SILTY CLAY, (CL-ML) light tannish brown to gray, poorly graded, fine to medium grained, dry, loose, some sand, no odor, some clay pebbles *(continued)*	
160						
165						
170						
175			CL-ML			
180						
185						
190						
195						

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PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
195					LEAN CLAY, SILTY CLAY, (CL-ML) light tannish brown to gray, poorly graded, fine to medium grained, dry, loose, some sand, no odor, some clay pebbles *(continued)*	
200						
205						
210						
215			CL-ML			
220						
225						
230						
235						

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(Continued Next Page)

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WELL NUMBER: 600C-005-GW

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PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
235						
			CL-ML		LEAN CLAY, SILTY CLAY, (CL-ML) light tannish brown to gray, poorly graded, fine to medium grained, dry, loose, some sand, no odor, some clay pebbles *(continued)*	
240					240.0 4176.1	
			ML		SILT, CLAYEY SILT, (ML) light tannish brown to gray, poorly graded, fine to coarse grained, dry, loose, some gravel, no odor, limestone clasts	
245						
250						
255						
260					260.0 4156.1	
			CL-ML		SILT, CLAYEY SILT, (CL-ML) light tannish brown to gray, poorly graded, fine to coarse grained, dry, loose, trace gravel, no odor	
265						
270						
275						

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PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
275			CL-ML		SILT, CLAYEY SILT, (CL-ML) light tannish brown to gray, poorly graded, fine to coarse grained, dry, loose, trace gravel, no odor *(continued)*	

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(Continued Next Page)

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WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
315			CL-ML		SILT, CLAYEY SILT, (CL-ML) light tannish brown to gray, poorly graded, fine to coarse grained, dry, loose, trace gravel, no odor *(continued)*	
320					320.0 4096.1	
			GP-GC		GRAVELLY SILT WITH SAND, (GP-GC) light tannish brown to gray, poorly graded, subangular, fine to coarse grained, dry, loose, no odor, limestone clasts	
325						
330						
335						
340					340.0 4076.1	
			CL-ML		SILTY CLAY, (CL-ML) brown, poorly graded, subrounded, fine to coarse grained, moist, loose, no odor	
345						
350						
355						

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(Continued Next Page)

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WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
355					SILTY CLAY, (CL-ML) brown, poorly graded, subrounded, fine to coarse grained, moist, loose, no odor *(continued)*	
			CL-ML			
360					360.0 4056.1	
					WELL GRADED GRAVEL WITH SILT AND SAND, (GP-GC) brown, well graded, angular, fine to coarse grained, moist, loose, no odor, limestone gravels	
365						
370						
375						Bentonite Holeplug
			GP-GC			
380					▼	Silica Sand 30/65 (381' to 384)
385						Silica Sand 10/20 (384' to 419')
390						
395						

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(Continued Next Page)

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661 Andersen Drive
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Telephone: (412)-921-7090

WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
395						
			GP-GC		WELL GRADED GRAVEL WITH SILT AND SAND, (GP-GC) brown, well graded, angular, fine to coarse grained, moist, loose, no odor, limestone gravels *(continued)*	Stainless Steel 4"x15' Screen, Slot Size 0.020
	GB	WSTF-A11-SB0009-398.0-20230729				
400					400.0 4016.1	
					WELL GRADED GRAVEL WITH SILT AND SAND, (GP-GC) brown, well graded, angular, fine to coarse grained, saturated, soft, no odor, limestone gravels	Dedicated bladder pump: QED Well Wizard PFAS Free Model P1101H(M)-Z Pump inlet depth 401.5
405						
410			GP-GC			
415						10' Sump
					419.0 3997.1	

Bottom of borehole at 419.0 feet.

Notes: Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983 (NAD83). Vertical data for well elevations are referenced in North American Vertical Datum, 1988 (NAVD88)

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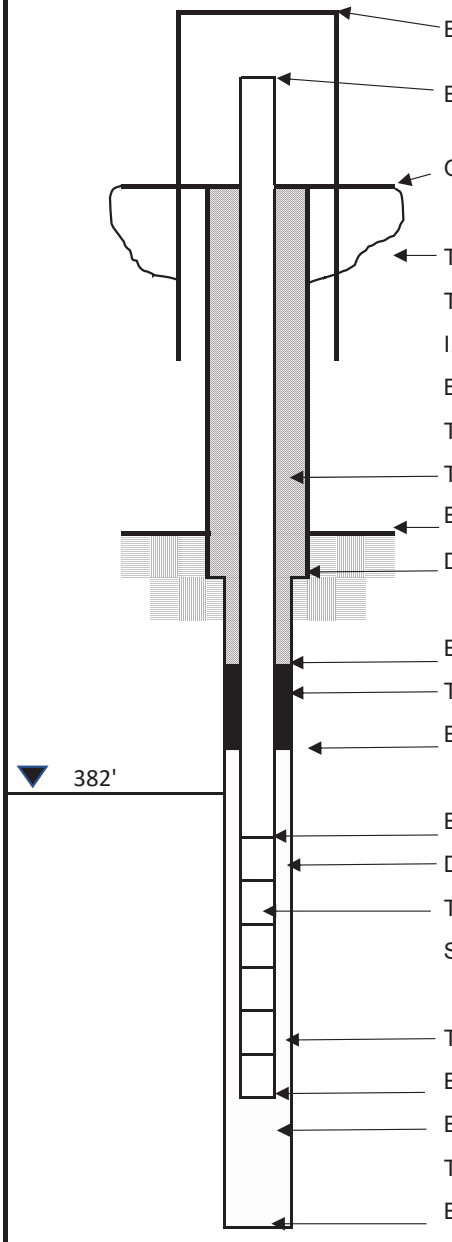
TETRA TECH

Well No. 600C-005-GW

MONITORING WELL CONSTRUCTION SHEET
OVERBURDEN / BEDROCK - STICK-UP

Project Name NASA WSTF SI	Drilling Co.: Cascade	Boring No.: 600C-005-GW
Project No: 112G09033	Driller: Gerry Woods	Date Completed:7/25-31/2023
Site Name: NASA PFAS SI	Drilling Method: Air Rotary with Casing Hammer	Northing:168059.66 meters
Geologist: Liz Heness	Dev. Method: Surge and Purge	Easting:460152.37 meters



Elevation / Height Top of Protective Casing:	-- /	+3'
Elevation / Height Top of Riser:	4419.03' /	+2.95'
Ground Elevation:	4416.08'	
Type of Surface Seal:	Portland Cement Type II	
Type of Protective Casing:	304 Stainless Steel	
I.D. of Protective Casing:	4.5"	
Borehole Diameter:	11 3/4" (0-240')	
Type of Riser and I.D.:	SCH 80 PVC 4"	
Type of Backfill:	Bentonite grout	
Elevation / Depth Top of Rock:	-- /	--
Depth and Diameter of Surface Casing:	9 5/8" (240-420')	
Elevation / Depth of Seal:	4042.38' /	374'
Type of Seal:	Bentonite Holeplug	
Elevation / Depth Top of Filter Pack:	4035.08' /	381'
Elevation / Depth Top of Screen:	4022.08' /	394'
Diameter of Hole in Bedrock:	N/A	
Type of Screen and I.D.:	Stainless Steel 4"	
Slot Size and Length:	0.020 15'	
Type of Filter Pack:	Silica Sand 10/20 and then 30/65 3' below seal	
Elevation / Depth Bottom of Screen:	4007.08' /	409'
Elevation / Depth Bottom of Filter Pack:	3997.08' /	419'
Type of Backfill Below Filter Pack:	10' sump below filter	
Elevation / Depth Bottom of Hole:	3997.08' /	419'

Not To Scale

Note:
Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983
Vertical data for well elevations are referenced to the North American Datum 1988
QED Well Wizard PFAS Free bladder pump (Model P1101H(M)-Z) installed with pump inlet at a depth of 401.5 feet

Tetra Tech
661 Andersen Drive
Pittsburgh, PA 15320
Telephone: (412)-921-7090

WELL NUMBER: 100-001-GW

CLIENT NASA
PROJECT NAME NASA WSTF PFAS SI
PROJECT NUMBER 112G09033
PROJECT LOCATION White Sands Test Facility, Las Cruces, NM
DATE STARTED 8/6/23 **COMPLETED** 8/13/23
GROUND ELEVATION 4810.49 ft **HOLE SIZE** 9.625" inches
DRILLING CONTRACTOR Cascade
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary with Casing Hammer (ARCH)
AT TIME OF DRILLING ---
LOGGED BY Liz Heness **CHECKED BY** Marvin Dunbar
AT END OF DRILLING ---
NOTES Northing : 167180.70 meters Easting: 466407.77 meters
AFTER DRILLING 185.00 ft / Elev 4625.49 ft

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						Casing Top Elev: 4813.86 (ft) Casing Type: Steel
	GB	WSTF-A03-SB0001-000.5-20230802			POORLY GRADED GRAVEL WITH SAND, (GP) light tannish gray, poorly graded, fine to coarse grained, dry, loose, non plastic, no odor	Type II Portland Cement Bentonite Grout
5	GB	WSTF-A03-SB0001-0305-20230810	GP			
10	GB	WSTF-A03-SB0001-099.5-20230806			10.0 4800.5	
					POORLY GRADED GRAVEL WITH SAND, (GP) light tannish brown and gray, poorly graded, subrounded, fine to coarse grained, dry, loose, non plastic, no odor, clasts are a mix of limestone and quartz	
15			GP			
20					20.0 4790.5	
					POORLY GRADED GRAVEL WITH SAND, (GP) light tannish brown and gray, poorly graded, subrounded, fine to coarse grained, dry, loose, non plastic, no odor	
25			GP			
30					30.0 4780.5	
					POORLY GRADED GRAVEL WITH SAND, (GP) light tannish brown and gray, poorly graded, subrounded, fine to coarse grained, dry, non plastic, no odor	
35			GP			

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Notes: Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983 (NAD83). Vertical data for well elevations are referenced in North American Vertical Datum, 1988 (NAVD88)

(Continued Next Page)

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WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
35					POORLY GRADED GRAVEL WITH SAND, (GP) light tannish brown and gray, poorly graded, subrounded, fine to coarse grained, dry, non plastic, no odor *(continued)*	
40			GP			
45						
50					50.0 4760.5	
	GB	WSTF-A03-SB0001-5050.5-20230806			POORLY GRADED GRAVEL WITH SILT AND SAND, (GP) gray, poorly graded, subangular, fine grained, dry, loose, non plastic, no odor, clasts are light gray limestone, some caliche	
55						
60			GP			
65						
70						
75						

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(Continued Next Page)

Tetra Tech
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WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
75			GP		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP) gray, poorly graded, subangular, fine grained, dry, loose, non plastic, no odor, clasts are light gray limestone, some caliche *(continued)*	
80						
85						
90						
95	GB	SB0001-095.5-20230806				
100					100.0 4710.5 Gray, Bedrock, andesite	
105						
110						
115						

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(Continued Next Page)

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WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
115					Gray, Bedrock, andesite *(continued)*	
120					120.0 4690.5	
					Gray, Bedrock, chatter	
125						
130						
135						
140						
145						
150						
155						

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CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
155					Gray, Bedrock, chatter *(continued)*	
160					160.0 4650.5 Gray, Bedrock, red oxidation on chips	
165						
170					170.0 4640.5 Gray, Bedrock, white veins, reactive to HCL	
175						
180					180.0 4630.5 Gray, Bedrock, hard veining in chips	
185						
190					190.0 4620.5 Reddish gray, Bedrock, thin layers of red clay on andesite chips	
195						

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CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
195					Reddish gray, Bedrock, thin layers of red clay on andesite chips *(continued)*	
200					200.0 4610.5 Reddish gray, Bedrock, fine grained andesite, calcite rhoms	
205						
210						
215						Bentonite Holeplug
220					220.0 4590.5 Reddish gray, Bedrock, small amounts of calcite	Silica Sand 30/65 (217' to 220') Silica Sand 10/20 (220' to 260')
225						
230					230.0 4580.5 Reddish gray, Bedrock, reddish brown clay	Stainless Steel 4"x15' Screen, Slot Size 0.020
235						

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CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
235					Reddish gray, Bedrock, reddish brown clay *(continued)*	
240						Dedicated bladder pump: QED Well Wizard PFAS Free Model P1101H(M)-Z pump inlet depth 240'
245						
250					250.0 4560.5 Reddish gray, Bedrock, andesite chips and reddish brown clay	5' Sump
255						
260						Bentonite Holeplug
265						
270						
275						

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CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
275					Reddish gray, Bedrock, andesite chips and reddish brown clay *(continued)*	
280					280.0 4530.5	
					Reddish gray, Bedrock, andesite chips and reddish brown clay, small amount of water	
285						
290						
295						
300					300.0 4510.5	
					Reddish gray, Bedrock, andesite chips and reddish brown clay	
305						
310						
315						

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CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
315					Reddish gray, Bedrock, andesite chips and reddish brown clay *(continued)*	
320						
325						
330						
335						
340						
345	GB	WSTF-A03-SB0001-345.5-20230807		345.0	Bottom of borehole at 345.0 feet. 4465.5	

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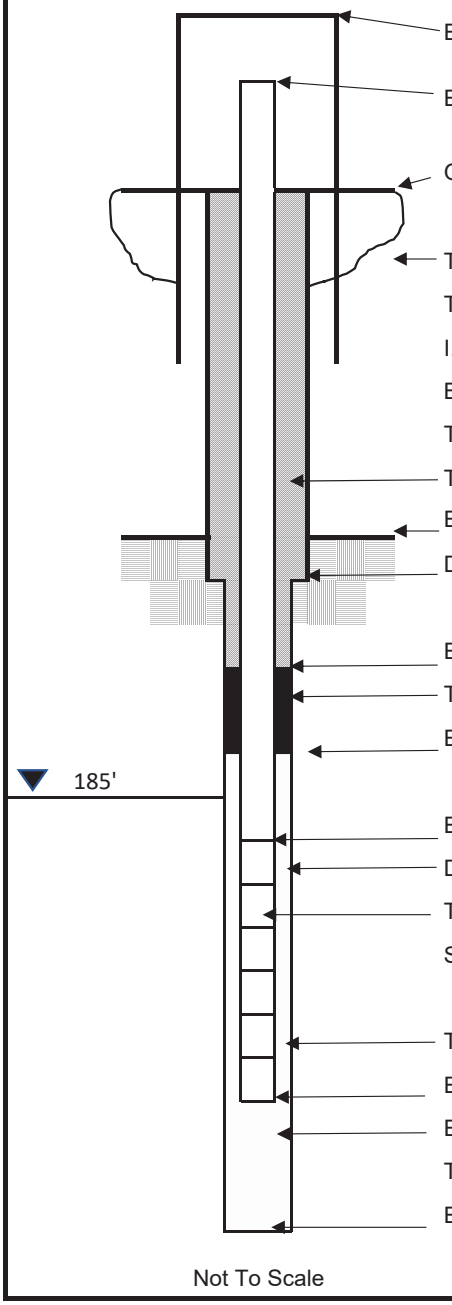
TETRA TECH

Well No. 100-001-GW

MONITORING WELL CONSTRUCTION SHEET
OVERBURDEN / BEDROCK - STICK-UP

Project Name NASA WSTF SI	Drilling Co.: Cascade	Boring No.: 100-001-GW
Project No: 112G09033	Driller: Gerry Woods	Date Completed: 8/6-13/2023
Site Name: NASA PFAS SI	Drilling Method: Air Rotary with Casing Hammer	Northing: 167180.70 meters
Geologist: Liz Heness	Dev. Method: Surge and Purge	Easting: 466407.77 meters



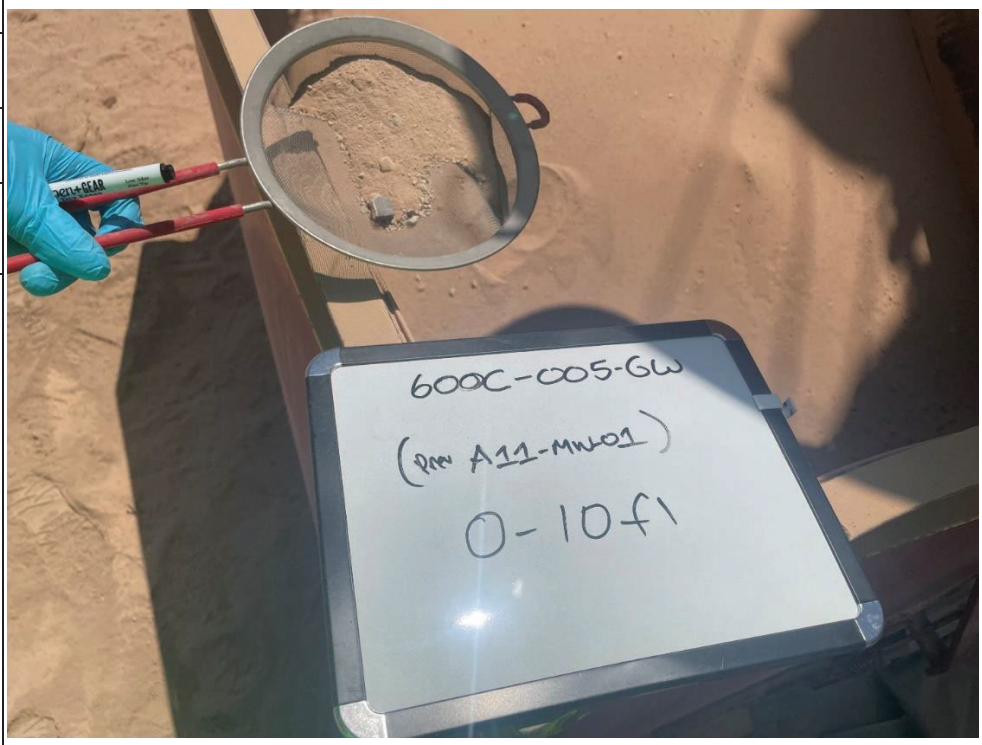
Elevation / Height Top of Protective Casing:	--	--
Elevation / Height Top of Riser:	4813.86'	+3.37'
Ground Elevation:	4810.49'	
Type of Surface Seal:	Portland Cement Type II	
Type of Protective Casing:	Steel	
I.D. of Protective Casing:	4.5"	
Borehole Diameter:	9 5/8" 0-100'	
Type of Riser and I.D.:	SCH 80 PVC 4"	
Type of Backfill:	Bentonite grout	
Elevation / Depth Top of Rock:	4710.49'	100'
Depth and Diameter of Surface Casing:	N/A	
Elevation / Depth of Seal:	4598.49'	212'
Type of Seal:	Bentonite Holeplug	
Elevation / Depth Top of Filter Pack:	4593.49'	217'
Elevation / Depth Top of Screen:	4580.49'	230'
Diameter of Hole in Bedrock:	8.5" depth of 100-345'	
Type of Screen and I.D.:	Stainless Steel 4"	
Slot Size and Length:	0.020 20'	
Type of Filter Pack:	Silica Sand 10/20 and then 30/65 3' below seal	
Elevation / Depth Bottom of Screen:	4560.49'	250'
Elevation / Depth Bottom of Filter Pack:	4550.49'	260'
Type of Backfill Below Filter Pack:	Holeplug to below 5' sump	
Elevation / Depth Bottom of Hole:	4465.49'	345'

Not To Scale

Note:
Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983
Vertical data for well elevations are referenced to the North American Datum 1988
QED Well Wizard PFAS Free bladder pump (Model P1101H(M)-Z) installed with pump inlet at a depth of 240 feet

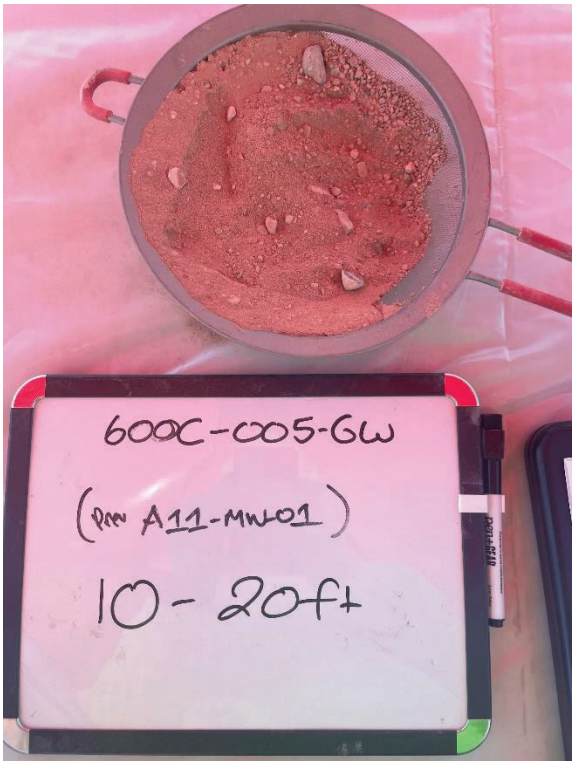
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 1 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** Overview of Air Rotary Drill Rig and logging workstation at 600C-005-GW	
PHOTO 2 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 0-10 ft – Fine Sand, some silt and clay, trace gravels	

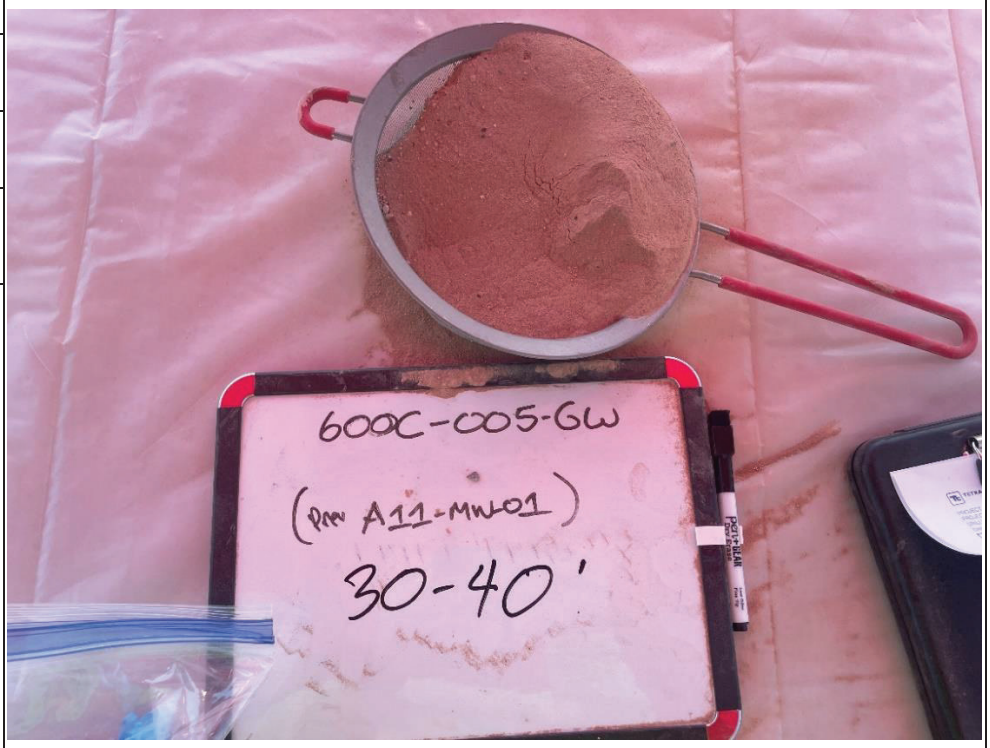
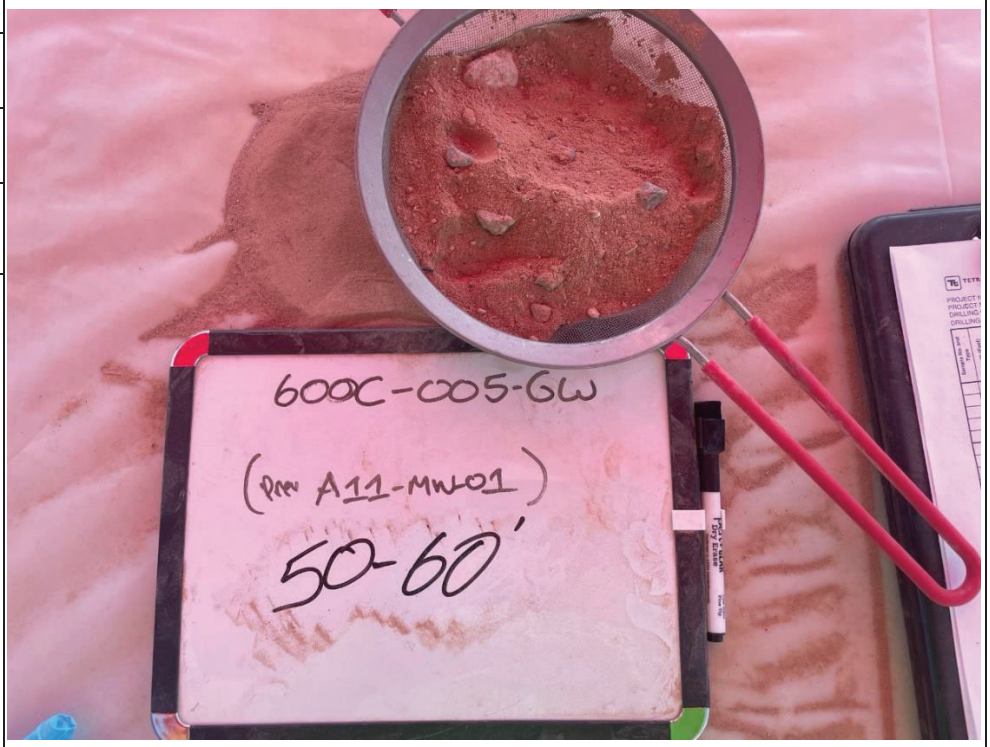
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 3 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 10-20 ft - Fine Sand, some silt and clay, increase in gravels	
PHOTO 4 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 20-30 ft – Silty clay, some coarse sand and small pebbles	

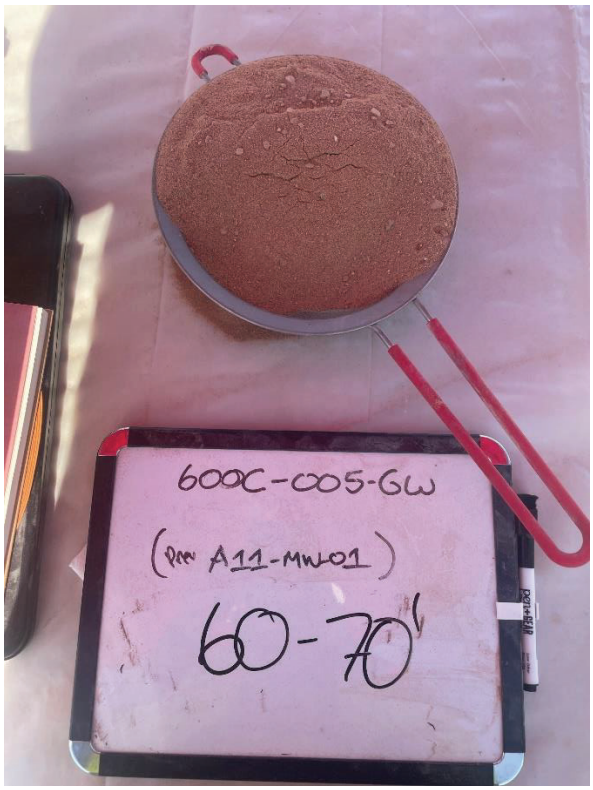
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 5 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 30-40 ft – Silty Clay	
PHOTO 6 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 50-60 ft – Silty clay, some gravels	

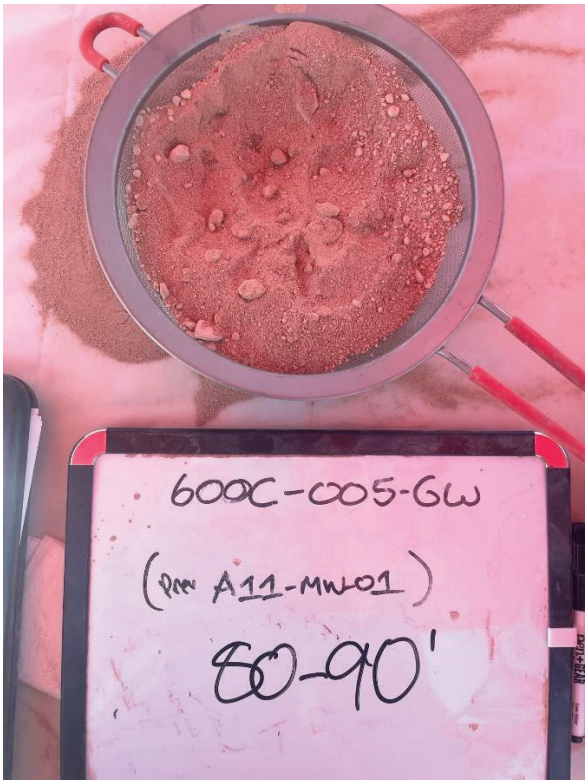
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 7 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 60-70 ft – Silty sand, some gravels	
PHOTO 8 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 70-80 ft – Silty sand, some gravels	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 9 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 80-90 ft – Sandy silt, few gravels	
PHOTO 10 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 90 - 100 ft – Gravelly silty clay, transition into 'clay pebbles'	

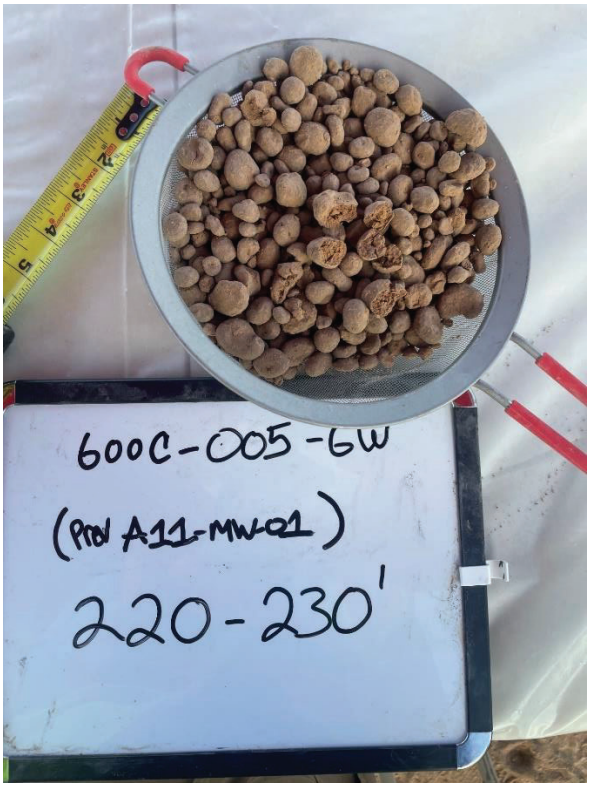
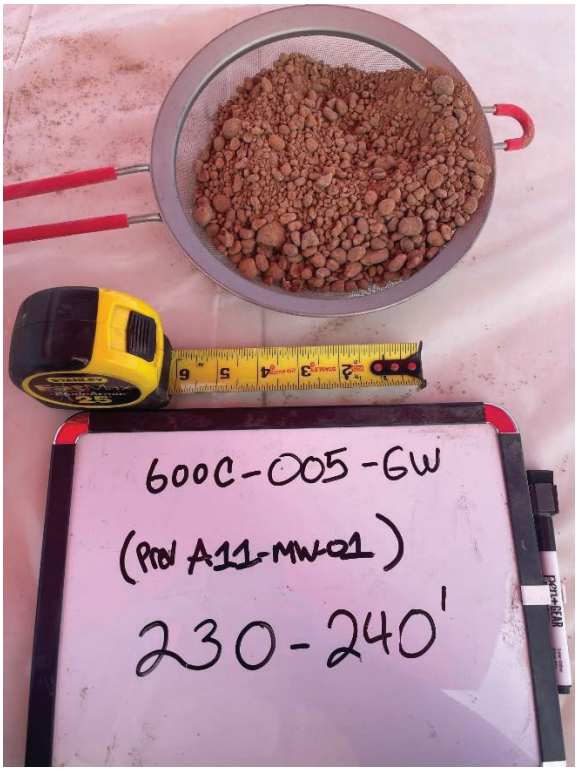
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 11 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 120 - 130 ft – Gravelly Silty clay, smallest trace of moisture and beginning of 'clay pebble' formation	
PHOTO 12 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 210-220 ft – SAA, Clay pebbles, some moisture, increase in pebble size	

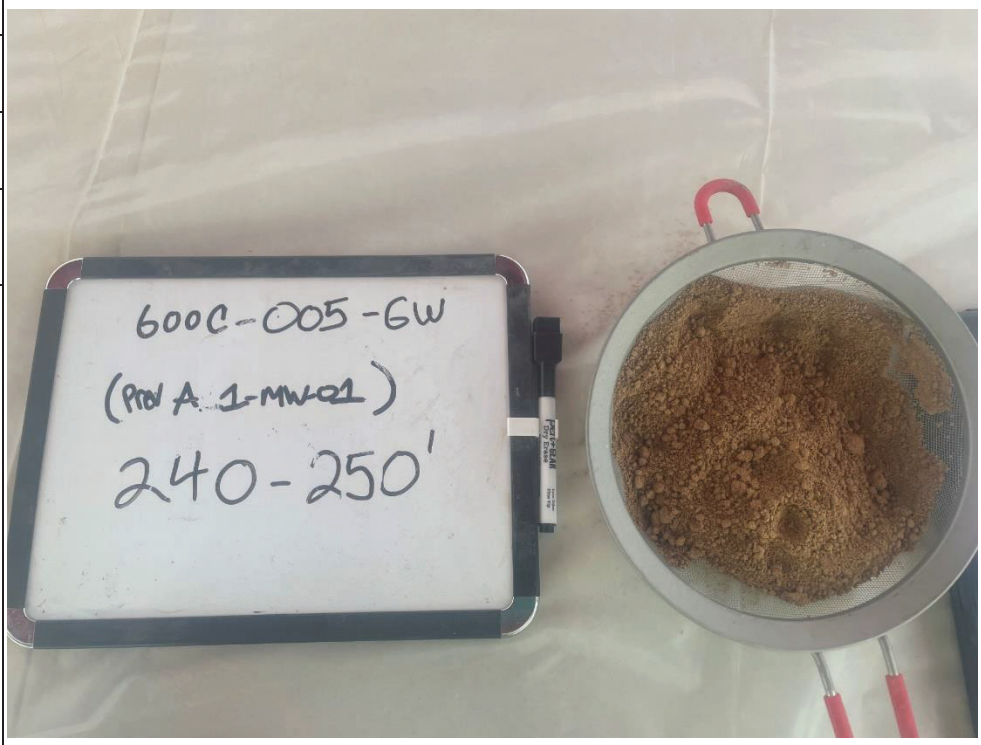
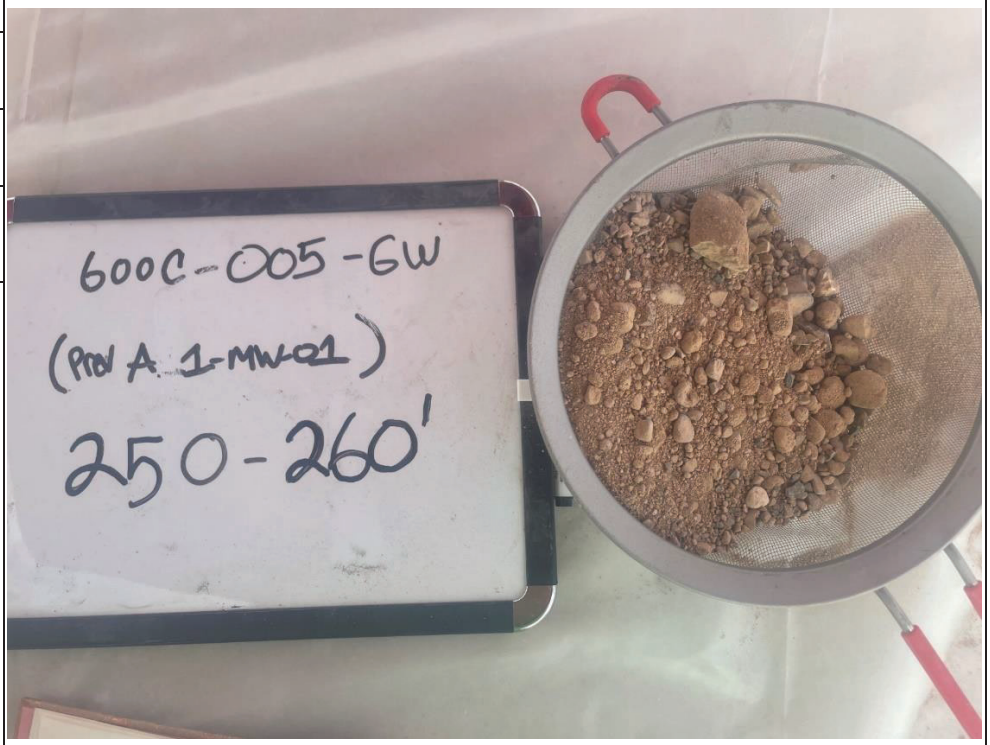
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 13 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 0600C-005-GW 220-230 ft – SAA, Clay pebbles, some moisture, increase in pebble size, broke pebbles in half to show inside texture.	
PHOTO 14 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 230-240 ft – SAA, Clay pebbles, some moisture, decrease in pebble size and silt transition increase.	

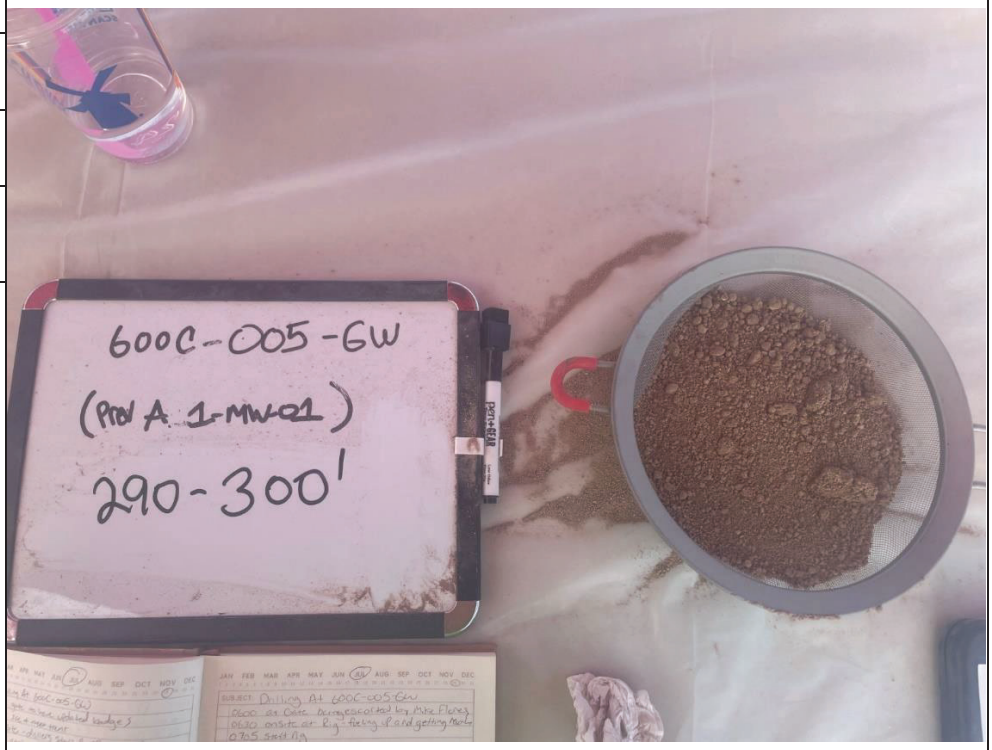
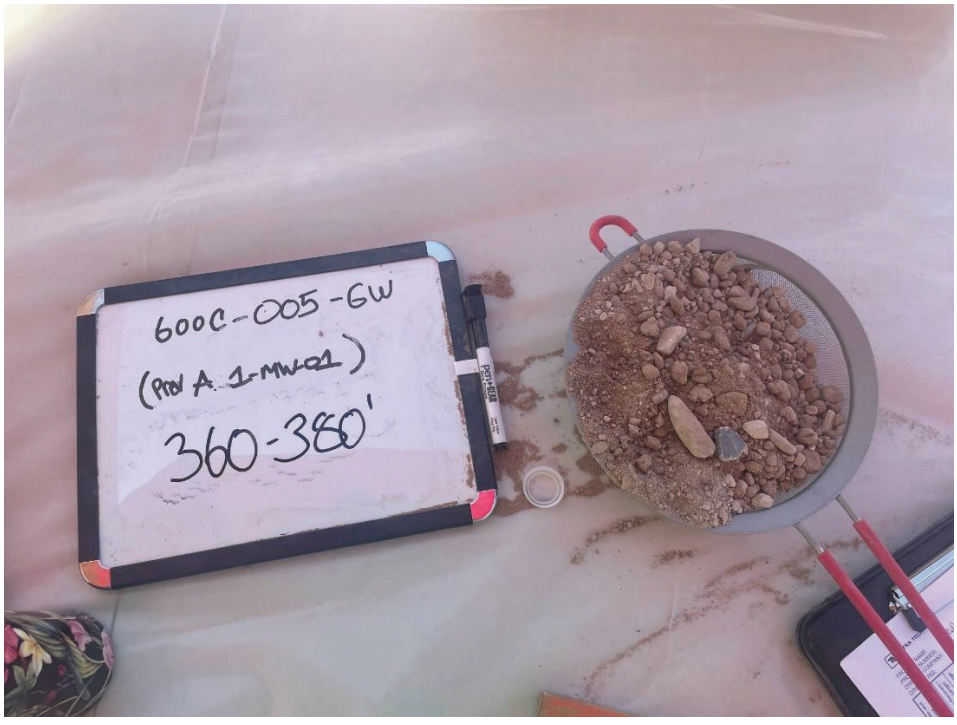
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 15 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 240-250 ft – Transition to a Clayey silt with some pebbles, trace moisture.	
PHOTO 16 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 250-260 ft – Transition to a poorly sorted, gravelly clayey silt, dry.	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 17 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 290-300 ft – Transition to a poorly sorted, gravelly sandy silt, with some clay, dry	
PHOTO 18 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 360-380 ft –Silty sandy gravels. Poorly sorted, dry	

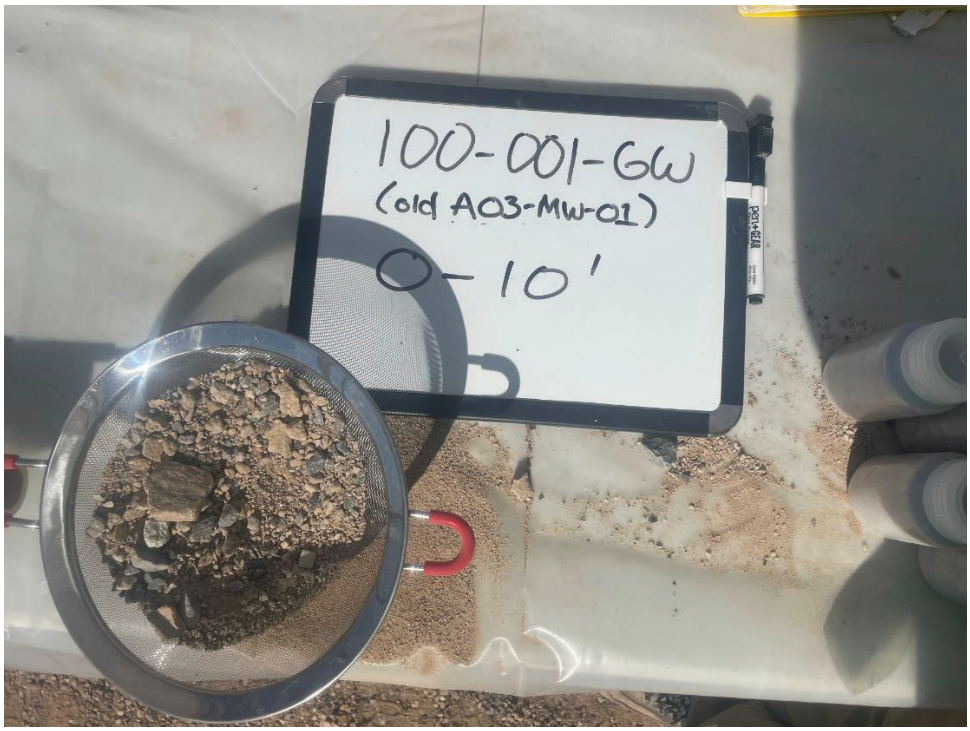
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 19 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 380-400 ft –Silty sandy gravels. Poorly sorted, dry	
PHOTO 20 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW completed	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 21 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** Soil borings for MW100-001-GW Sandy Gravels, dry	
PHOTO 22 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 10 – 20 ft, Sandy Gravels, dry	

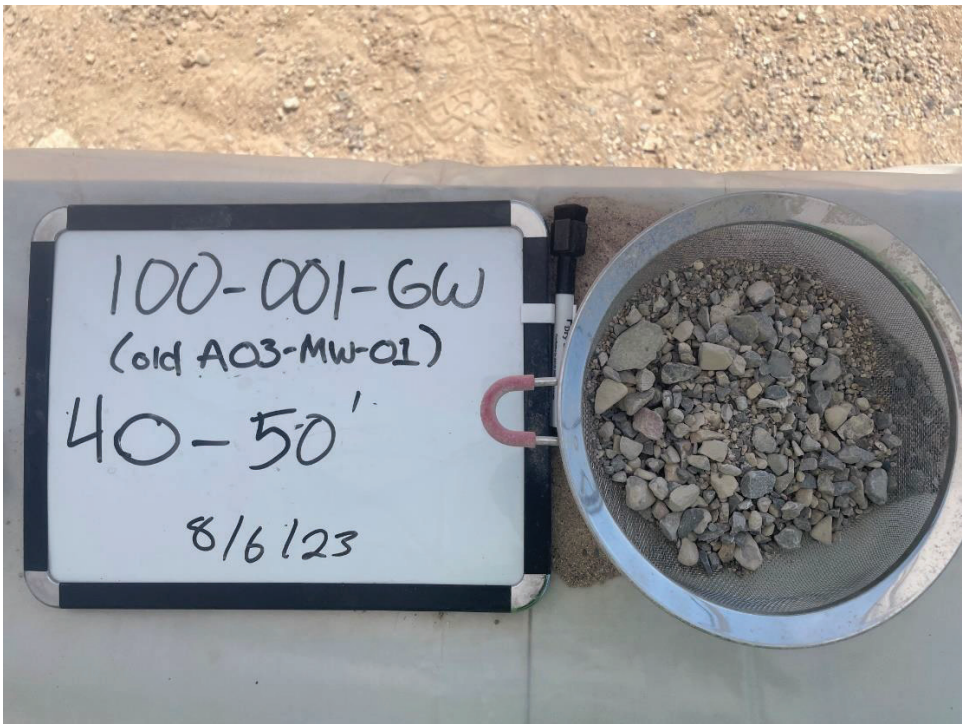
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 23 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 20 – 30 ft, Sandy Gravels, dry	
PHOTO 24 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 30 – 40 ft, Sandy Gravels, dry	

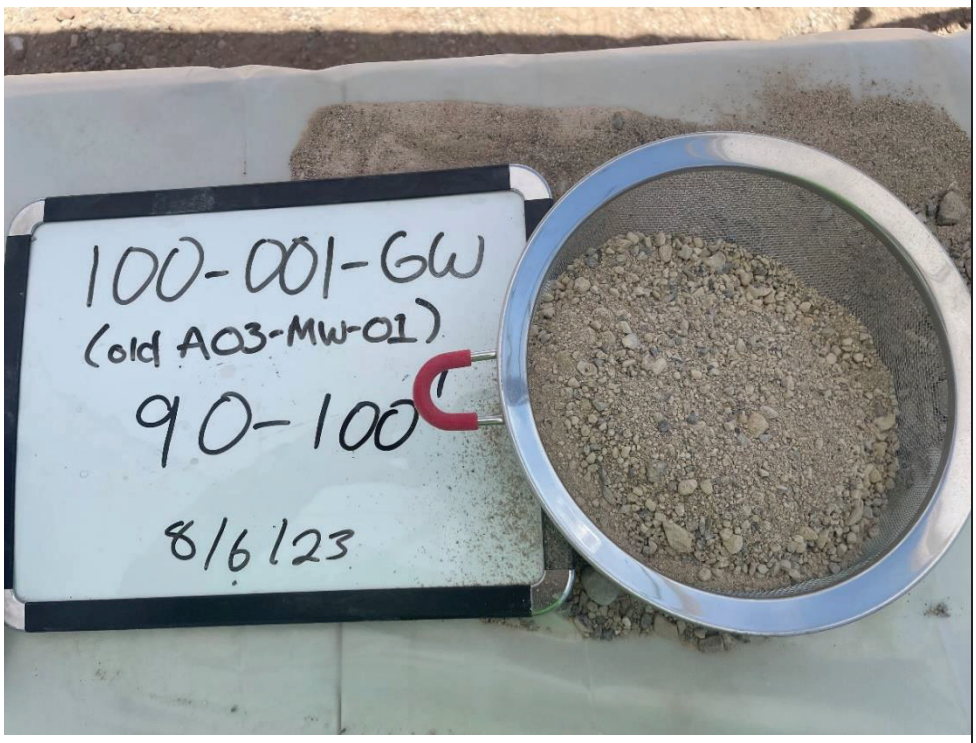
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 25 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 40 – 50 ft, Sandy Gravels, dry	
PHOTO 26 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 60 – 70 ft, Sandy Gravels with silts, dry	

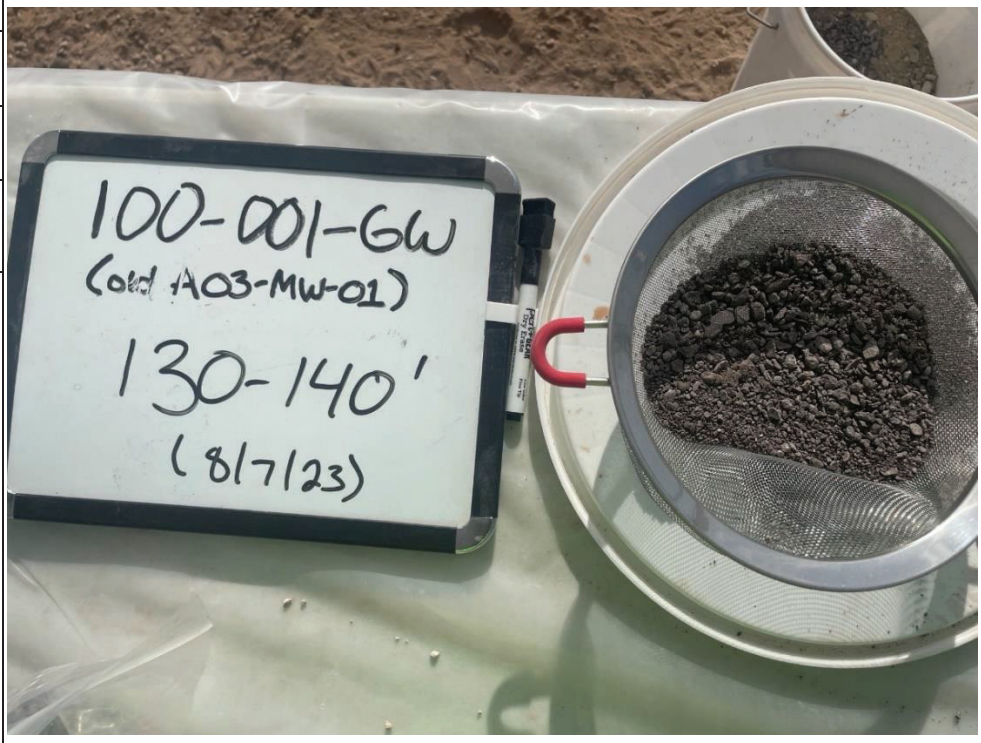
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 27 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 80 – 90 ft, Sandy Gravels with silts, dry	
PHOTO 28 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 90 – 100 ft, Sandy Gravels with silts, dry, bedrock at 100 ft.	

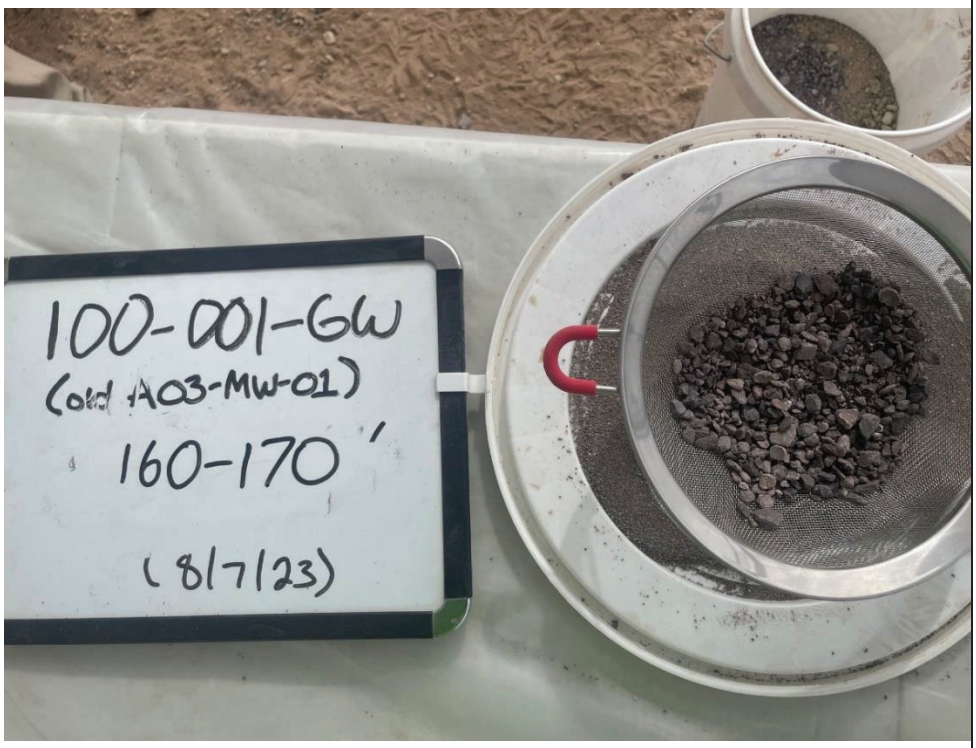
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 29 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 120 – 130 ft, In Bedrock, Andesite, small chips	
PHOTO 30 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 130 – 140 ft, In Bedrock, Andesite, small chips	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 31 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 150 – 160 ft, In Bedrock, Andesite, small chips, hint of red oxidation on chips	
PHOTO 32 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 160 – 170 ft, In Bedrock, Andesite, small chips	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 33 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 170 – 180 ft, In Bedrock, Andesite, small chips, possible fracture zone, calcite veining	
PHOTO 34 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 180 – 190 ft, In Bedrock, Andesite, small chips, veining in chips	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 35 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 200 – 210 ft, In Bedrock, Andesite, small pebbles of clay, calcite rhomb crystals, moist	
PHOTO 36 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 210 – 220 ft, In Bedrock, Andesite, small pebbles of clay, calcite rhomb crystals, moist	

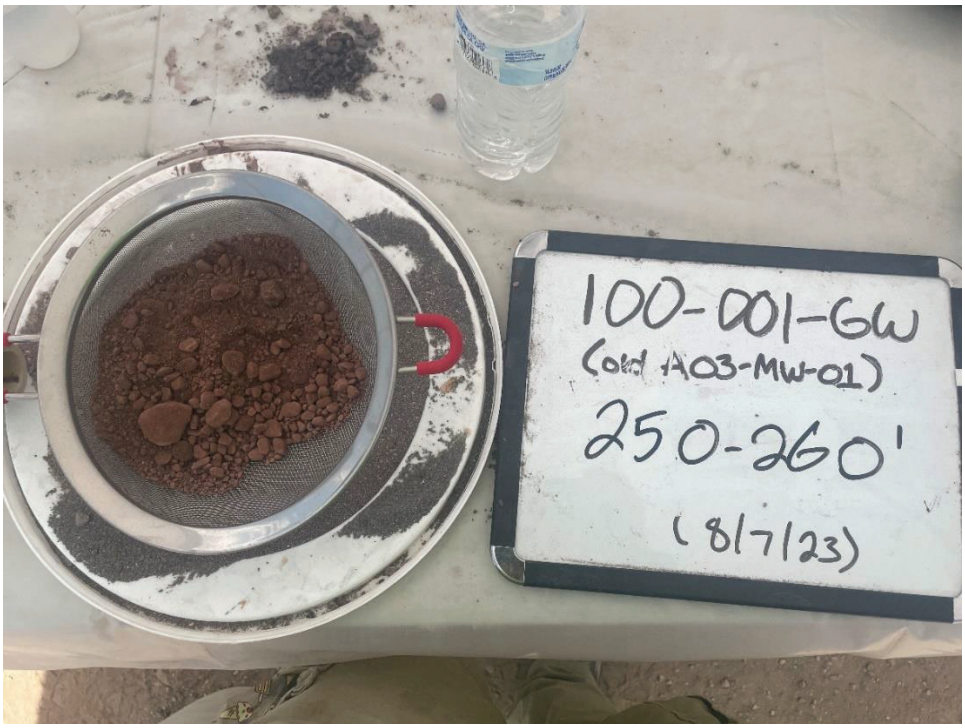
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 37 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 210 – 220 ft, In Bedrock, Andesite, small pebbles of clay, calcite rhomb crystals, moist	
PHOTO 38 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 230 – 240 ft, In Bedrock, Andesite, clay coating chips, moist	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 39 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 250 – 260 ft, In Bedrock, Andesite, clay coating chips, moist	
PHOTO 40 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW 100-001-GW after installation	

SOIL & SEDIMENT SAMPLE LOG SHEET

TETRA TECH

Event:	PFAS SI
Project Site Name:	WSTF PFAS SI
Project No.:	112G09033

Sample ID No.:	WSTF-A03-SB0001	**Sampled By:**	Liz Heness
Sample Location:	100-001	**Sample Date:**	8/2/2023 - 8/7/2023
QA/QC Duplicate ID:	WSTF-FD-20230806-09	**MS/MSD Collected:**	NO

MATRIX / CONCENTRATION:

[X] Surface Soil

[X] Subsurface Soil — **[ ] Low Concentration**

[ ] Sediment — **[ ] High Concentration**

GRAB SAMPLE DATA:

Time:	multiple	**Depth Interval**	**Color**	**Description (Sand, Silt, Clay, Moisture, etc.)**
Method:	Grab			
Monitor Reading (ppm):	0			

MULTIPLE / COMPOSITE SAMPLE DATA:

Method: — **PID Readings (Range in ppm):**

Sample ID	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
WSTF-A03-SB0001-000.5-20230802	915	0-0.5'	lt tan grey	Sand with large SA gravels
WSTF-A03-SB0001-009.5-20230806	930	9-9.5'	lt tan brwn grey	Sand with large SA gravels
WSTF-FD-20230806-09	0000	'	'	Sand with large SA gravels
WSTF-A03-SB0001-050.5-20230806	1120	50-50.5'	lt tan brwn grey	Sand with large SA gravels
WSTF-A03-SB0001-095.5-20230806	1300	95-95.5'	lt tan brwn grey	Sand with large SA gravels
WSTF-A03-SB0001-345.5-20230807	1630	345-345.5	Reddish brwn	Clay
WSTF-A03-SB0001-005.0-20230810	800	3-5	lt tan grey	Sand with large SA gravels

SAMPLE COLLECTION INFORMATION:

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
PFAS	QSM Table B-15	None	1 per sample	125	HDPE	Yes

OBSERVATIONS / NOTES:

MAP:



Coordinates:	N	E	
NAD83 Harn State Plane NM Central meters	167180.7	466407.77	

Signature(s): Elizabeth Heness

SOIL & SEDIMENT SAMPLE LOG SHEET

TETRA TECH

Event:	PFAS SI
Project Site Name:	WSTF PFAS SI
Project No.:	112G09033

Sample ID No.:	WSTF-A11-SB0009-398.0-20230729	**Sampled By:**	EH
Sample Location:	600C-005	**Sample Date:**	7/29/2023
QA/QC Duplicate ID:		**MS/MSD Collected:**	YES

MATRIX / CONCENTRATION:

- [ ] Surface Soil
- [x] Subsurface Soil
- [ ] Sediment
- [ ] Low Concentration
- [ ] High Concentration

GRAB SAMPLE DATA:

		Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:	13:45			
Method:	Grab			
Monitor Reading (ppm):	0	398'	Md brwn	Sandy silty clay, wet

MULTIPLE / COMPOSITE SAMPLE DATA:

Method: **PID Readings (Range in ppm):**

Sample ID	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)

SAMPLE COLLECTION INFORMATION:

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
PFAS	QSM Table B-15	None	3	125	HDPE	Yes

OBSERVATIONS / NOTES:

Sample collected from borehole during installation of monitoirng well A11-MW01

MAP:



Coordinates:	N	E	
NAD83 Harn State Plane N meters	**168059.66**	460152.37	

Signature(s): Elizabeth Heness

TETRA TECH

MONITORING WELL DEVELOPMENT RECORD

Event: NASA WSTF SI
Project Site Name: White Sands Test Facility
Project Number: 112G09033

WELL INFORMATION:

Well No.:	600C-500-GW	**Casing ID (in.):**	4
Drilling Co.:	Cascade	**Depth to Bottom (ft.):**	421.55 BTOC
Date Installed:	7/30-31/23	**Static Water Level Before (ft.):**	388.4
Date Developed:	8/9-10/23	**Static Water Level After (ft.):**	385.1
Dev. Method:	Bailing, surge-purge	**Screen Length (ft.):**	15'
Pump Type:	Grunfos	**Specific Capacity:**	--
Developed By:	Dan Hawkins-Wood		

DEVELOPMENT DATA:

Time	Estimated Sediment Thickness (ft.)	Cumulative Water Volume (Gal.)	Water Level (ft. below TOC)	Temp. (C°)	pH (S.U.)	SC (µS/cm)	Turbidity (NTU)	Remarks: (odor, color, etc.)
Date: 08/09/2023								
1330	--	--	--	--	--	--	--	Bailer used to remove coarse sediment
1422	--	10	--	--	--	--	--	Bailed 10 gallons, DTW 388.55
1432	--	--	--	--	--	--	--	Surging
1610	--	20	--	--	--	--	--	Bailed 10 gallons, DTW 388.55
Date: 08/10/2023								
1325	--	--	--	--	--	--	--	Turbid
1430	0	1 gal/min	385.9	28.5	6.1	822	18.7	
1440	0	1 gal/min	385.9	27.5	6.55	803	5.31	
1500	0	3 gal/min	385.92	28	6.51	803	4.77	
1510	0	3 gal/min	385.95	28.2	6.57	808	3.46	
1520	0	3 gal/min	385.92	27.2	6.55	794	3.25	
1527	0	300	--	--	--	--	--	Off WL after 385 ft

TETRA TECH

MONITORING WELL DEVELOPMENT RECORD

Event: NASA WSTF SI
Project Site Name: White Sands Test Facility
Project Number: 112G09033

WELL INFORMATION:

Well No.:	100-001-GW	**Casing ID (in.):**	4
Drilling Co.:	Cascade	**Depth to Bottom (ft.):**	258.6
Date Installed:	8/9-10/23	**Static Water Level Before (ft.):**	175.56
Date Developed:	8/13-15/23	**Static Water Level After (ft.):**	222.8
Dev. Method:	Bailing, surge-purge	**Screen Length (ft.):**	20'
Pump Type:	Grunfos	**Specific Capacity:**	--
Developed By:	Dan Hawkins-Wood		

DEVELOPMENT DATA:

Time	Estimated Sediment Thickness (ft.)	Cumulative Water Volume (Gal.)	Water Level (ft. below TOC)	Temp. (C°)	pH (S.U.)	SC (mS/cm)	Turbidity (NTU)	Remarks: (odor, color, etc.)
Date: 08/13/2023								
1215	--	0	182.2	--	--	--	--	Bailed 5 Gallons - low recharge well
1246	--	5	180.05	--	--	--	--	Surged
1250	--	10	--	--	--	--	--	Bailed ~5 Gallons
1313	--	--	186.7	--	--	--	--	Set up pump after surge
1500	--	1 gal/min	--	--	--	--	--	Start Purge, turbid
1510	--	--	205	--	--	--	--	
1520	--	--	215	--	--	--	--	
1533	--	--	230.4	--	--	--	--	Cloudy water/ lt grey
1543	--	--	235	--	--	--	--	
1604	--	--	254	--	--	--	--	Turned off pump to recharge - removed 1 well volume
Date: 08/14/2023								
645	--	--	181	--	--	--	--	
652	--	--	205	--	--	--	--	Cloudy water/ lt grey
658	--	--	214	--	--	--	--	
716	--	--	235	--	--	--	--	
739	--	~130	--	--	--	--	--	Turned off pump to recharge - removed 2 well volume
1458	--	--	191	25.8	7.97	651	110	

TETRA TECH

MONITORING WELL DEVELOPMENT RECORD

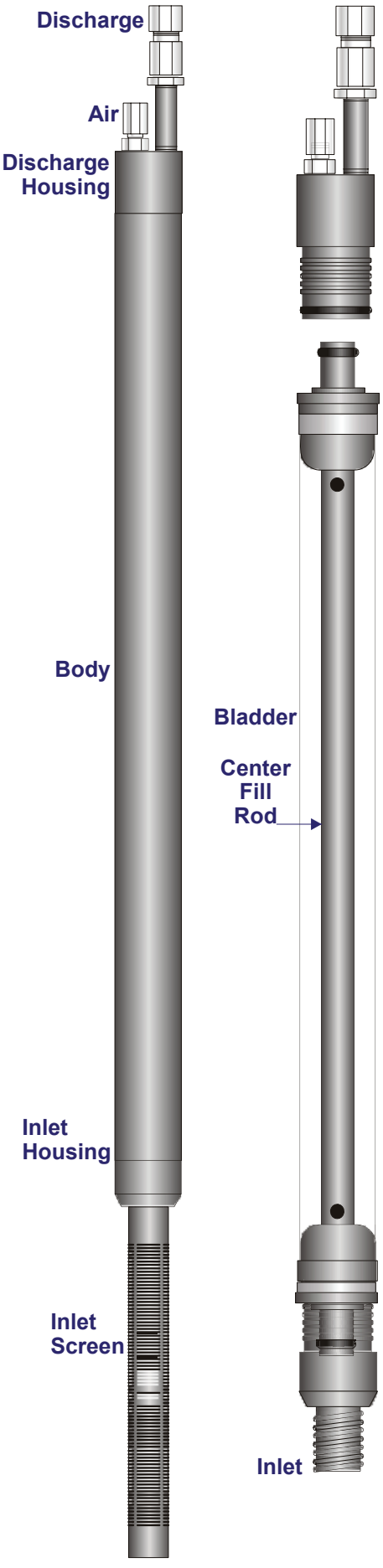
Event: NASA WSTF SI
Project Site Name: White Sands Test Facility
Project Number: 112G09033

WELL INFORMATION:

Well No.:	100-001-GW	**Casing ID (in.):**	4
Drilling Co.:	Cascade	**Depth to Bottom (ft.):**	258.6
Date Installed:	8/9-10/23	**Static Water Level Before (ft.):**	175.56
Date Developed:	8/13-15/23	**Static Water Level After (ft.):**	222.8
Dev. Method:	Bailing, surge-purge	**Screen Length (ft.):**	20'
Pump Type:	Grunfos	**Specific Capacity:**	--
Developed By:	Dan Hawkins-Wood		

DEVELOPMENT DATA:

Time	Estimated Sediment Thickness (ft.)	Cumulative Water Volume (Gal.)	Water Level (ft. below TOC)	Temp. (C°)	pH (S.U.)	SC (mS/cm)	Turbidity (NTU)	Remarks: (odor, color, etc.)
1505	--	--	213	24.8	7.54	687	37.4	
1510	--	--	222	24.1	7.81	671	32	
1520	--	--	234	25.9	7.98	688	29.1	
1525	--	--	242	25.7	8	688	22.4	
1530	--	--	244	25.9	8	695	23	
1535	--	--	246	26	8.01	696	43.1	
1540	--	--	252	26.1	7.98	727	86.8	Turned off pump to recharge - removed 3 well volume
Date: 08/15/2023								
700	--	--	183.9	21.4	8.68	601	59.3	
705	--	--	204.5	21.1	7.63	660	22.1	
710	--	--	210.5	21.4	7.6	666	14.9	
715	--	--	220	21.6	7.75	662	17.7	
720	--	3 gal/min	--	--	--	--	--	Increased flow and pumped 4th well volume
730	--	217	--	--	--	--	--	Pumped dry



PUMP TYPE:
Positive Air Displacement

DIMENSIONS:

Pump O.D.:	1.66" (42 mm)
Length:	42.25" (107.3 cm)
Length w/Screen:	48.25" (122.5 cm)
Screen Slot Size:	.010
Weight:	4.05 lbs. (1.8 kg)

MATERIALS:
PVC, SS EPDM Flouropolymer-free

FITTINGS:
Stainless Steel Compression

Discharge Size:	1/2" O.D., 3/8" I.D. (12.7 mm / 9.5 mm)
Air Supply Size:	1/4" O.D., 3/16" I.D. (6.3 mm / 4.7 mm)
(M) Discharge Size:	3/8" O.D., 1/4" I.D. (9.5 mm / 6.3 mm)

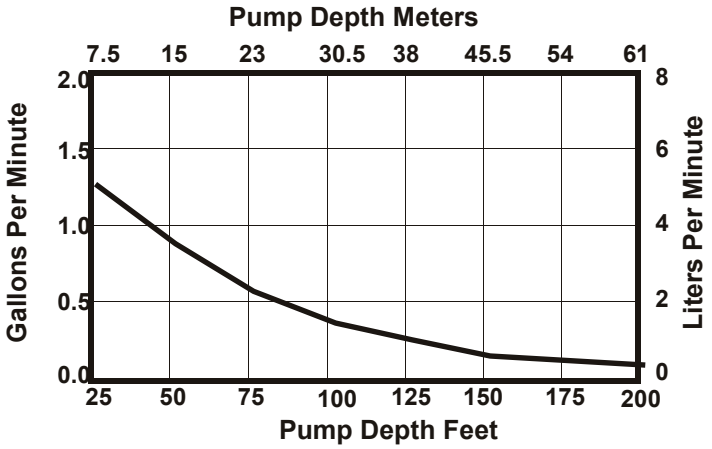
PUMP PERFORMANCE:

MAXIMUM LIFT:
600 Feet (182.8 m)

PUMP STROKE VOLUME:

Liters	Milliliters	Gallons	Ounces
.395	395	.10	12.8

PUMP FLOW RATES:



NOTE: Flow rates are based on a pump submergence of 25' (7.5 m), 1/2" (12.7 mm) discharge tubing and an operating gas pressure of 100 P.S.I. (7 bar) from an 3111HR air source/controller.

ACCESSORIES:

P/N 37789	Inlet Screen 6" (15.2 cm) PVC
P/N 41933	Bladder Cartridge
P/N 35052	Clamp Hand Tool

P/N 2163 REV 11-7-02

Installed 9-12-23

2 new wells

QED PUMP CERTIFICATION

Tim Wheeler — Quality Certification Manager

8/23/2023 — Date

P1101HM-Z — Pump Model

All Pump 052302 — Batch Serial Number

Wells: GOC-005-GW-402

If you need further information on QED's Pump Certification Program please contact QED Environmental Systems at 1-800-624-2026

QED PUMP CERTIFICATION

Tim Wheeler — Quality Certification Manager

8/23/2023 — Date

P1101HM-Z — Pump Model

052302 — Batch Serial Number

Wells: 100-OOOI-GW-240

If you need further information on QED's Pump Certification Program please contact QED Environmental Systems at 1-800-624-2026

Tetra Tech, Inc. Groundwater Sampling Sheet

SITE NAME: **NASA WSTF**		SITE LOCATION: **White Sands Test Facility, Dona Ana County, NM**
LOCATION ID: **A03-100-001-GW**	SAMPLE ID: **WSTF-A03-100-001-GW-240-20230913** Sample depth (ddd)=Top of Screen (feet bls)	DATE: **09/13/2023**

PURGING DATA

Static Depth to Water (feet): 169.41	CASING HEIGHT (feet als): NA	STATIC DEPTH TO WATER (feet bls) = DTW (btoc) - Casing Height (feet als): NA	WELL SCREEN INTERVAL DEPTH (feet bls): 230-250

WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/8	PURGE PUMP TYPE OR BAILER: Bladder Pump	TOP DEPTH = top of screen or depth to water which ever is greatest (feet bls): NA	BOTTOM DEPTH (feet bls): NA

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)

NA Liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)

NA Liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 240	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 240	PURGING INITIATED AT: 1040	PURGING ENDED AT: 1105	TOTAL VOLUME PURGED (Liters):

TIME	VOLUME PURGED (Liters)	CUMUL. VOLUME PURGED (Liters)	PURGE RATE (mlpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	ORP (mV)	COLOR (describe)
1045	0.5	1.5	100	170.26	6.93	20.7	9	6.93	1.98	243.0	Clear
1050	0.5	2.0	100	170.42	7.70	20.9	717	7.70	1.98	215.4	-
1055	0.5	2.5	100	170.47	7.68	20.8	744	7.68	2.74	220.6	-
1100	0.5	3.0	100	170.54	7.68	20.9	730	7.68	2.54	220.3	-
1105	0.5	2.5	100	170.55	7.68	20.8	725	7.68	2.83	219.7	-
Stable											
1110	Sample	Collected									

WELL CAPACITY (Liters Per Foot): **0.75"** = 0.076; **1"** = 0.15; **1.25"** = 0.23; **2"** = 0.61; **3"** = 1.40; **4"** = 2.46; **5"** = 3.86; **6"** = 5.57; **12"** = 22.26
TUBING INSIDE DIA. CAPACITY (Liters/Ft.): **1/8"** = 0.002; **3/16"** = 0.005; **1/4"** = 0.0098; **5/16"** = 0.015; **3/8"** = 0.023; **1/2"** = 0.038; **5/8"** = 0.09

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Aaron Kupper /Tetra Tech	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT: 1110	SAMPLING ENDED AT: 1120

PUMP OR TUBING DEPTH IN WELL (feet): 240	SAMPLE PUMP FLOW RATE (mL per minute): 100	TUBING MATERIAL CODE: HDPE

FIELD DECONTAMINATION: **(Y)** N	FIELD-FILTERED: Y **(N)** FILTER SIZE: ____ µm Filtration Equipment Type: _____	DUPLICATE: Y **(N)**

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
1	2	HDPE	250 mL	4°C	NONE	See Above	PFAS – QSM Table B-15	APP

REMARKS: erroneous Cond reading first reading. Checked meter with cal solution, good. Purged 1L dialing in settings. Pump pressure 200psi. Discharged 500ml each cycle. Set to 1 cycle every 5 min for a flow rate of 100ml/min. Controller settings: refill 275 seconds, discharge 25 seconds.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O** = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **PP =** Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

Tetra Tech, Inc. Groundwater Sampling Sheet

SITE NAME: **NASA WSTF**		SITE LOCATION: **White Sands Test Facility, Dona Ana County, NM**
LOCATION ID: **A11-600C-005-GW**	SAMPLE ID: **WSTF-A11-600C-005-GW-402-20230913** Sample depth (ddd)=Top of Screen (feet bls)	DATE: **09/13/2023**

PURGING DATA

Static Depth to Water (feet): 386.65	CASING HEIGHT (feet als): NA	STATIC DEPTH TO WATER (feet bls) = DTW (btoc) - Casing Height (feet als): NA	WELL SCREEN INTERVAL DEPTH (feet bls): 394 to 409	
WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/8	PURGE PUMP TYPE OR BAILER: Bladder Pump	TOP DEPTH = top of screen or depth to water which ever is greatest (feet bls): NA	BOTTOM DEPTH (feet bls): NA

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)

NA Liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)

NA Liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 402	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 402	PURGING INITIATED AT: 1310	PURGING ENDED AT: 1430	TOTAL VOLUME PURGED (Liters): 12.6

TIME	VOLUME PURGED (Liters)	CUMUL. VOLUME PURGED (Liters)	PURGE RATE (mlpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	ORP (mV)	COLOR (describe)
1330	0.8	3.8	160	385.64	7.46	20.6	889	6.07	9.09	221.4	Clear
1335	0.8	4.6	160	385.64	7.42	20.7	971	4.71	7.65	223.2	-
1340	0.8	5.4	160	385.64	7.41	20.7	970	4.83	5.25	224.2	-
1345	0.8	6.2	160	385.64	7.40	20.7	969	4,81	13.9	224.4	-
1350	0.8	7.0	160	385.64	7.40	20.7	967	4.76	24.3	224.6	-
1355	0.8	7.8	160	385.64	7.40	20.7	965	4.75	15.0	223.9	-
1400	0.8	8.6	160	385.64	7.40	20.7	963	4.75	14.6	223.8	-
1405	0.8	9.4	160	385.64	7.40	20.7	962	4.77	12.2	223.5	-
1410	0.8	10.2	160	385.64	7.40	20.7	960	4.78	10.3	222.9	-
1415	0.8	11	160	385.64	7.40	20.7	958	4,76	9.55	222.8	-
1420	0.8	11.8	160	385.64	7.41	20.7	956	4.76	7.80	222.8	-
1425	0.8	12.6	160	385.64	7.40	20.7	953	4.75	7.91	222.8	-
Stable											
1430	Sample	Collected									

WELL CAPACITY (Liters Per Foot): **0.75"** = 0.076; **1"** = 0.15; **1.25"** = 0.23; **2"** = 0.61; **3"** = 1.40; **4"** = 2.46; **5"** = 3.86; **6"** = 5.57; **12"** = 22.26
TUBING INSIDE DIA. CAPACITY (Liters/Ft.): **1/8"** = 0.002; **3/16"** = 0.005; **1/4"** = 0.0098; **5/16"** = 0.015; **3/8"** = 0.023; **1/2"** = 0.038; **5/8"** = 0.09

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Aaron Kupper /Tetra Tech	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT: 1430	SAMPLING ENDED AT: 1440
PUMP OR TUBING DEPTH IN WELL (feet): 402	SAMPLE PUMP FLOW RATE (mL per minute): 160	TUBING MATERIAL CODE: HDPE, S	
FIELD DECONTAMINATION: **(Y)** N	FIELD-FILTERED: Y **(N)** FILTER SIZE: ____ µm Filtration Equipment Type:	DUPLICATE: Y **(N)**	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
1	2	HDPE	250 mL	4°C	NONE	See Above	PFAS – QSM Table B-15	ABP

REMARKS: Unsure why Initial depth to water reading was deeper then purge readings. Took a while to dial in controller settings to get water to surface. Purged about 3 Liters tuning settings. 400ml water discharged each cycle. Set controller to run 2 times every 5 minutes for a flow rate of 160ml/min. Pressure set at 270psi. Controller set to 120 second refill, 30 second discharge.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O** = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **ABP** = After Bladder Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **PP =** Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

Hot! H: 102°F sunny

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Mob to WSTF - NASA

0600 onsite at Gate with Corey, AAron, Marvin, Garry (Drillers), Alex & Jake (cascade). Escorted By Trent
mob to building 101
0700 - safety meeting with Kyle & Navarro.
0848 - Call Potty time about setting up Porta john
Set up Porta john to come tommorow
0900 - mob to site, machinist moves brush out of way. Forklift getting dropped off
0930 - Frack tank & Rolloff are delivered, corey needs to escort Frack Tank drive back on in an hour or so.
1200 - lunch time
1245 - mob back, drillers unload Pipe/casing
Jake goes to get fuel.
1330 - Drillers set up rig/site
1430 - Drillers contine set up
1530 - Cascade brings more supplies/casing
1630 - cascade contines set up, Jake is back
1700 - leave site for day.

EAM

H: 104°F Su

JAN FEB MAR A
1 2 3 4 5 6 7 8 9 10

SUBJECT: Drillers

Hot
0600 meet
before gate
0700 grab ic
0748 Shanno
0820 core
(more sup
0855 - Dal
drop off
0910 Corey
Shannon n
kyle text
other locatio
0930 Drillers
- need to
Gw, nterfa
1130 - lunch
1200 - Drillers
1300 - Drillers
1330 - about
1345-1425-
& hose w/
1450 - ~30
1540 ~ 40
1630 - ~
Off Si

P OCT NOV DEC
24 25 26 27 28 29 30 31

AAron, Marvin,
). Escorted

+ Navarro:
Porta John
omow
rush out of

eel, corey
back on in

pe/casing

es/casing
ke is back

Hi 104°F Sunny

JAN FEB MAR APR MAY JUN (JUL) AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 (25) 26 27 28 29 30 31

SUBJECT: Drillers continue set up at WSTF-NASA

Hot
0600 meet Corey + drillers at turn off before gate and head to building
0700 grab ice + head to site
0748 Shannon is with us this morning
0820 corey has to go escort Drillers deliveries (more supplies)
0855 - Dale from Pottytime is on way to drop off Porta John.
0910 Corey is bringing both over but Shannon needs to unlock gate
Kyle texts me well ID - 600C-005-GW
other location (headquarters) will be (100-001-GW).
0930 Drillers unloading supplies
- need to take samples[EH] from VADOSE GW. nterface zone
1130 - lunch
1200 - Drillers start at 600C-005-GW
1300 - Drilled about 20ft
1330 - about half an hour to add casing/rods
1345-1425 - lost time due to needing to fix compressor + hose w/ leak
1450 - ~30 ft
1540 ~ 40 ft
1630 - ~60 ft
Off Site

EAM

SEP OCT NOV DEC
24 25 26 27 28 29 30 31

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT:

Remaining Items for WSTF

✓ ○ Source water blank – collected 8/1/23 @ 1200

✓ ○ Equipment blank collected 8/2/23 @ 0950

○ 2 GW samples → 600C-005-GW "WSTF-600C-005-YYMMDD
100-001-GW

✓ ○ Soil samples → ○ WSTF-A11-SB0009-398.0-20230729 ☑ ms/msd

✓ ○ WSTF-A03-SB0001-000.5-20230802 ☑

✓ <1 oft ○ WSTF-A03-SB0001- ☑

✓ mid point ○ WSTF-A03- ☑

○ IDW samples → 2 soil, 2 water — Bedrock interface → " ☑

WSTF-IDW-YYYYMMDD-01 (ect)

○ WSTF-IDW-20230802-01 -01 (soil)

○ -02

○ -03

○ -04

◎ Ship back equipment to field

Hot! Hi: 108°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drilling At 600C-005-GW

0600 meet onsite at turnoff to go to gate together
0620 Get ice and head to site
0720 Drillers start up rig
0745 Issues with hose
0855 need new hydraulic hose
1000 - Drillers heading offsite for hose
1100 - Help out with work for Aaron & Corey
1320 - Gary calls - has hose + going to get crew from hotel
1418 - Gary calls back - need to get Mark Green pass for tomorrow. They are not coming back today.
1500 offsite for day.

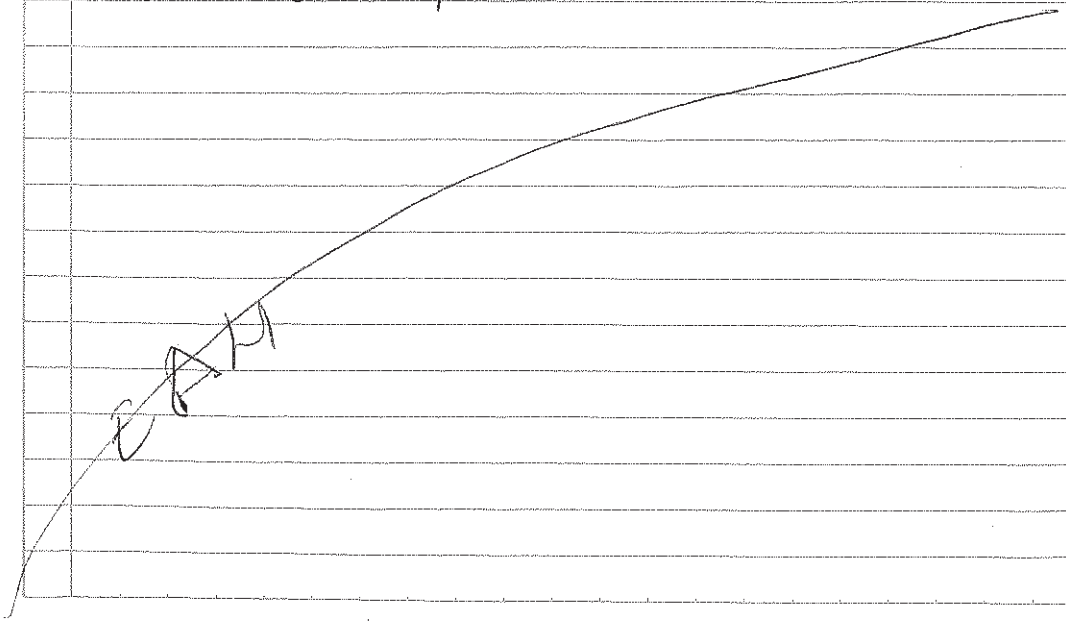
TDH

Hot! Hi: 104°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drilling At 600C-005-GW

0600 at gate to have updated badges
0620 get IA & meet trent
0640 at site - drillers start Prepping for day
0720 add another 20' of drill string & start drilling
0749 at 225 ft
0800 Mark leaving site for the day, corey escorting him off
0830 - Clay lense is slow going
0915 - changing out drill bit
1040 - still removing casing to change out drill bit
1200-1230 - lunch
1230 - inserting smaller casing (telescoping)
1446 - still installing smaller casing
1506 - installing Bit & rods
1630 - installing Bits & rods - Powering down for day
1645 - offsite for day

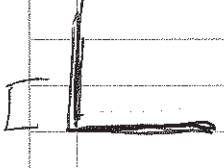


Hot Hi:

JAN FEB MAR A
1 2 3 4 5 6 7 8 9 10

SUBJECT: Drill

0600 at
0630 ons
0705 start
0715 beg
0723 ~ 24
0830 ~ 28
0930 - ~ 3
32
1050 · Jake
1130 ~ 3
Call with S
closer to 4
1145 - Screw
1216 - addin
1308 - back a
water at
1345 - T
WSTF-A
did MS/MSD
Pulled Rod
d. drit sta
38



1645 - offsite f

04°F

P OCT NOV DEC
24 25 26 27 28 29 30 31

es

for day
& start drilling

corey escorting

t drill bit

ng)

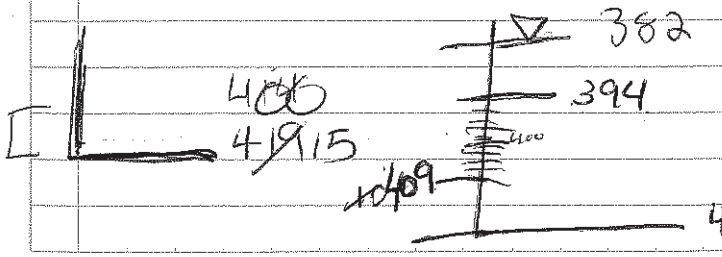
rig down for day

Hot H, 102°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drilling At 600C-coS-GW

0600 at Gate being escorted by Mike Flores
0630 onsite at Rig - fueling up and getting ready
0705 start Rig
0715 begin drilling
0723 ~ 247ft
0830 ~ 280ft
0930 - ~~300ft~~ 320ft Jake leaves to get fuel
1050 Jake back ~ at 340ft
1130 ~ 360ft - moist!
Call with Sarah - depth to water might be shallower closer to 420, set screen 10ft below wt.
1145 - screwing in casing for 380'
1216 - adding casing for 400, took lunch
1308 - back at drilling
water at roughly 398'
1345 - take soil sample from cuttings
WSTF-All-SB0009-398.0-20230729
did MS/MSD (2 additional bottles)
Pulled Rods TD 422.5 - 3.7 = 419 - Bottom
d.drit stay open at bottom
~~395~~ - 3.7 ≈ 382



1645 - offsite for day

Hot, Windy H: 99°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Well installation At 600C-005-6Gw

0605 - onsite at Gate - mob to get ice

0635 - arrive at site, Drillers fuel up

WL At ~~3862'~~ 386ft - 3.7ft = 382.3ft bgs

805 set well at 419 ft

858 move rig away from casing to set up for annulus/ casing Pulling

1006 Pulling up casing & dumping sand for annulus

1040 - added ~40 bags of sand, Void space at depth Pulling off 20ft of casing (40 total to see where they are at,

1103 - 47 Bags of sand total to get to 380.8ft

1130 - ~~Bentonite~~ 3ft of fine sand (60) 377

Then Bentonite for 5ft.

Took lunch & started making grout

1427 - Gerry Says the one pump is acting up & might need to be replaced tomorrow. Taking Pump apart

1514 still taking Pump apart casing at 300ft.

1556 Testing Pump - need to get Part

1626 leave site & mob offsite

Hot! 100°F

JAN FEB MAR

1 2 3 4 5 6 7 8 9

SUBJECT: Well

0605 ons

0615 · grat

0635 ons

0713 ca

for dr. lle

0900 Dr

Grinding

0925 Gr

1018 stil

1030 got P

1120 Finish

Casing to

1130 chec

1200 lunch

1230 Dr

The helper

he's fly in

1525 le

Hot! 100°F

EP OCT NOV DEC
24 25 26 27 28 29 30 1

005-GW
Ice
up
= 382.3ft bgs
set up for
sand for annulus
id space at depth
see where they
380.8ft
377
ut
cting up
Taking Pump start
at 300-ft.
rt

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Well Construction/Installation At 600C-005-GW

0605 onsite at Gate to mob to site
0615 grab Ice & head to Site
0635 onsite drillers fueling up / Changing out Pump
0713 call with Sarah for update - Pump is working for drillers
0900 Drillers think grout tank is clogged
Grinding on out Put to see if clogged
0925 Grinding stops
1018 still trouble shooting
1030 got Pump to work & started removing casing
1120 Finished Pulling out larger casing, 225 ft of casing to go. (DTW) 2 (Casing Stage)
1130 checked WL - 389.2 - 6.5 = 382.7 ft bgs
1200 lunch
1230 Drillers having issues with Pump again
The helper Alex - his flight was cancelled, so now he's flying earlier, need to leave site by 3:30pm.
1525 leaving site

Hot! Hi of 95°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

SUBJECT: Drillers work on repair, hopefully fix rig

0603 At gate to be escorted in

0610 Grab ice mob to site

0625 at site, Drillers go through Paperwork

0700 Drillers work to remove parts/cleanup

0930- Sample Soil IDW

↳ WSTF-IDW-20230802-01

0915 - Sample 0-6in at A03MW01

↳ WSTF-A03-SB0001-000.5-20230802

0950 - Sample Equipment blank off Drill Bit (using on next hole/well)

0955 - Drillers need to take Part to ABQ for testing - Putting Drill string on trailer

1044 - Leaving site for day

1050 - Call Sarah to update her on issues

1120 - Back at hotel, to get samples ready to ship.

WSTF-EB-20230802-01

WSTF-TB-20230802-01

Shipped samples ~1400, Done for day

EAH

P OCT NOV DEC

24 25 26 27 28 29 30 31

e 11

rk on compressor

see other site

ty attendant

Clean Porta John

. Drillers grouting

ater blank

lic fluids

l. ng tech out

spill stuff +

lace because

s. Put down spill kit

told drillers to get

Hot Hi: 101°F

JAN FEB MAR APR MAY JUN JUL (AUG) SEP OCT NOV DEC

1 2 3 (4) 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Fixing Rig

0605 on site at gate for new badge
0611 Call from Robert Walker - sending escort to us
0625 Getting Ice
0645 at site drillers finish safety meeting, begin fueling & working on rig
0808 Still working on rig
0900 - Still working on rig, called in Hot work Permit just in case
0957 Talk to Sarah about drilling schedule
1053 Pumps are back in place, finishing up oil top off.
1200 Remove Casing
1230 Start mixing grout Casing finished.
1347 Still grouting
1545 Finish grouting, Drillers clean up site
1645 leave Site for the day

Hot Hi: 101°

JAN FEB MAR A

1 2 3 4 (5) 6 7 8 9 10

SUBJECT: Comp

0600 ons
0620 Grab
0640 ons
0800 Star
0855 Check
0907 Begin
0917 move r
1030 moved
things onto
1200 Putting
1300 move fr
1430 move ri
1520 move
1540 at
Staging the
1600 finish
to site
1640 Finish
in the morn
office

Hot Hi 101°F

EP OCT NOV DEC
24 25 26 27 28 29 30 31

scort to OS

, begin fueling

work Permit just

ing up oil to pat.

clean up site

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT, NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Completion of well

0600 On site at Gate for escort
0620 Grab Ice
0640 on site at rig/setup
0800 start mixing cement
0855 Checked TD 419 ft bgs
0907 Begin demobing rig - lowered tower
0917 move rig & start making forms
1030 moved generator, fork lift IS moving things onto trailer
1200 Putting together frame for monument
1300 Move trailer to other site
1430 move rig to next site, finish Pads
1520 MOB to decon Pad
1540 at 100-001-GW site, Drillers moving / Staging things
1600 finish decoming and bring rods/casing to site
1640 Finish set up at rig, some stuff to do in the morning before start drilling.
Off site

Hot Hi: 108°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Set up on 100-001-GW

0605 onsite at gate, mob to get rec

0620 onsite at 100-001-GW well location unloading hoppers/supplies. need to make another run to the other site

0700 at other site loading supplies

0800 mob back to 100-001-GW

0830 setting up on rig to start drilling

0914 start drilling

0930 sample 9-9.5ft

[Took Duplicate sample

→ WSTF-A03-SB0001-099.5-20230806

DUP→ WSTF-FD-20230806-09 @ 0000

0940 ~ 20ft

0950 adding casing/rod

1038 ~ 40ft - Having a hard time blowing gravels out of hole, add casing

1120 - sample 50ft

WSTF-A03-SB0001-5050.5-20230806

1200 ~ 70-75ft

1220 add another casing on

→ 1300 at ~ 100ft, lunch! took sample incase we were at ER

1350 changing out drill bit

1420 advancing rods

1435 Bedrock at ~ 100ft

sampled @ 95'

[1300 → WSTF-A03-SB0001-9595.5-20230806

1500-1530 Rod stuck, rock pinching rod in hole not advancing

1620 - Need to possibly switch to different bit. leaving for day.

Hot Hi: 100°F

JAN FEB MAR AP

1 2 3 4 5 6 7 8 9 10

SUBJECT: Drilling

0600 onsite

0615 onsite

meeting. Ge

the stabilizer

0650 start Pr

0750 ~ 110 ft

hole)

0823 ~ 1

0847 ~ 1

0942 ~ 19

0947 - shan

samples from

doesn't fizz

most closl

with calcit

1045 - called

more casing

1130 Talked

we might n

Have to re

don't hit w

1226 start d

1411 - call u

and have

1438 - Instr

of materials

Kyle says

find water

Hot Hi 100°F

SEP OCT NOV DEC
23 24 25 26 27 28 29 30 31

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drilling at 100-001-GW

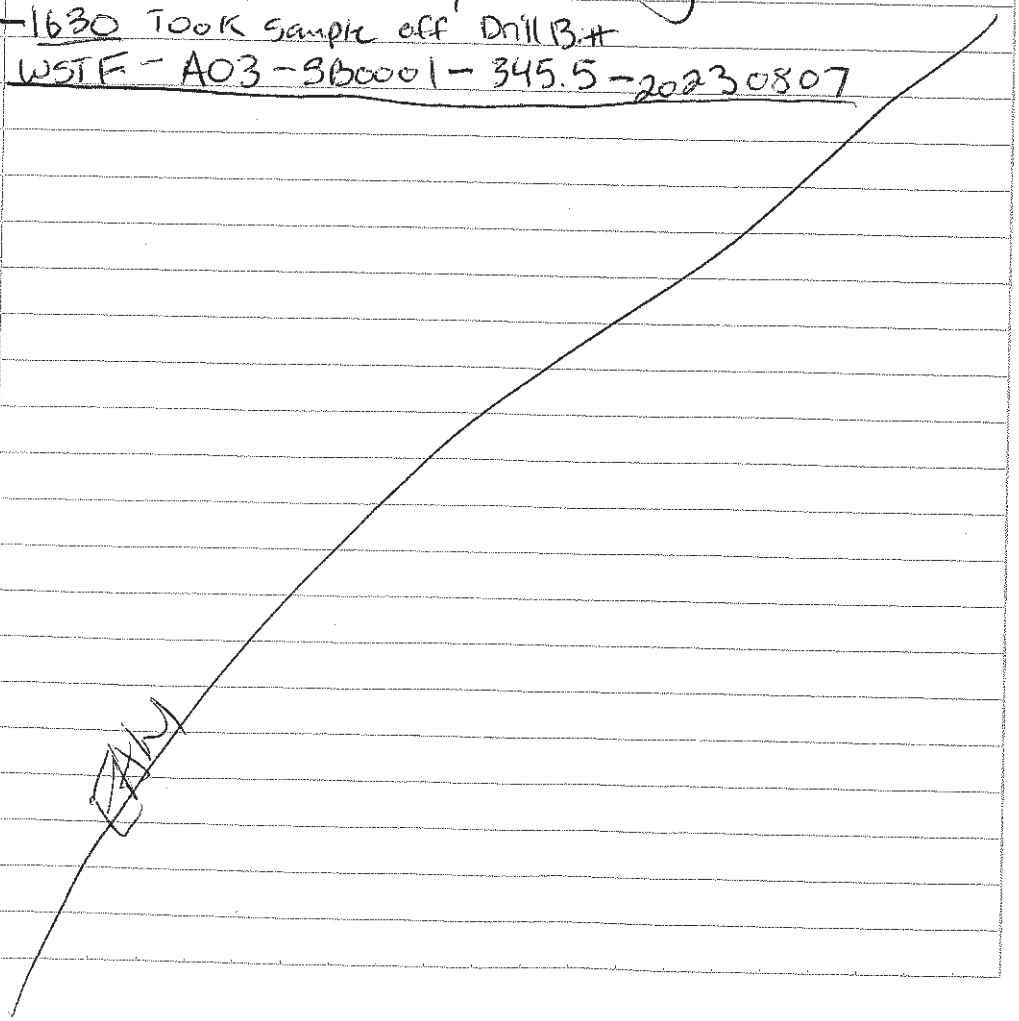
0600 onsite at ~~W~~ Gate, mob to get Ice
0615 onsite at well, drillers start up rig, H&S meeting, Gerry says the issue with the bit is the stabilizer and that mark said to remove it.
0650 Start Process of Pulling rods & removing stabilizer
0750 ~ 110 ft, debris (rocks from sidewall fell in hole)
0823 ~ 130 ft
0847 ~ 150 ft
0942 ~ 190 ft
0947 - Shannon came over with HCL & some samples from around the area the "Limestone" doesn't fizz at all even when scratch. It most closly resembles a sample of Andesite with calcite veins (veins do fizz)
1045 - called Sarah, Drillers needed to go get more casing from other site. (~ 240)
1130 Talked to Shannon, there is a possibility that we might not reach water, hit or miss in Andesite Have to re-evaluate if we reach 320' and don't hit water.
1226 Start drilling again.
1411 - call with Sarah Reached 280-300' and haven't hit water.
1438 - Instructed to go to 360' (the amount of materials we have)
Kyle says that its very difficult to find water in the Andesite. →

+ ice
location
make another
GW
rt drilling
20230806
0000
owing gravels out
5-20230806
sample incase we were at ~~BR~~
9595.5-20230806
ing rod in hole
bit. leaving for day

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT:

1441 at 300' - small amount of water!
need to add a small amount of water because it gummed up Hoses
1520 at 320' some water but mixed with a lot of clay. Will go to 340-345 & see what kind of water we get
1546 - TPPing ~~up to outer casing~~ EH out of hole
1635 - Done for day
1630 Took sample off Drill Bit
WSTF - A03 - 3B0001 - 345.5 - 20230807



Hi 96°F

JAN FEB MAR AP
1 2 3 4 5 6 7 8 9 10 11

SUBJECT: Settin

0600 at Ga te
0605 Get Ice
0615 on site
0637 WL
- Call w.
top of wt,
for, large Sa
Screen deep
0735 - WL
821 - Call w
- atleast 3f
- ands. is
~~but~~ WT in are
- where the
- not higher
Close ~ M
920 - WL

1546 063
Yesterday to tod
9.14
+ 6 37
15 51 x 16 hr

= 95ft x (0.
= 20.45 Ga

Bett p2 = 5.11 Ft

Hi 96°F

SEP OCT NOV DEC
23 24 25 26 27 28 29 30 31

- of water!
of water because

ixed with a
0-345ft see

out of hole

230807

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Setting

0600 at Gate
0605 Get Ice
0615 on site
0637 WL is at 242 Ft - Call Kyle/Sarah
- Call with Jeff Orient - Put screen near top of wt, would use gravel instead sand for, large sand pack to cover interval, set screen deep enough
0735 - WL is ~238 Ft
821 - Call w/ Geph Giles - Drillers go to clean up other site
- atleast 3ft of sand above - 35-40ft of sand
- ands. is unconfined, in some areas,
~~wt~~ wt in area ~170 Ft, wait to
- where the wt - equilibriates
- not higher then 238 because we're getting close ~ Maybe 260-280 for screen, ~~sand below~~ Ft
920 - WL 229

546 0637 = 340 — 242 ft bgs
Yesterday to today = 95 ft
9.14
+ 6 37
15 51 ± 16 hr
≈ 6.1 ft/hr r = 4.25

= 95ft × (0.35 Ft)² = 36.54 Ft³ × 7.48 gal/Ft³ = 273.3 Gal
= 20.45 Gal/hr. × ~~16 hr = 12 gal~~ 1 Ft³ / 960 min =

13 Ft × π r² = 5.11 Ft³ = 38.22 gal / 223 = 0.17 gal/min

343

SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

too well
05-ow

2 gallon/125min =
0.0176

and out
hole. One of
El Paso for Bentonite

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT:

1438 - Start blowing out hole, Dalton leaves to get supplies
1640 - Dalton heading back, Drillers tripping out after blowing hole
1717 looks like storms are coming in but not here just yet
1728 - raining, stop work lightning within 6mi. wait in vehicles til dalton arrives
1813 - Dalton back w/ supplies, lightning warning over need to unload + leave for day
1818 leaving site for the day

EAW

JAN FEB MAR APR MAY JUN JUL (AUG) SEP OCT NOV DEC

1 2 3 4 5 6 7 8 (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Well construction at 100-00[illegible]-Cav & Develop.

0600 - onsite at Gate
0605 - mob for Ice
0620 - onsite Prepping for day
0749 - blowing dam hole
0806 - begin tripping
0900 - Chipping bottom w/ bentonite
1011 - finishe Placing bento, Set sump at 255
1020 - Start to put well in before setting sand
1124 - Developer at Gate, to be escorted to our site,
Drillers adding Sand, drillers need to move
some materials, over at other site
1200 meh to other site, drillers move some things
~~to~~ around So developer can pull up to well.
1241 Call w.th Sarah, developer starts to set up.
1330 Dan (Developer) Sends down bailer
Initail WL is 388.4 TOC DTB 421.55 TOC
1422 Bailed 10 Gallons, DTW 388.55 Same DTB
1432 Set up Surge Block
1537 - Remove surgeblock DTW 38905-ft TOC
1610 Bailed 10 gallons, Pack up at 600-005-GW
DTW 388.75 Same DTB.
Leave to meet w/ drillers
1640 - Grout to 85ft. Casing removed.
Leave site for day

JAN FEB MAR A

1 2 3 4 5 6 7 8 9 (10)

SUBJECT: Finish

0600 - at
0620 - Lead
0630 - on si
hand auge
enough to
0700 - Dal
0720 - Take
WSTF - ID

0740 - Tri.b
WSTF - IB

0800 - Too
WSTF - AO3

0842 - Drille
Clean up
0934 - Ca
In Still has
0950 - Jake
1010 moving
1057 mobi
1145 - leave
1300 - com
1226 - Dan
- needed
1330 - Da
working
1335 - Ba

G SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

-00ф-Gw & Develop

ite
t sump at 255
re setting sand
corted to our site,
rs need to move
er site
, move some things
up to well.
s to set up.
uler
421.55 TOC
.55 Some DTB

38905-ft TOC
t 600-005-GW

ing removed.

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Finish well construction & Develop 600-005-GW

0600 - at Gate, Dalton needs new Pass
0620 - Leading to get Ice
0630 - on site at 100-001-GW, need to get hand auger from other site, Dan is nice enough to drop it off
0700 - Dalton back on site
0720 - Take Soil IDW Sample 02
WSTF-IDW-20230810-02

0740 - Trip blank labeled
WSTF-TB-20230810-02

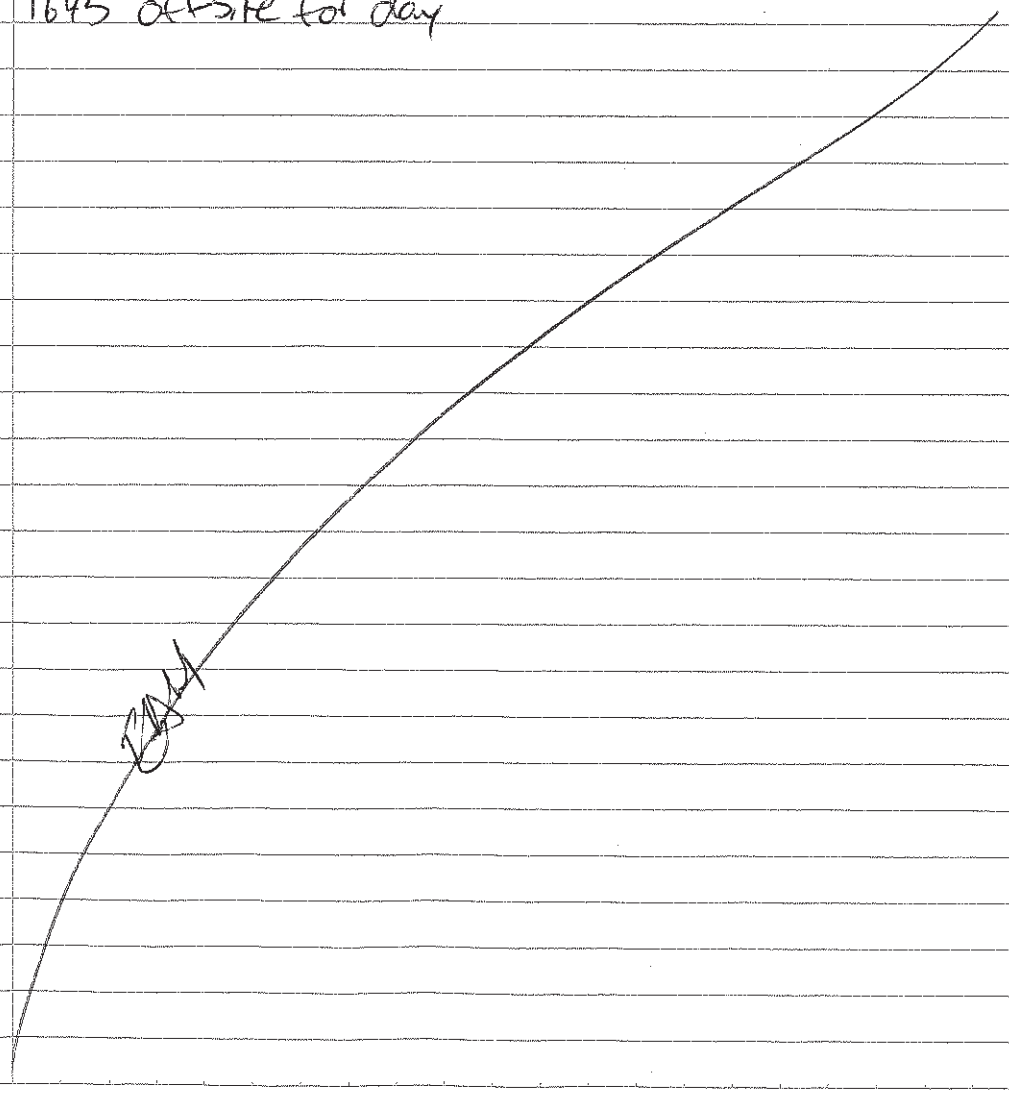
0800 - Took 03-05 Soil Sample
WSTF-A03-SB0001-0305-20230810

0842 - Drillers finish Grouting & get ready to clean up site
0934 - Call w/ Dan - Still working on tripping in Still has >9 rods to go.
0950 - Jake needs to leave to get more concrete.
1010 moving rig off hole
1057 mobilizing rig to laydown area
1145 - leave base to ship Samples
1300 - Coming back to site
1226 - Dan had Pump set up but not Pulling water - needed to call Larry
1330 - Dan called back, was able to get Pump working
1335 - Back on site

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT:

1345 – Head to get water with drillers
1420 on site at Development
1527 WL after stop development @ 385.0
400 Gallons total
1600 Dan packs up & we mob back to other site
1645 offsite for day



JAN FEB MAR AP
1 2 3 4 5 6 7 8 9 10 11

SUBJECT: Clean.n

0600 on s.
0605 mob
0635 on s.
is 182.
0654 trailer
area.
0718 leave for
0800 Decon
0850 leav.
0920 Decon
1030 Still
1100 Develop
1142 Still D
1215 Developer
decanning Dev
1300 Driller
1430 load
1500 Decon
1600 Flat be
1654 Still
1720 Still
1741 finish
1750 leav

SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

drillers

t @ 385.0

k to other Site

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Cleaning up site

0600 on site at Gate, Dan half hour late
0605 mob to get ice, Mike brought donuts
0635 on site at 100-001-GW - WL is 182.6 ft btoc!
0654 trailering up trucks to take to laydown area.
0718 leave for site 600-005-GW
0800 cleaning up at Site 600-005 GW
0850 leaving 600-005-GW
0920 Deconing casing/Gear
1030 Still deconing casing/Gear
1100 Developer comes over to decon area
1142 Still deconing casing larger diameter
1215 Developer done for day leaving Site, drillers still deconning Developer offsite 1230
1300 Drillers loading up flatbed w/casing
1430 load up Generator
1500 Deconning rig
1600 Flat beds leave with Generator
1654 Still deconing rig
1720 Still deconning rig
1741 finishing up decon for the day
1750 leaving site for day

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: 3 ft stick up

Well name/#	600C-005-Gw	100-001-Gw
date/time of well construction	7/31/23 0900	8/9-8/10/23
borehole diam/well casing diam	9 5/8 (240-420) 11 3/4 (0-240)	PVC 5 (0-100) S.S. 3 5
well depth	421.55 btoc	255+3ft = ~258 ft btoc
Casing length	396.55 ft toc	255 bgs
Casing material	Sch 80 PVC	"
casing & screen joint type	screw on	"
Screened interval	396.55 - 411.55 btoc	~~245-225~~ ~~233-263~~
Screen material	stainless steel	"
Screen slot size & design	0.020	"
filterpack material & size	Silica sand 10/20 ~~30/65 #60~~	260-220
filterPack volume (calculated-tactual)	47 (50lb bags)	23 (4bags sieved)
filter Pack Placement method	Gravity	"
Filter Pack intervals	419-382 (bgs)	→ bgs
annular seal composition	~~Silica Sand~~ Bentonite	no lie Plug
Placement Gravity	379-373.5	"
Volume	3 (50lb bags)	3 bags
interval	379-373.5	212-217
Grout Sealant composition	Quik Grout	bentonite at bottom
Placement Gravity		52 on bottom
Volume	~~28~~ (50lb bags) 84 total	12 bags Grout
interval	373.5-10ft	
Surface Completion & well apron design	10 bag (50lb) Portland Cement	
well CapV	10-0	10-0ft
Construction of Protective casing	Steel	
well development volume	400 Gallons	

JAN FEB MAR APR

1 2 3 4 5 6 7 8 9 10 11 12

SUBJECT: Drillers

0600 on site
0610 Grab Ic
0630 at Deco
- Drillers contu
0708 still waiting
0720 M.Ke Flor
0800 - Drillers
0840 - mob to
0900 - Dump D
loading up
0939 - Dan clean
1000 - Dan dump
on 100-00
1215 - Surging
1246 - finish
1250 Bailing
1313 DTW -
1332 setting
1440 Drillers
1450 - setting
1500 Sample
WSTF - ID
1510 - label TB
↳ WSTF - TB
Start development
1511 205 ft bto
1604 254 ft bt
1630 offsite

SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

5. Gw	100-001-Gw
900	8/9/-8/10/23
0) 11¾(0-3½)	95/5(0-100) 8.5 flow 35
toc	255+3ft = ~258ft DTOC
ft toc	255 bgs
	"
	"
	245-225
otoc	233-253
	"
	"
	260-220
bags)	23 (4bags Sieved)
	"
	→ bgs
ntonite	no Ice Plug
5	ft
	3 bags
	212-217
ut	bentonite at bottom
	52 on bottom
5¼ total	12 bags Grout
+	↓
	10 bags (5/16) Portland Cement
0	10-ft
allons	

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drillers Demob, Development of 100-001-Gw

0600 on site at Gate
0610 Grab Ice and mob to Decon Pad
0630 at Decon Pad, waiting on second escort
- Drillers continue decon
0708 still waiting on second escort
0720 Mike Flora on site - Take Dan over to frack tank
0800 - Drillers decon'ing, Dan Pumping IDW into tank
0840 - mob to dump decon water
0900 - Dump Decon, head back to Pad, Drillers loading up, Dan Pumping
0939 - Dan cleans off Pad a bit, drillers still loading
1000 - Dan dumps 250 decon water, and start set up on 100-001-Gw
1215 - Surging well initial DTW 175.56 DTB 258.60
1246 - finish surging well DTW 180.05ft DTOC
1250 Bailing well ~5 Gallons
1313 DTW - 186.7 DTB - same
1337 setting up Pump
1440 Drillers Demob/head off site
1450 - Setting up Pump (complete)
1500 Sample Liquid IDW for 600C-005-GW
WSTF-IDW-20230813-03
1510 - label TB
↳ WSTF-TB-20230813-03
start development
1511 205 ft btoc (Dropping steady) 1 gal/min
1604 254 ft btoc - end development for day (1 well vol)
1630 offsite

TBH

Cloudy!

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Development

0605 onsite at Gate, waiting on Dan
0615 go through Gate, Get Ice
0625 set up at 100-001-GW
0645 - Start Pumping well WL 181 ft btoc
6:52 WL 205 ft btoc @ 1 gal/min
6:58 WL 214 ft btoc @ 1 gal/min
7:16 WL 235 ft btoc @ 1 gal/min call w/ Sarah
7:39 Turned off Pump to let recharge
removed ~130 Gallons
0817 at Decon pad for cleanup
0930 still at Decon pad for cleanup, moving to 600 well
1059 Back at 100 site, WL ~201 need to wait a bit longer for recharge before we can Pump again.
1130 calibrate YSI & Hanna Turb meter
1200 WL ~201
1237 WL ~200
1245 Mike escorts me to Decon Pad, I grab last of Garbage left by drillers, mob offsite to dispose of trash at hotel
1450 - Back onsite at well, Start Purge
WL 191 ft btoc
1540 finish Purge / call Sarah, take a couple readings in morning to check turb.
1614 Leaving Site for day

7th is water callow
80% 59.2

JAN FEB MAR APR
1 2 3 4 5 6 7 8 9 10 11 12

SUBJECT: Finish De

0600 onsite
0627 at 100-
0700 start
0715 Turbidity
is still Jump
0720 increase
0730 Pumpe
0740 take
↳ WSTF-I
0750 Driller
0840 finish
0900 WLT
Pump
0940 Dem
0956 mo
of well &
roll off
1013 Porta Potty
10 min, I'm he

SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

on Day

1 ftbtoc

gal/min

al/min

al/min call ursarah

t recharge

nothing to 600 well

200 need to

before we can

h meter

ed, I grab last

nob offsite to

rt Purge

take a couple

turb.

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Finish Development + mob offsite

0600 onsite at Gate
0627 at 100-001-GW / calibrate
0700 start taking readings. 1GPM
0715 Turbidity is lower than yesterday but is still Jumping, everything else is stable
0720 increase flow to 3GPM to Pump dry
0730 Pumped dry
0740 take IDW sample
↳ WSTF-IDW-20230815-04
0750 Dailer starts tripping out
0840 finish tripping out
0900 WLT 222.8 ftbtoc
Pump off water
0940 Developer offsite
0956 mob to 600C to take Photo of well + label IDW sample on roll off
1013 Porta Potty man (Dale) will be here in 10 min, I'm heading offsite to Ship.

Appendix B
Laboratory Data

TETRA TECH

INTERNAL CORRESPONDENCE

TO: **S. DAMPHOUSSE** **DATE:** **OCTOBER 16, 2023**

FROM: **CALVIN J. LODGE** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – POLY- AND PERFLUOROALKYL SUBSTANCES**
NASA-WHITE SANDS
SAMPLE DELIVERY GROUP (SDG) YI15029

SAMPLES: 9/Aqueous/PFAS

WSTF-A03-100-001-GW-240-20230913
WSTF-A08-EFF0001-20230914
WSTF-A08-EFF0002-20230914
WSTF-A08-INF0001-20230914
WSTF-A08-INF0002-20230914
WSTF-A11-600C-005-GW-402-20230913
WSTF-EB-20230913-07
WSTF-FB-20230913-08
WSTF-FB-20230914-09

Overview

The sample set for NASA-White Sands, SDG YI15029, consisted of six (6) aqueous samples, one (1) equipment blank, and two (2) field blanks. All nine (9) samples were analyzed for poly-and perfluoroalkyl substances (PFAS). No field duplicate pairs were associated with this SDG.

The samples were collected by Tetra Tech, Inc. on September 13 and 14, 2023, and analyzed by Pace Analytical Services. All analyses were conducted in accordance with Department of Defense ((DOD)/Department of Energy (DOE) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.4, PFAS using LC/MS/MS Appendix B Table B-15 (2021). The data contained in this SDG was validated via EPA Stage 4 with regard to the following parameters:

* • Data completeness
* • Hold times/Sample Preservation
* • Mass Calibration
* • LC/MS/MS System Tuning and Performance
* • Mass Spectral Acquisition Rate
* • Instrument Sensitivity Check
* • Ion Transition Check
* • Ion Ratios
* • Initial/Continuing Calibrations
* • Laboratory Instrument/Method and Field Blank Results
* • Extraction Internal Standard Recoveries
* • Laboratory Control Sample/Laboratory Control Sample Duplicate Results
* • Compound Identification
* • Compound Quantitation
* • Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Qualified analytical results are presented in Appendix A, results as reported by the laboratory are presented in Appendix B, and documentation supporting these findings is presented in Appendix C.

Notes

Detected results reported below the Limit of Quantitation (LOQ) but above the Detection Limit (DL) were qualified as estimated, (J).

Non-detected results were reported to the Limit of Detection (LOD).

PFAS

None.

Additional Comments

The percent recovery (%R) for the extracted internal standard 13C2-6:2 fluorotelomer sulfonate (13C2-6:2FTS) was above the 150% quality control limit in samples WSTF-EB-20230913-07, WSTF-FB-20230913-08, and WSTF-FB-20230914-09. No action was necessary since 6:2 FTS was not detected in any sample.

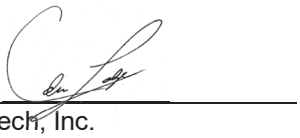
Instances of manual integrations were present in this data package. All manual integrations were documented by the laboratory and are noted in the raw data of the original data package.

Executive Summary

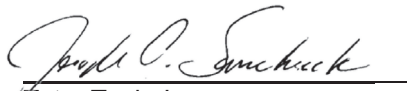
Laboratory Performance Issues: None

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the Department of Defense (DOD) document entitled “Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis be QSM Table B15” (May 1, 2020). The text of this report has been formulated to address only those areas affecting data quality.



Tetra Tech, Inc.
Calvin J. Lodge
Chemist/Data Validator



Tetra Tech, Inc.
Joseph A. Samchuck
Data Validation Manager

Attachments:
Appendix A - Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Data Qualifier Definitions

The following definitions provide brief explanations of the validation qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted detection limit.
J	The result is an estimated value with an unknown bias. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The reported detection limit is approximate and may be inaccurate or imprecise.
NJ	The analyte has been “tentatively identified” or “presumptively” as present and the associated numerical value is the estimated concentration in the sample.
R	The sample result (detected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
UR	The sample result (nondetected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team, but exclusion of the data is recommended.

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's r < 0.995
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient r < 0.995
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 standard deviations is greater than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed
Z3 = Tentatively Identified Compound aldol condensate
Z4 = Sample activity is less than the at uncertainty at 3 standard deviations and greater than the MDC
Z5 = Sample activity is less than the at uncertainty at 3 standard deviations and less than the MDC

PROJ_NO: 09033W	NSAMPLE	WSTF-A03-100-001-GW-240-202309			WSTF-A08-EFF0001-20230914			WSTF-A08-EFF0002-20230914			WSTF-A08-INF0001-20230914		
SDG: YI15029	LAB_ID	YI15029-001			YI15029-004			YI15029-006			YI15029-003		
FRACTION: PFAS	SAMP_DATE	9/13/2023			9/14/2023			9/14/2023			9/14/2023		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	NG/L			NG/L			NG/L			NG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
10:2 FLUOROTELOMER SULFONATE (10:2FTS)		3.6	U		3.6	U		3.5	U		3.6	U	
11CL-PF3OUDS		3.6	U		3.6	U		3.5	U		3.6	U	
2-(N-ETHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-ETFOSE)		3.6	U		3.6	U		3.5	U		3.6	U	
2-(N-METHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-MEFOSE)		3.6	U		3.6	U		3.5	U		3.6	U	
4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)		3.6	U		3.6	U		3.5	U		3.6	U	
4:2 FLUOROTELOMER SULFONATE		3.6	U		3.6	U		3.5	U		3.6	U	
6:2 FLUOROTELOMER SULFONATE (6:2FTS)		3.6	U		3.6	U		3.5	U		3.6	U	
8:2 FLUOROTELOMER SULFONATE (8:2FTS)		3.6	U		3.6	U		3.5	U		3.6	U	
9CL-PF3ONS		3.6	U		3.6	U		3.5	U		3.6	U	
HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)		3.6	U		3.6	U		3.5	U		3.6	U	
N-ETHYLPERFLUORO-1-OCTANESULFONAMIDE (N-ETFOSA)		3.6	U		3.6	U		3.5	U		3.6	U	
N-ETHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NEFOSA)		3.6	U		3.6	U		3.5	U		3.6	U	
N-METHYLPERFLUORO-1-OCTANESULFONAMIDE (N-MEFOSA)		7	U		7	U		7	U		7	U	
N-METHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NMFOSA)		3.6	U		3.6	U		3.5	U		3.6	U	
PENTADECAFLUOROOCTANOIC ACID (PFOA)		1.8	U		2.7	J	P	1.8	U		2.8	J	P
PERFLUOROBUTANESULFONIC ACID (PFBS)		1.8	U		0.92	J	P	1.8	U		0.89	J	P
PERFLUOROBUTANOIC ACID (PFBA)		1.8	U		53			1.8	U		52		
PERFLUORODECANESULFONIC ACID (PFDS)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUORODECANOIC ACID (PFDA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUORODODECANESULFONIC ACID (PFDOS)		3.6	U		3.6	U		3.5	U		3.6	U	
PERFLUORODODECANOIC ACID (PFDOA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROHEPTANESULFONIC ACID (PFHPS)		1.8	U		1.8	U		1.8	U		1.8	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-A08-INF0002-20230914			WSTF-A11-600C-005-GW-402-20230			WSTF-EB-20230913-07			WSTF-FB-20230913-08		
SDG: YI15029	LAB_ID	YI15029-005			YI15029-002			YI15029-007			YI15029-008		
FRACTION: PFAS	SAMP_DATE	9/14/2023			9/13/2023			9/13/2023			9/13/2023		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	NG/L			NG/L			NG/L			NG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
10:2 FLUOROTELOMER SULFONATE (10:2FTS)		3.7	U		3.5	U		3.6	U		3.7	U	
11CL-PF3OUDS		3.7	U		3.5	U		3.6	U		3.7	U	
2-(N-ETHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-ETFOSE)		3.7	U		3.5	U		3.6	U		3.7	U	
2-(N-METHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-MEFOSE)		3.7	U		3.5	U		3.6	U		3.7	U	
4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)		3.7	U		3.5	U		3.6	U		3.7	U	
4:2 FLUOROTELOMER SULFONATE		3.7	U		3.5	U		3.6	U		3.7	U	
6:2 FLUOROTELOMER SULFONATE (6:2FTS)		3.7	U		3.5	U		3.6	U		3.7	U	
8:2 FLUOROTELOMER SULFONATE (8:2FTS)		3.7	U		3.5	U		3.6	U		3.7	U	
9CL-PF3ONS		3.7	U		3.5	U		3.6	U		3.7	U	
HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)		3.7	U		3.5	U		3.6	U		3.7	U	
N-ETHYLPERFLUORO-1-OCTANESULFONAMIDE (N-ETFOSA)		3.7	U		3.5	U		3.6	U		3.7	U	
N-ETHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NEFOSA)		3.7	U		3.5	U		3.6	U		3.7	U	
N-METHYLPERFLUORO-1-OCTANESULFONAMIDE (N-MEFOSA)		7.5	U		7	U		7	U		7.5	U	
N-METHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NMFOSA)		3.7	U		3.5	U		3.6	U		3.7	U	
PENTADECAFLUOROOCTANOIC ACID (PFOA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROBUTANESULFONIC ACID (PFBS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROBUTANOIC ACID (PFBA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORODECANESULFONIC ACID (PFDS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORODECANOIC ACID (PFDA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORODODECANESULFONIC ACID (PFDOS)		3.7	U		3.5	U		3.6	U		3.7	U	
PERFLUORODODECANOIC ACID (PFDOA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROHEPTANESULFONIC ACID (PFHPS)		1.9	U		1.8	U		1.8	U		1.9	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-FB-20230914-09		
SDG: YI15029	LAB_ID	YI15029-009		
FRACTION: PFAS	SAMP_DATE	9/14/2023		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	NG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
10:2 FLUOROTELOMER SULFONATE (10:2FTS)		3.7	U	
11CL-PF3OUDS		3.7	U	
2-(N-ETHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-ETFOSE)		3.7	U	
2-(N-METHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-MEFOSE)		3.7	U	
4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)		3.7	U	
4:2 FLUOROTELOMER SULFONATE		3.7	U	
6:2 FLUOROTELOMER SULFONATE (6:2FTS)		3.7	U	
8:2 FLUOROTELOMER SULFONATE (8:2FTS)		3.7	U	
9CL-PF3ONS		3.7	U	
HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)		3.7	U	
N-ETHYLPERFLUORO-1-OCTANESULFONAMIDE (N-ETFOSA)		3.7	U	
N-ETHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NEFOSA)		3.7	U	
N-METHYLPERFLUORO-1-OCTANESULFONAMIDE (N-MEFOSA)		7.5	U	
N-METHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NMFOSA)		3.7	U	
PENTADECAFLUOROOCTANOIC ACID (PFOA)		1.9	U	
PERFLUOROBUTANESULFONIC ACID (PFBS)		1.9	U	
PERFLUOROBUTANOIC ACID (PFBA)		1.9	U	
PERFLUORODECANESULFONIC ACID (PFDS)		1.9	U	
PERFLUORODECANOIC ACID (PFDA)		1.9	U	
PERFLUORODODECANESULFONIC ACID (PFDOS)		3.7	U	
PERFLUORODODECANOIC ACID (PFDOA)		1.9	U	
PERFLUOROHEPTANESULFONIC ACID (PFHPS)		1.9	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-A03-100-001-GW-240-202309			WSTF-A08-EFF0001-20230914			WSTF-A08-EFF0002-20230914			WSTF-A08-INF0001-20230914		
SDG: YI15029	LAB_ID	YI15029-001			YI15029-004			YI15029-006			YI15029-003		
FRACTION: PFAS	SAMP_DATE	9/13/2023			9/14/2023			9/14/2023			9/14/2023		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	NG/L			NG/L			NG/L			NG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
PERFLUOROHEPTANOIC ACID (PFHPA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROHEXADECANOIC ACID (PFHXDA)		3.6	U		3.6	U		3.5	U		3.6	U	
PERFLUOROHEXANESULFONIC ACID (PFHXS)		1.8	U		3.5	J	P	1.8	U		3.6		
PERFLUOROHEXANOIC ACID (PFHXA)		1.8	U		1.9	J	P	1.8	U		1.8	J	P
PERFLUORONONANESULFONIC ACID (PFNS)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUORONONANOIC ACID (PFNA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROOCTADECANOIC ACID (PFODA)		3.6	U		3.6	U		3.5	U		3.6	U	
PERFLUOROOCTANE SULFONAMIDE (FOSA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROOCTANESULFONIC ACID (PFOS)		1.8	U		4.9			1.8	U		7.3		
PERFLUOROPENTANESULFONIC ACID (PFPES)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROPENTANOIC ACID (PFPEA)		1.8	U		1.3	J	P	1.8	U		1.1	J	P
PERFLUOROTETRADECANOIC ACID (PFTEA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROTRIDECANOIC ACID (PFTRIA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROUNDECANOIC ACID (PFUNA)		1.8	U		1.8	U		1.8	U		1.8	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-A08-INF0002-20230914			WSTF-A11-600C-005-GW-402-20230			WSTF-EB-20230913-07			WSTF-FB-20230913-08		
SDG: YI15029	LAB_ID	YI15029-005			YI15029-002			YI15029-007			YI15029-008		
FRACTION: PFAS	SAMP_DATE	9/14/2023			9/13/2023			9/13/2023			9/13/2023		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	NG/L			NG/L			NG/L			NG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
PERFLUOROHEPTANOIC ACID (PFHPA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROHEXADECANOIC ACID (PFHXDA)		3.7	U		3.5	U		3.6	U		3.7	U	
PERFLUOROHEXANESULFONIC ACID (PFHXS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROHEXANOIC ACID (PFHXA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORONONANESULFONIC ACID (PFNS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORONONANOIC ACID (PFNA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROOCTADECANOIC ACID (PFODA)		3.7	U		3.5	U		3.6	U		3.7	U	
PERFLUOROOCTANE SULFONAMIDE (FOSA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROOCTANESULFONIC ACID (PFOS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROPENTANESULFONIC ACID (PFPES)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROPENTANOIC ACID (PFPEA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROTETRADECANOIC ACID (PFTEA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROTRIDECANOIC ACID (PFTRIA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROUNDECANOIC ACID (PFUNA)		1.9	U		1.8	U		1.8	U		1.9	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-FB-20230914-09		
SDG: YI15029	LAB_ID	YI15029-009		
FRACTION: PFAS	SAMP_DATE	9/14/2023		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	NG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
PERFLUOROHEPTANOIC ACID (PFHPA)		1.9	U	
PERFLUOROHEXADECANOIC ACID (PFHXDA)		3.7	U	
PERFLUOROHEXANESULFONIC ACID (PFHXS)		1.9	U	
PERFLUOROHEXANOIC ACID (PFHXA)		1.9	U	
PERFLUORONONANESULFONIC ACID (PFNS)		1.9	U	
PERFLUORONONANOIC ACID (PFNA)		1.9	U	
PERFLUOROOCTADECANOIC ACID (PFODA)		3.7	U	
PERFLUOROOCTANE SULFONAMIDE (FOSA)		1.9	U	
PERFLUOROOCTANESULFONIC ACID (PFOS)		1.9	U	
PERFLUOROPENTANESULFONIC ACID (PFPES)		1.9	U	
PERFLUOROPENTANOIC ACID (PFPEA)		1.9	U	
PERFLUOROTETRADECANOIC ACID (PFTEA)		1.9	U	
PERFLUOROTRIDECANOIC ACID (PFTRIA)		1.9	U	
PERFLUOROUNDECANOIC ACID (PFUNA)		1.9	U	

Appendix B

Results as Reported by the Laboratory

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-001
Description: WSTF-A03-100-001-GW-240-20230913
Matrix: Aqueous
Date Sampled: 09/13/2023 1110
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0506	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.5	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		96	50-150
13C2_6:2FTS		113	50-150
13C2_8:2FTS		87	50-150
13C2_PFDoA		79	50-150
13C2_PFHxDA		84	50-150
13C2_PFTeDA		85	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-001
Description: WSTF-A03-100-001-GW-240-20230913
Matrix: Aqueous
Date Sampled: 09/13/2023 1110
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		86	50-150
13C3_PFHxS		91	50-150
13C3-HFPO-DA		91	50-150
13C4_PFBA		96	50-150
13C4_PFHpA		90	50-150
13C5_PFHxA		88	50-150
13C5_PFPeA		94	50-150
13C6_PFDA		83	50-150
13C7_PFUdA		85	50-150
13C8_PFOA		89	50-150
13C8_PFOS		85	50-150
13C8_PFOSA		91	50-150
13C9_PFNA		89	50-150
d-EtFOSA		64	50-150
d5-EtFOSAA		82	50-150
d9-EtFOSE		78	50-150
d-MeFOSA		73	50-150
d3-MeFOSAA		82	50-150
d7-MeFOSE		86	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-002
Description: WSTF-A11-600C-005-GW-402-20230913
Matrix: Aqueous
Date Sampled: 09/13/2023 1430
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0517	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.5	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		102	50-150
13C2_6:2FTS		117	50-150
13C2_8:2FTS		98	50-150
13C2_PFDoA		87	50-150
13C2_PFHxDA		86	50-150
13C2_PFTeDA		92	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-002
Description: WSTF-A11-600C-005-GW-402-20230913
Matrix: Aqueous
Date Sampled: 09/13/2023 1430
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		94	50-150
13C3_PFHxS		95	50-150
13C3-HFPO-DA		98	50-150
13C4_PFBA		94	50-150
13C4_PFHpA		84	50-150
13C5_PFHxA		89	50-150
13C5_PFPeA		95	50-150
13C6_PFDA		88	50-150
13C7_PFUdA		90	50-150
13C8_PFOA		98	50-150
13C8_PFOS		87	50-150
13C8_PFOSA		90	50-150
13C9_PFNA		90	50-150
d-EtFOSA		70	50-150
d5-EtFOSAA		87	50-150
d9-EtFOSE		97	50-150
d-MeFOSA		74	50-150
d3-MeFOSAA		87	50-150
d7-MeFOSE		88	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-003
Description: WSTF-A08-INF0001-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1145
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0528	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.6	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	0.89	J	3.6	1.8	0.89	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	3.6		3.6	1.8	0.89	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	52		3.6	1.8	0.89	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	UM-01	3.6	1.8	0.89	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	JM-03	3.6	1.8	0.89	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	2.8	JM-03	3.6	1.8	0.89	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.1	J	3.6	1.8	0.89	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	7.3	M-06	3.6	1.8	0.89	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		103	50-150
13C2_6:2FTS		129	50-150
13C2_8:2FTS		115	50-150
13C2_PFDoA		104	50-150
13C2_PFHxDA		83	50-150
13C2_PFTeDA		103	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-003
Description: WSTF-A08-INF0001-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1145
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		103	50-150
13C3_PFHxS		101	50-150
13C3-HFPO-DA		109	50-150
13C4_PFBA		100	50-150
13C4_PFHpA		104	50-150
13C5_PFHxA		108	50-150
13C5_PFPeA		101	50-150
13C6_PFDA		103	50-150
13C7_PFUdA		105	50-150
13C8_PFOA		111	50-150
13C8_PFOS		99	50-150
13C8_PFOSA		100	50-150
13C9_PFNA		103	50-150
d-EtFOSA		81	50-150
d5-EtFOSAA		104	50-150
d9-EtFOSE		93	50-150
d-MeFOSA		69	50-150
d3-MeFOSAA		89	50-150
d7-MeFOSE		101	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-004
Description: WSTF-A08-EFF0001-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 0800
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0600	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.6	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	0.92	J	3.6	1.8	0.90	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	3.5	J	3.6	1.8	0.90	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	53		3.6	1.8	0.90	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.9	JM-01	3.6	1.8	0.90	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	2.7	J	3.6	1.8	0.90	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.3	J	3.6	1.8	0.90	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	4.9	M-06	3.6	1.8	0.90	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		104	50-150
13C2_6:2FTS		102	50-150
13C2_8:2FTS		97	50-150
13C2_PFDoA		89	50-150
13C2_PFHxDA		87	50-150
13C2_PFTeDA		97	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)
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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-004
Description: WSTF-A08-EFF0001-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 0800
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		95	50-150
13C3_PFHxS		97	50-150
13C3-HFPO-DA		98	50-150
13C4_PFBA		85	50-150
13C4_PFHpA		91	50-150
13C5_PFHxA		94	50-150
13C5_PFPeA		92	50-150
13C6_PFDA		97	50-150
13C7_PFUdA		87	50-150
13C8_PFOA		96	50-150
13C8_PFOS		86	50-150
13C8_PFOSA		92	50-150
13C9_PFNA		90	50-150
d-EtFOSA		73	50-150
d5-EtFOSAA		89	50-150
d9-EtFOSE		84	50-150
d-MeFOSA		83	50-150
d3-MeFOSAA		94	50-150
d7-MeFOSE		91	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-005
Description: WSTF-A08-INF0002-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1340
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0610	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.5	U	15	7.5	3.7	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		95	50-150
13C2_6:2FTS		114	50-150
13C2_8:2FTS		103	50-150
13C2_PFDoA		95	50-150
13C2_PFHxDA		92	50-150
13C2_PFTeDA		102	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-005
Description: WSTF-A08-INF0002-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1340
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		99	50-150
13C3_PFHxS		104	50-150
13C3-HFPO-DA		104	50-150
13C4_PFBA		97	50-150
13C4_PFHpA		93	50-150
13C5_PFHxA		100	50-150
13C5_PFPeA		97	50-150
13C6_PFDA		103	50-150
13C7_PFUdA		97	50-150
13C8_PFOA		103	50-150
13C8_PFOS		103	50-150
13C8_PFOSA		98	50-150
13C9_PFNA		101	50-150
d-EtFOSA		67	50-150
d5-EtFOSAA		97	50-150
d9-EtFOSE		93	50-150
d-MeFOSA		70	50-150
d3-MeFOSAA		94	50-150
d7-MeFOSE		86	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-006
Description: WSTF-A08-EFF0002-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1350
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0621	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.5	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		112	50-150
13C2_6:2FTS		130	50-150
13C2_8:2FTS		114	50-150
13C2_PFDoA		103	50-150
13C2_PFHxDA		105	50-150
13C2_PFTeDA		112	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-006
Description: WSTF-A08-EFF0002-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1350
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		112	50-150
13C3_PFHxS		114	50-150
13C3-HFPO-DA		113	50-150
13C4_PFBA		110	50-150
13C4_PFHpA		103	50-150
13C5_PFHxA		112	50-150
13C5_PFPeA		110	50-150
13C6_PFDA		117	50-150
13C7_PFUdA		112	50-150
13C8_PFOA		113	50-150
13C8_PFOS		110	50-150
13C8_PFOSA		115	50-150
13C9_PFNA		105	50-150
d-EtFOSA		85	50-150
d5-EtFOSAA		107	50-150
d9-EtFOSE		102	50-150
d-MeFOSA		86	50-150
d3-MeFOSAA		104	50-150
d7-MeFOSE		99	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-007
Description: WSTF-EB-20230913-07
Matrix: Aqueous
Date Sampled: 09/13/2023 1550
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0631	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.6	UQ	7.2	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.6	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		134	50-150
13C2_6:2FTS	N	161	50-150
13C2_8:2FTS		125	50-150
13C2_PFDoA		112	50-150
13C2_PFHxDA		101	50-150
13C2_PFTeDA		121	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-007
Description: WSTF-EB-20230913-07
Matrix: Aqueous
Date Sampled: 09/13/2023 1550
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		123	50-150
13C3_PFHxS		128	50-150
13C3-HFPO-DA		129	50-150
13C4_PFBA		123	50-150
13C4_PFHpA		121	50-150
13C5_PFHxA		123	50-150
13C5_PFPeA		119	50-150
13C6_PFDA		120	50-150
13C7_PFUdA		114	50-150
13C8_PFOA		130	50-150
13C8_PFOS		112	50-150
13C8_PFOSA		113	50-150
13C9_PFNA		124	50-150
d-EtFOSA		83	50-150
d5-EtFOSAA		111	50-150
d9-EtFOSE		114	50-150
d-MeFOSA		82	50-150
d3-MeFOSAA		122	50-150
d7-MeFOSE		105	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-008
Description: WSTF-FB-20230913-08
Matrix: Aqueous
Date Sampled: 09/13/2023 1600
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0642	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.7	UQ	7.4	3.7	1.9	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.5	U	15	7.5	3.7	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		114	50-150
13C2_6:2FTS	N	165	50-150
13C2_8:2FTS		119	50-150
13C2_PFDoA		111	50-150
13C2_PFHxDA		94	50-150
13C2_PFTeDA		107	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech			Laboratory ID: YI15029-008
Description: WSTF-FB-20230913-08			Matrix: Aqueous
Date Sampled: 09/13/2023 1600		Project Name: NASA White Sands	
Date Received: 09/15/2023		Project Number: 112G09033	

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		115	50-150
13C3_PFHxS		113	50-150
13C3-HFPO-DA		123	50-150
13C4_PFBA		116	50-150
13C4_PFHpA		111	50-150
13C5_PFHxA		111	50-150
13C5_PFPeA		119	50-150
13C6_PFDA		119	50-150
13C7_PFUdA		101	50-150
13C8_PFOA		122	50-150
13C8_PFOS		102	50-150
13C8_PFOSA		116	50-150
13C9_PFNA		113	50-150
d-EtFOSA		73	50-150
d5-EtFOSAA		109	50-150
d9-EtFOSE		105	50-150
d-MeFOSA		79	50-150
d3-MeFOSAA		107	50-150
d7-MeFOSE		112	50-150

LOQ = Limit of Quantitation	B = Detected in the method blank	E = Quantitation of compound exceeded the calibration range	DL = Detection Limit	Q = Surrogate failure
U = Not detected at or above the LOD	N = Recovery is out of criteria	P = The RPD between two GC columns exceeds 40%	J = Estimated result < LOQ and ≥ DL	L = LCS/LCSD failure
H = Out of holding time	W = Reported on wet weight basis	LOD = Limit of Detection		S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech | Laboratory ID: YI15029-009
Description: WSTF-FB-20230914-09 | Matrix: Aqueous
Date Sampled: 09/14/2023 0925 | Project Name: NASA White Sands
Date Received: 09/15/2023 | Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0652	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.7	UQ	7.4	3.7	1.9	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.5	U	15	7.5	3.7	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		119	50-150
13C2_6:2FTS	N	153	50-150
13C2_8:2FTS		120	50-150
13C2_PFDoA		104	50-150
13C2_PFHxDA		63	50-150
13C2_PFTeDA		82	50-150

LOQ = Limit of Quantitation
U = Not detected at or above the LOD
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%
LOD = Limit of Detection
DL = Detection Limit
J = Estimated result < LOQ and ≥ DL
Q = Surrogate failure
L = LCS/LCSD failure
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech			Laboratory ID: YI15029-009
Description: WSTF-FB-20230914-09			Matrix: Aqueous
Date Sampled: 09/14/2023 0925		Project Name: NASA White Sands	
Date Received: 09/15/2023		Project Number: 112G09033	

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		117	50-150
13C3_PFHxS		116	50-150
13C3-HFPO-DA		119	50-150
13C4_PFBA		114	50-150
13C4_PFHpA		106	50-150
13C5_PFHxA		108	50-150
13C5_PFPeA		109	50-150
13C6_PFDA		112	50-150
13C7_PFUdA		114	50-150
13C8_PFOA		119	50-150
13C8_PFOS		107	50-150
13C8_PFOSA		104	50-150
13C9_PFNA		113	50-150
d-EtFOSA		76	50-150
d5-EtFOSAA		107	50-150
d9-EtFOSE		94	50-150
d-MeFOSA		72	50-150
d3-MeFOSAA		106	50-150
d7-MeFOSE		97	50-150

LOQ = Limit of Quantitation	B = Detected in the method blank	E = Quantitation of compound exceeded the calibration range	DL = Detection Limit	Q = Surrogate failure
U = Not detected at or above the LOD	N = Recovery is out of criteria	P = The RPD between two GC columns exceeds 40%	J = Estimated result < LOQ and ≥ DL	L = LCS/LCSD failure
H = Out of holding time	W = Reported on wet weight basis	LOD = Limit of Detection		S = MS/MSD failure

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Appendix C

Support Documentation

NASA-WHITE SANDS
SDG YI15029

Initial Calibration 9/20/2023
LCMSMS01.i

PFOS

Analyte Concentration	Analyte Response	Internal Standard Response	Internal Standard Amount	RRF	Reported RRF/RSD
92.8	29619	597564	2000	1.068238	1.068238
185.6	54082	514885	2000	1.131865	1.131865
464	145917	553769	2000	1.135767	1.135767
928	268890	530037	2000	1.093328	1.093328
1856	492223	552943	2000	0.959254	0.959254
4640	1428877	534495	2000	1.152294	1.152294
9280	2652123	499127	2000	1.145156	1.145156
13920	3857093	488047	2000	1.135505	1.135505
18560	5304578	504185	2000	1.133739	1.133739
			Average	1.106127	1.106127
			Standard Deviation	0.061229	
			RSD	0.055355	
			%RSD	5.535464	5.5

Continuing Calibration 09/29/2023 @ 02:27
LCMSMS01.i

PFOS	Analyte Concentration	Target Concentration	Calculation	Calculated %R	Reported %R	QC Limits
	199.39	185.6	199.39/185.60*100	107.4299569	107.0000	70-130

Sample Identification WSTF-A08-INF0001-20230914
Compound PFOS

Compound Area	124429	Average RRF	1.106127
Internal Standard Amount (ng)	2000	Sample Volume(ml)	279.8
Dilution Factor	1	Volume Extract (ml)	5
Internal Standard Area	552131		

Concentration	7.2816	ng/L
Reported Result	7.3	ng/L

Extracted Internal Standard (EIS) 13C8-PFOS
%Recovery = ((Area * DF)/Opening CCV Area) * 100

Calculation	((552131*1)/557998)*100		
Calculated EIS %R	98.94856254		
Reported EIS %R	99	QC Limits	50-150

LCS %R YQ85972-002

	PFOS	Spike amount	LCS concentration
Calculation	14/15*100		
Calculated LCS %R	93.33	15	14
Reported LCS %R	97		

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Injection Vol:	10.0 uL
Sample Type:	Client	Auto Sampler:	77
Lab Sample ID:	YI15029-003	Lab Prep. Batch:	85972
Client ID:	WSTF-A08-INF0001-20230914	Sample Group:	YI15029
Sample Info:	YI15029-003	Misc. Info:	
Inst. ID:	LCMSMS01.i	Operator:	eqi.svoa
Method:	LCMSMS01_PFAS-ID2	Version: V16	30-Jun-2022 10:54:24
Calib Method:	PFAS-ID2	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker

Matrix: Aqueous
Final Conc.: Amt * DF * CF
Concentration Formula: CF = (VF/1000) * 1/VI = 0.0178699

Name	Value	Units	Description
DF	1		Dilution Factor
VF	5000	ul	Final Volume
VI	279.8	ml	Initial Sample Volume

IsoDil Stds %Recovery = ((Area * DF)/Opening CCV Area) * 100

Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1000 ml

Signal	Quant Std	RT (Min)	Exp RT (Min)	Δ RT (Min)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.660	1.660	0.000	1867244	18	>100:1			2000.00	2082.32	100	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													
212.9 > 168.9	46	1.668	1.660	0.000	2174068	17	>100:1			2884.82	51.551		
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		1.989	1.989	0.000	1499479	18	>100:1			2000.00	2038.19	101	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													J
262.9 > 218.9	50	1.989	1.989	0.000	53429	15	63:1			63.432	1.1335		
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.038	2.030	0.000	683621	16	>100:1			2000.00	2232.49	103	
7 Perfluoro-1-butanesulfonate (PFBS) CAS: 375-73-5													U
298.9 > 80	44		2.030		ND								
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													U
349 > 80	44		2.355		ND								
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.290	2.290	0.000	359816	17	>100:1			10000	10563	103	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonate] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.290		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.327	2.327	0.000	1756490	16	>100:1			2000.00	2330.98	108	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													J
313 > 269	49	2.327	2.327	0.000	79100	12	85:1	Target = 15.95		101.28	1.8099		M
313 > 119	49	2.327	2.327		4442	16	23:1	17.80 (7.97-23.93)					
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.449	2.440	0.000	1538028	16	>100:1			10000	10352	109	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.440		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.711	2.711	0.000	2484120	18	>100:1			2000.00	2410.51	104	
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													U
363 > 319	47		2.711		ND								

Signal	Quant Std	RT (Min)	Exp RT (Min)	Δ RT (Min)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.727	2.728	0.000	628751	19	>100:1			2000.00	2059.58	101	
14 Perfluorohexanesulfonate (PFHxS) CAS: 355-46-4													
399 > 80	45	2.727	2.728	0.000	72325	27	>100:1	Target = 3.56	5.31	200.58	3.5844		
399 > 99	45	2.736	2.728		21808	26	>100:1	3.31 (1.78-5.35)	5.23				
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.753		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													U
449 > 80	45		3.162		ND								
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.135	3.127	0.000	431009	23	>100:1			10000	13407	129	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonate] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.109		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.162	3.162	0.000	1951160	20	>100:1			2000.00	2415.79	111	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													J
413 > 369	53	3.170	3.162	0.000	137753	29	73:1	Target = 2.61	5.50	155.64	2.7814		M
413 > 169	53	3.170	3.162		53345	31	89:1	2.58 (1.30-3.93)	3.55				
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.651	3.644	0.000	552131	23	>100:1			2000.00	2081.31	99	
18 Perfluorooctanesulfonate (PFOS) CAS: 1763-23-1													
499 > 80	54	3.658	3.651	0.000	124429	49	>100:1	Target = 4.00	1.24	407.48	7.2816		M
499 > 99	54	3.651	3.651		23897	47	>100:1	5.20 (2.00-6.00)	2.79				
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.929		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		4.127		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.574		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.809		ND								
34 Perfluorododecanesulfonic acid (PFDOS) CAS: 79780-39-5													U
699 > 80	54		5.341		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.658	3.651	0.000	1633762	21	>100:1			2000.00	2105.88	103	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.651		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		4.090	4.082	0.000	902365	24	>100:1			2000.00	2006.61	100	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		4.075		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		4.127	4.112	0.000	327724	23	>100:1			10000	11004	115	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonate] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		4.120		ND								
4 1H,1H,2H,2H-perfluorododecane sulfonate (10:2FTS) CAS: 120226-60-0													U
627 > 607	65		4.998		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		4.142	4.135	0.000	1455982	23	>100:1			2000.00	2019.36	103	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		4.135		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.358	4.358	0.000	1443414	23	>100:1			10000	9263.35	89	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.367		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.588	4.589	0.000	1441774	23	>100:1			10000	11319	104	

Signal	Quant Std	RT (Min)	Exp RT (Min)	Δ RT (Min)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.589		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.596	4.589	0.000	1393151	22	>100:1			2000.00	2116.14	105	
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.589		ND								
D 61 d7-MeFOSE CAS: SESI-0129													
623 > 59		4.723	4.724	0.000	221045	18	>100:1			2000.00	1900.47	101	
32 2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE) CAS: 24448-09-7													U
616 > 59	61		4.741		ND								
D 57 d3-MeFOSA CAS: SESI-0109													
515 > 169		4.749	4.749	0.000	94449	26	>100:1			2000.00	1497.60	69	
26 N-methylperfluoro-1-octanesulfonamide (MeFOSA) CAS: 31506-32-8													U
512 > 169	57		4.758		ND								
D 62 d9-EtFOSE CAS: SESI-0130													
639 > 59		4.974	4.982	0.000	183018	22	>100:1			2000.00	1738.28	93	
33 2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE) CAS: 1691-99-2													U
630 > 59	62		4.998		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		5.005	5.005	0.000	1354606	25	>100:1			2000.00	2062.33	104	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		5.005		ND								
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		5.377		ND								
D 59 d5-EtFOSA CAS: SESI-0108													
531 > 169		5.012	5.013	0.000	100619	30	>100:1			2000.00	1688.11	81	
27 N-ethylperfluoro-1-octanesulfonamide (EtFOSA) CAS: 4151-50-2													U
526 > 169	59		5.013		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		5.709	5.716	0.000	1448259	22	>100:1			2000.00	2082.43	103	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		5.709		ND								
D 40 13C2_PFHxDA CAS: SESI-0103													
815 > 770		6.295	6.295	0.000	792102	25	>100:1			2000.00	1797.86	83	
35 Perfluoro-n-hexadecanoic acid (PFHxDA) CAS: 67905-19-5													U
813 > 769	40		6.295		ND								
36 Perfluoro-n-octadecanoic acid (PFODA) CAS: 16517-11-6													U
913 > 869	40		6.804		ND								

Compound Type Legend

D - Isotopic Dilution Std.

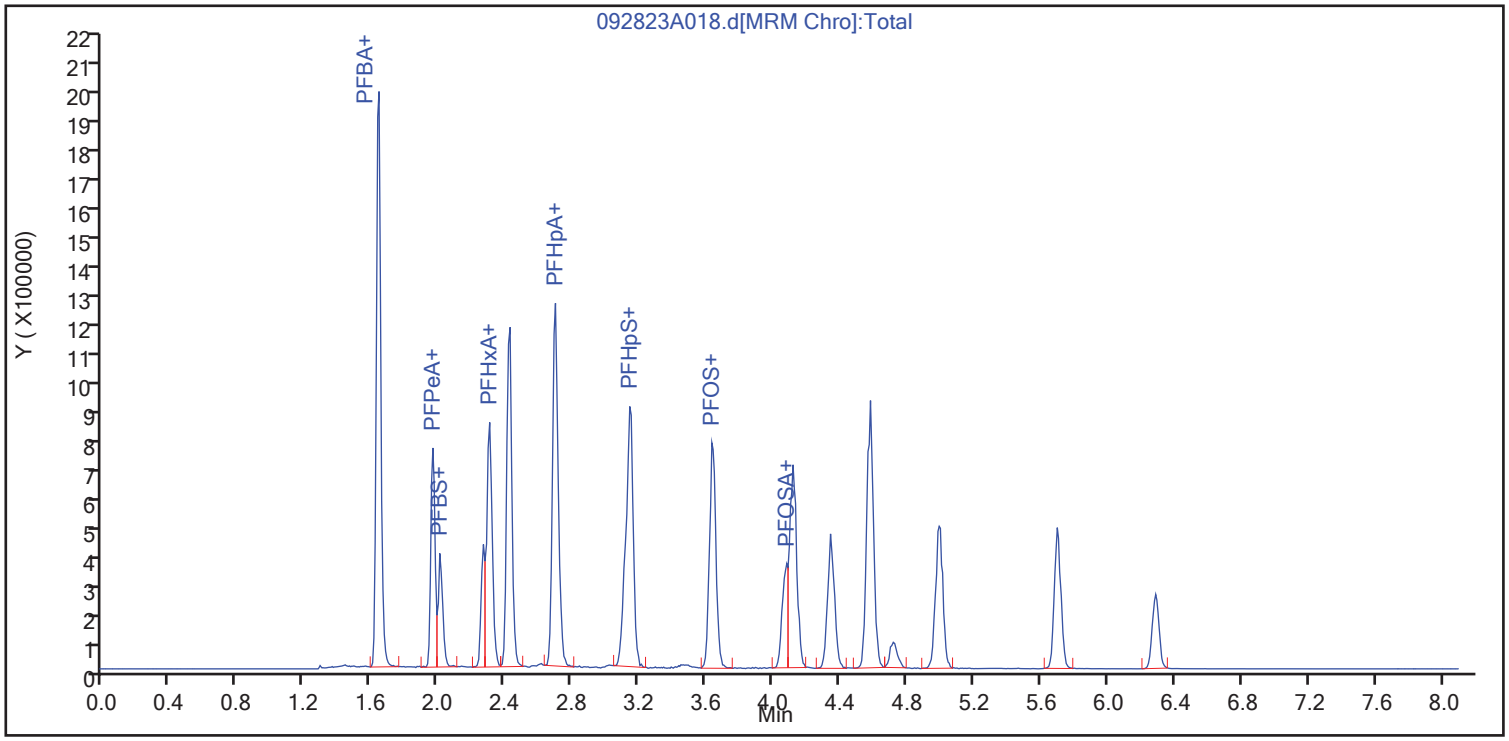
QC Flag Legend

U - Result Less Than Method Detection Limit
J - Compound Concentration Below Quantitation Limit
M - Compound Hit/Peak Manually Integrated

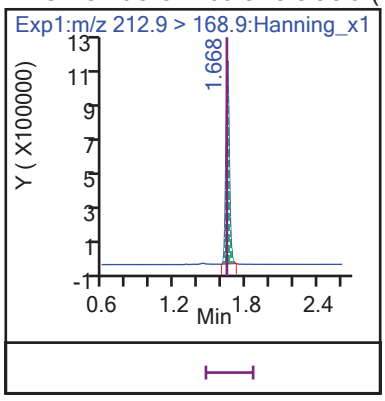
Report Date: 29-Sep-2023 17:46:59 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

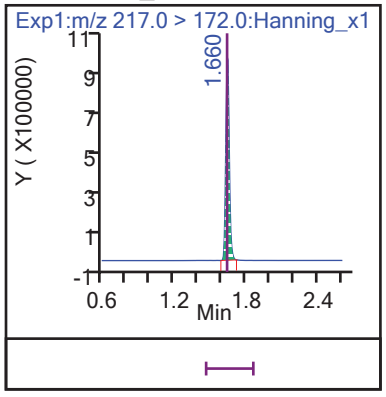
Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Inst. ID:	LCMSMS01.i
Client ID:	WSTF-A08-INF0001-20230914	Lab ID:	YI15029-003
Sample Info:	YI15029-003		
Dil. Factor:	1	Operator:	eqi.svoa



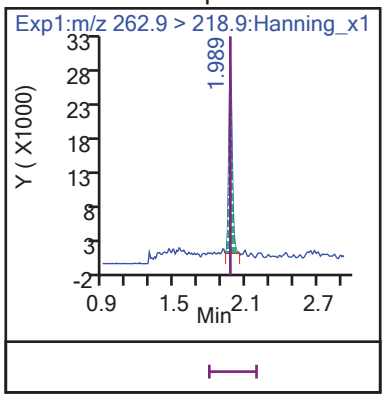
8 Perfluoro-n-butanoic acid (PFBA)



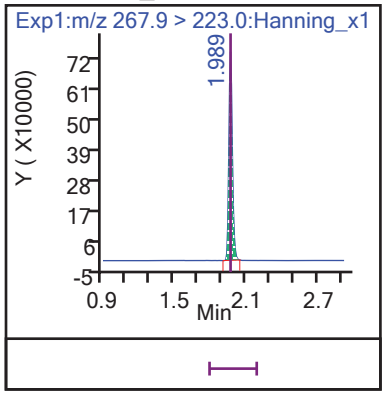
D 46 13C4_PFBA



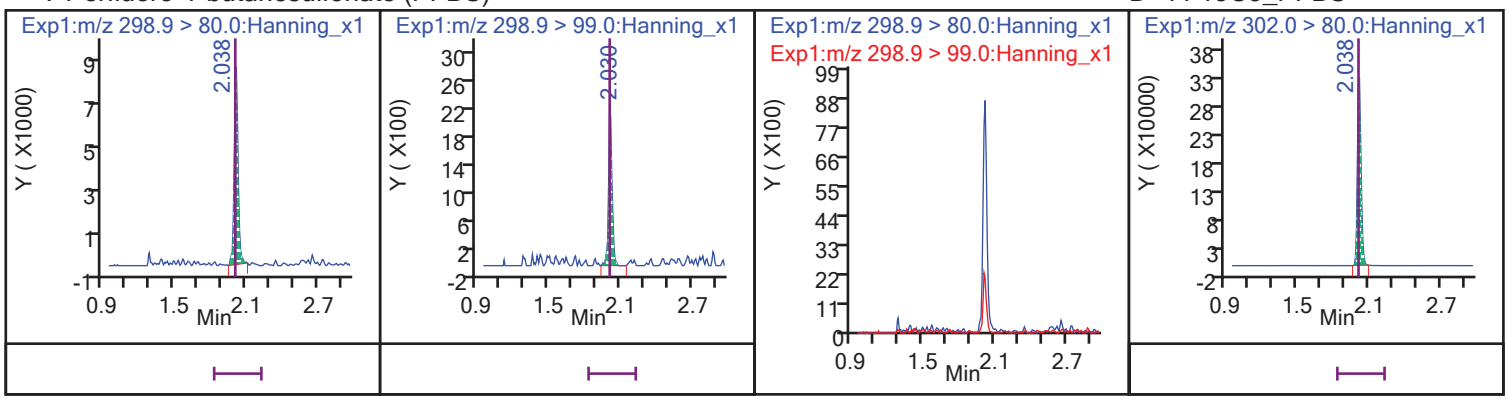
21 Perfluoro-n-pentanoic acid (PFPeA)



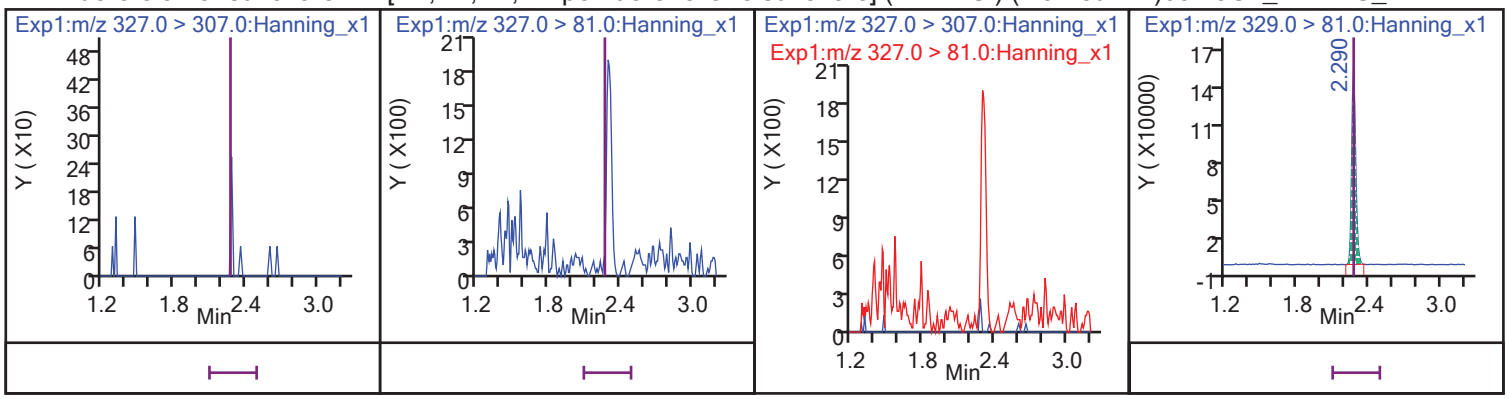
D 50 13C5_PFPeA



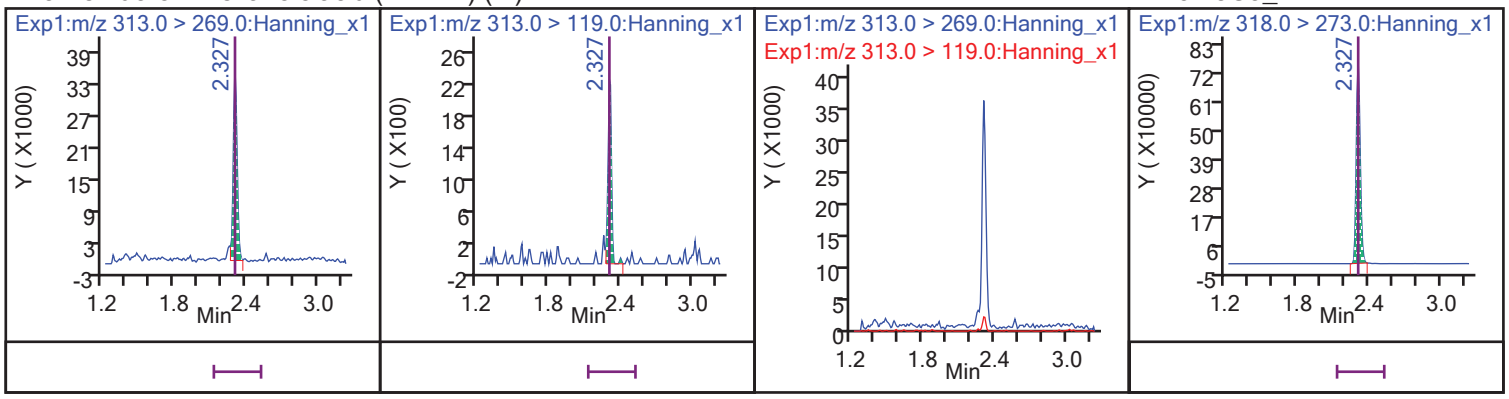
7 Perfluoro-1-butanesulfonate (PFBS) D 44 13C3_PFBS



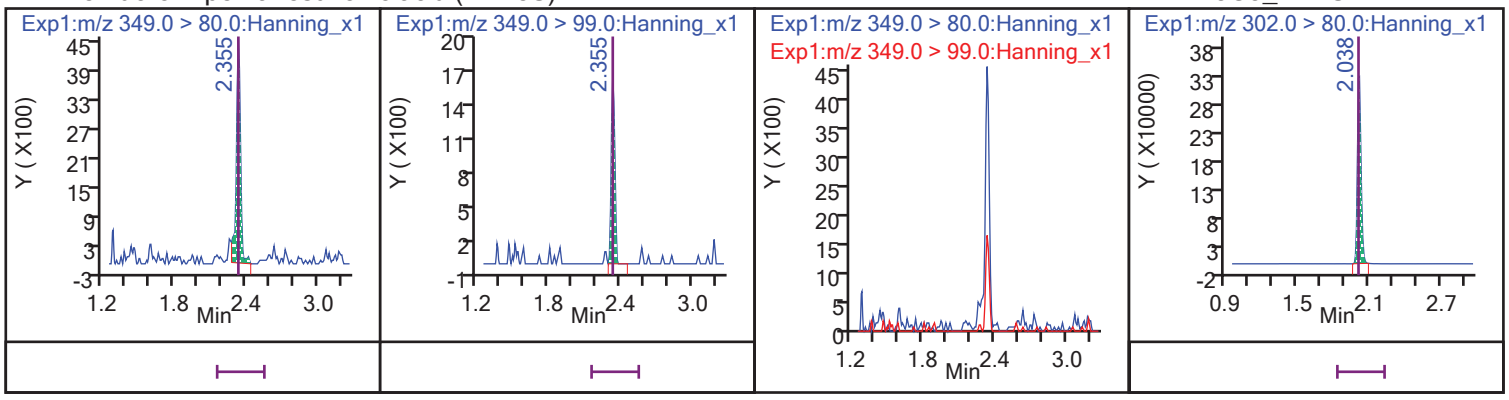
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonate] (4:2 FTS) (Marked ND) 63 13C2_4:2 FTS_2



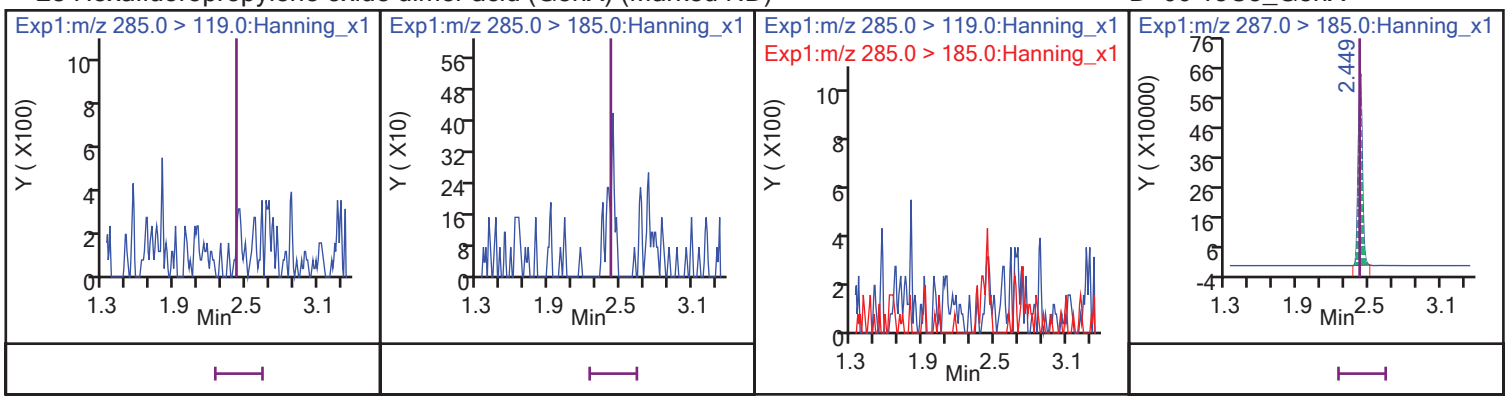
15 Perfluoro-n-hexanoic acid (PFHxA) (M) D 49 13C5_PFHxA



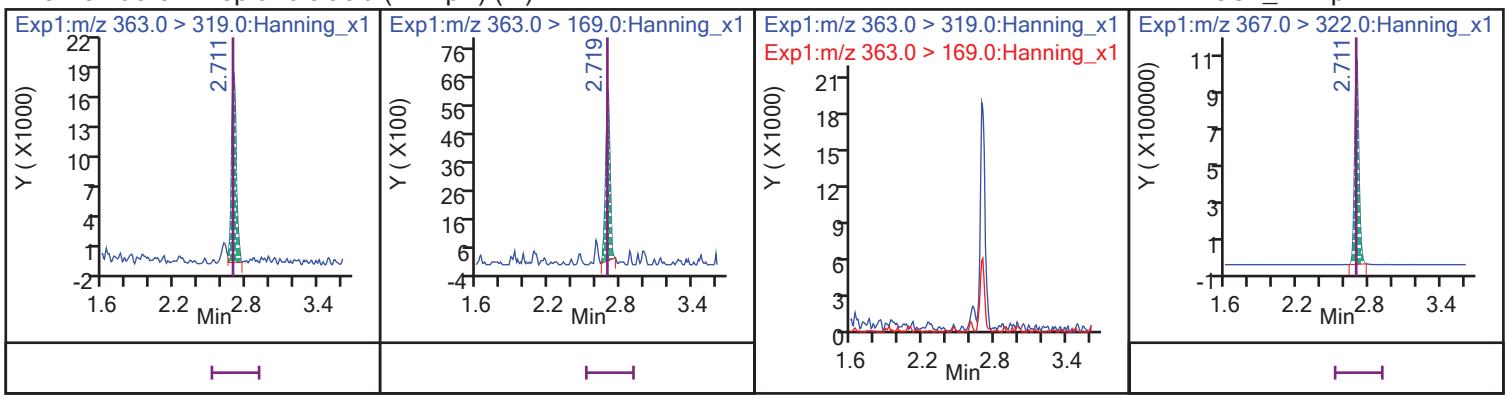
22 Perfluoro-1-pentanesulfonic acid (PFPeS) D 44 13C3_PFBS



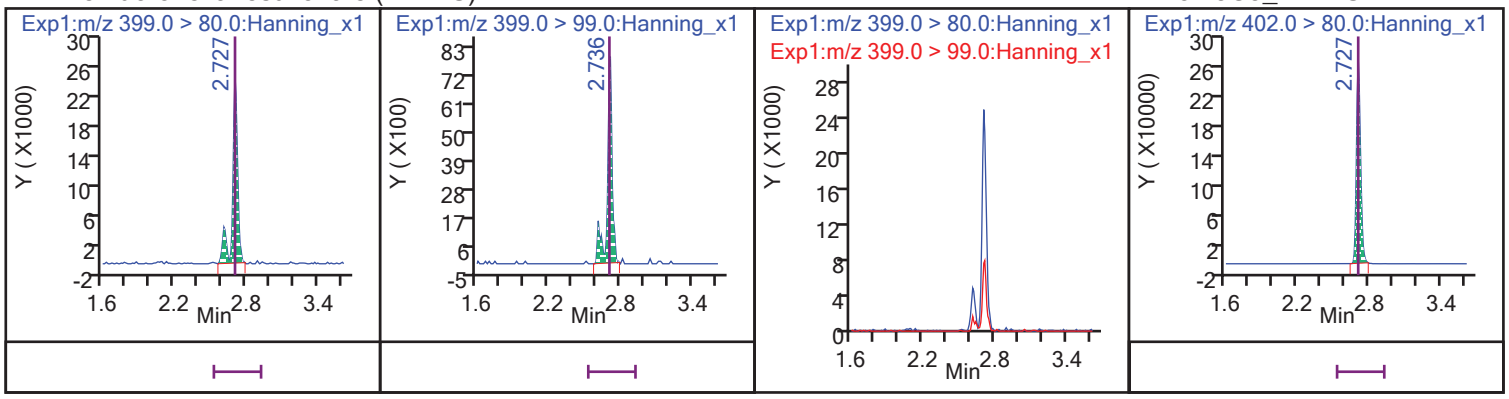
28 Hexafluoropropylene oxide dimer acid (GenX) (Marked ND) D 66 13C3_GenX



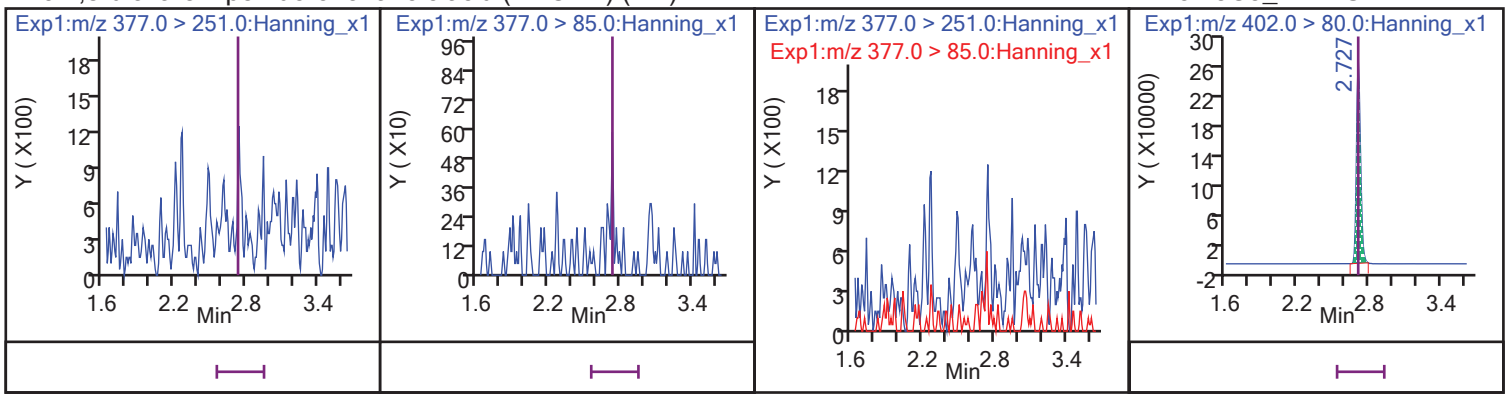
13 Perfluoro-n-heptanoic acid (PFHpA) (M) D 47 13C4_PFHpA



14 Perfluorohexanesulfonate (PFHxS) D 45 13C3_PFHxS

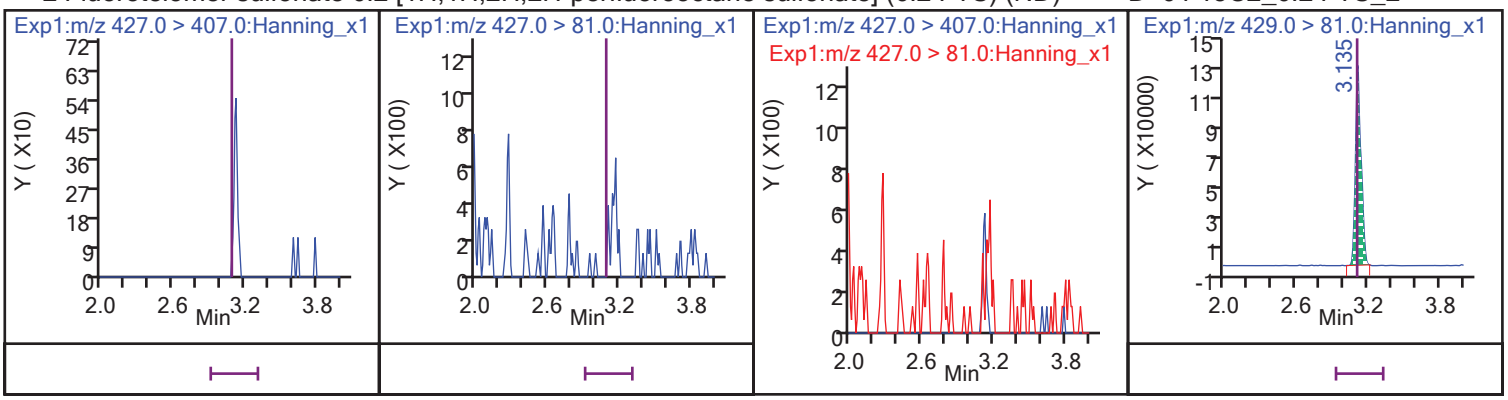


29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) (ND) D 45 13C3_PFHxS



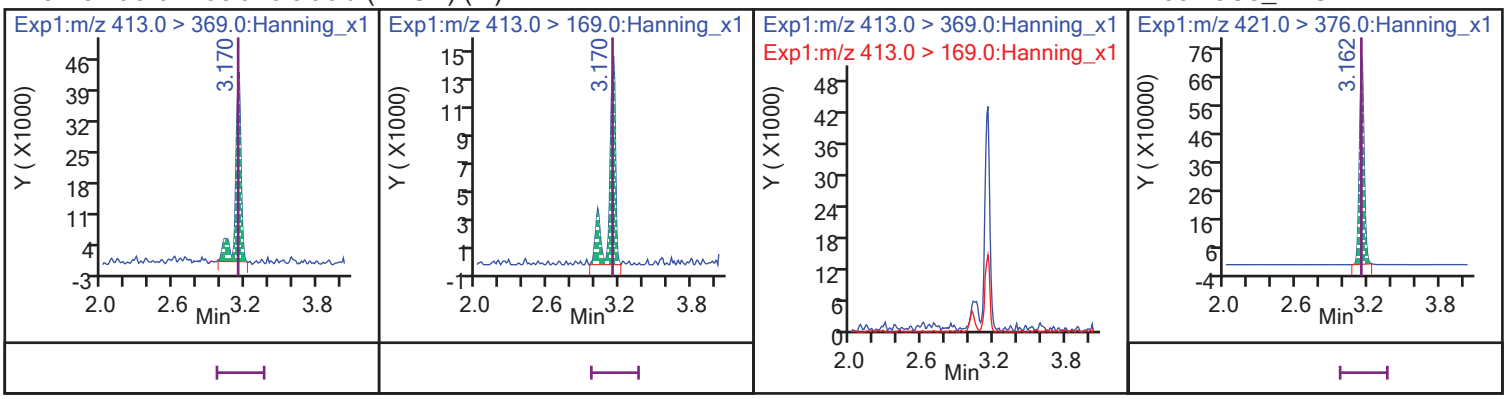
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonate] (6:2 FTS) (ND)

D 64 13C2_6:2 FTS_2



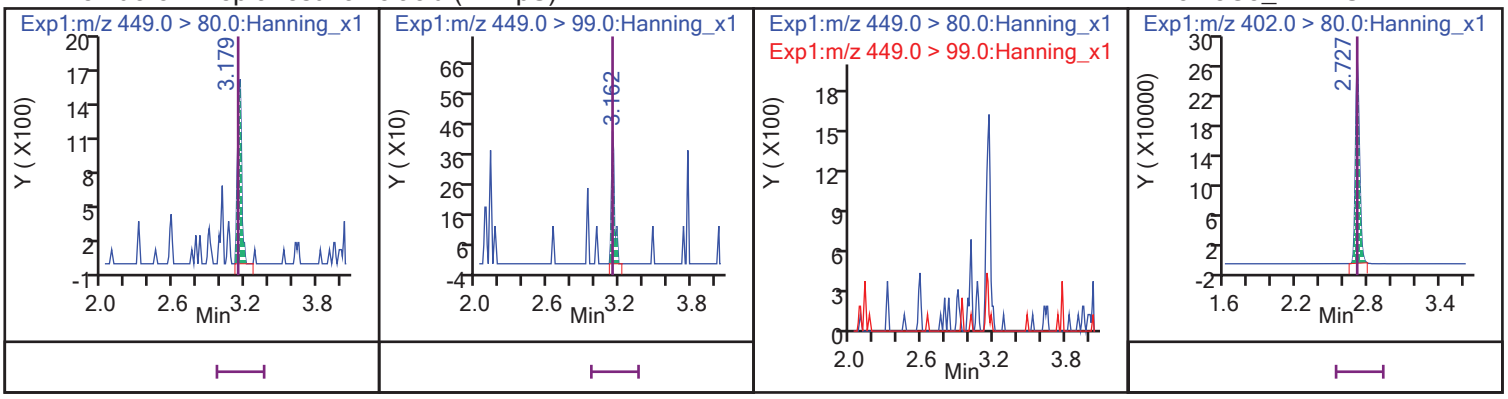
20 Perfluoro-n-octanoic acid (PFOA) (M)

D 53 13C8_PFOA



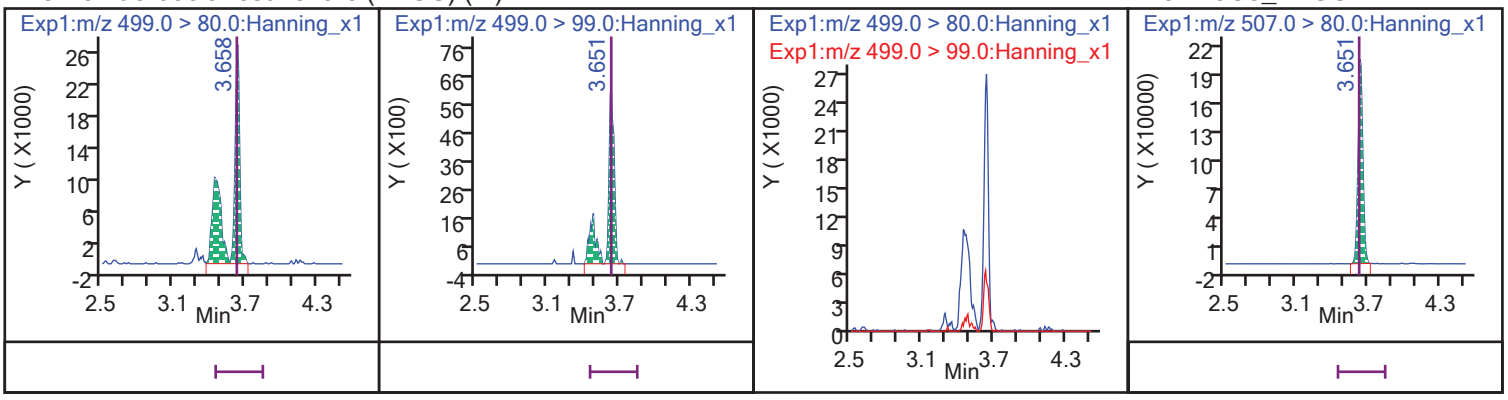
12 Perfluoro-1-heptanesulfonic acid (PFHpS)

D 45 13C3_PFHxS

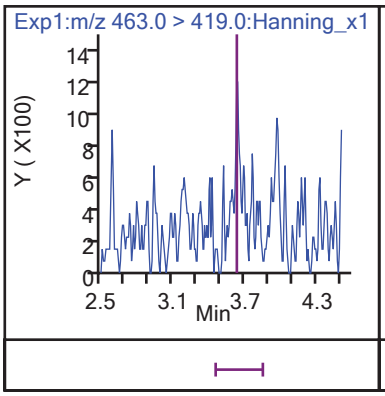


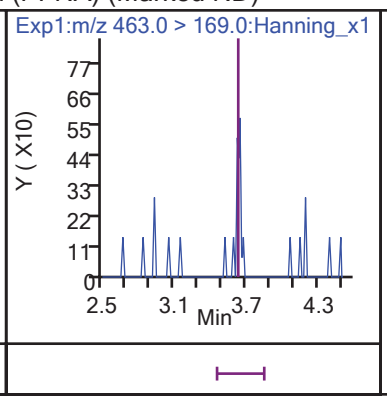
18 Perfluorooctanesulfonate (PFOS) (M)

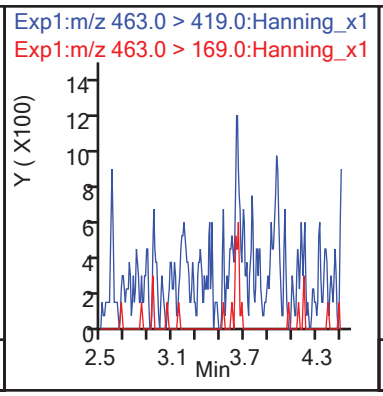
D 54 13C8_PFOS



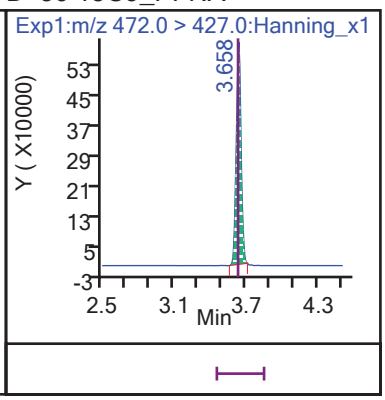
17 Perfluoro-n-nonanoic acid (PFNA) (Marked ND)



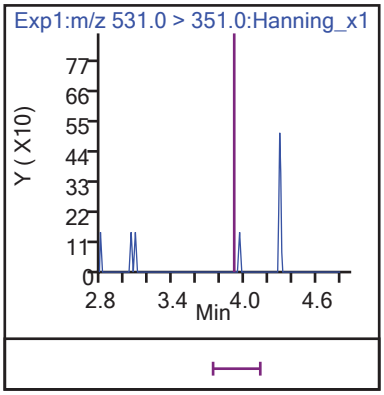




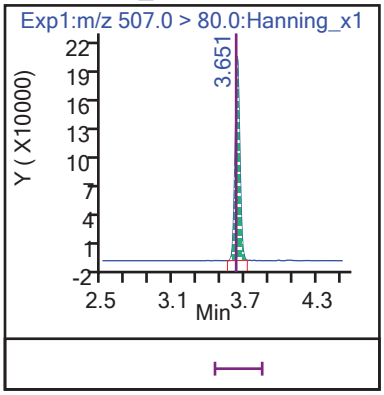
D 56 13C9_PFNA



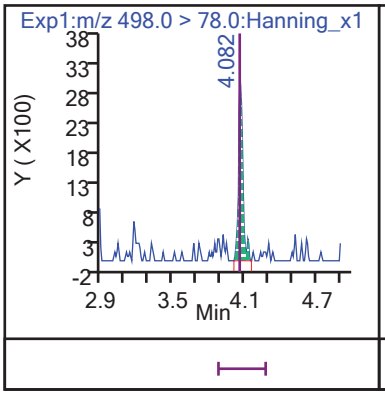
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) (Marked ND)

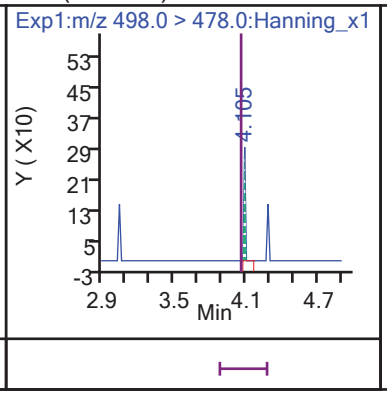


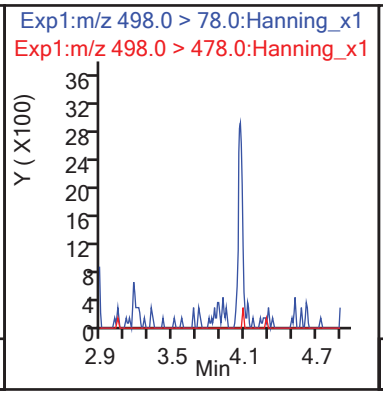
D 54 13C8_PFOS



19 Perfluoro-1-octanesulfonamide (PFOSA)







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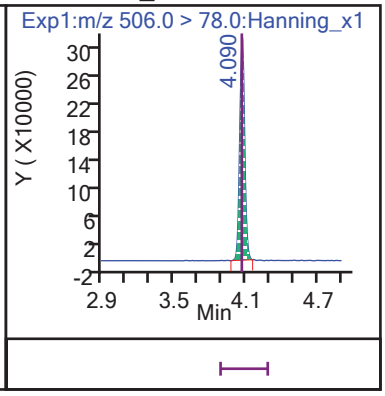
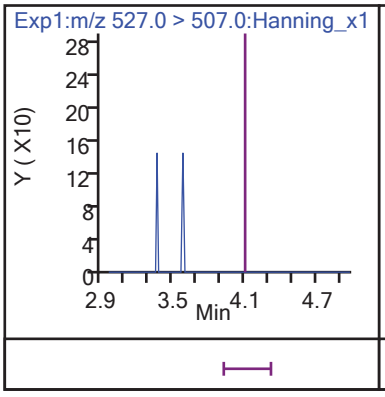
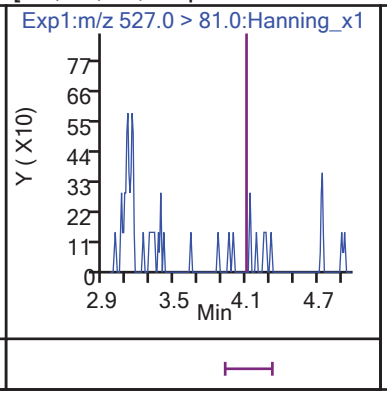
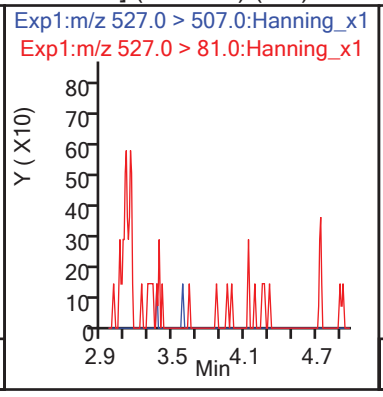


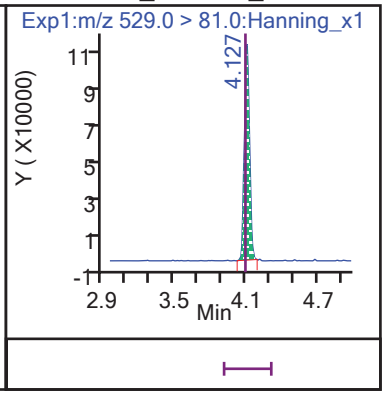
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonate] (8:2 FTS) (ND)



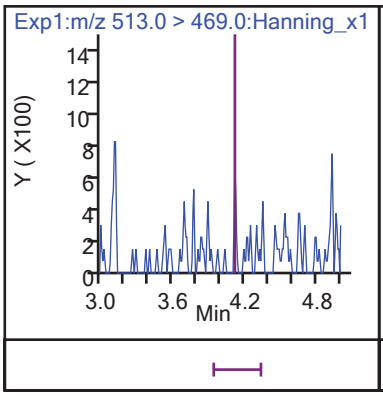


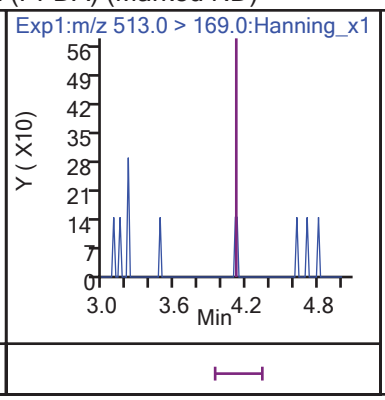


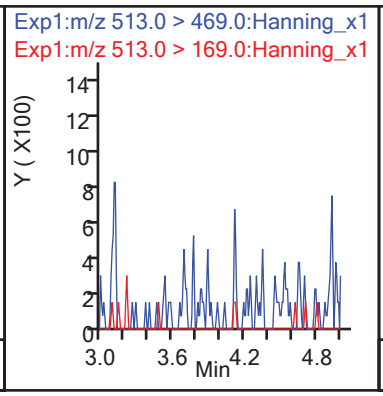
D 65 13C2_8:2 FTS_2



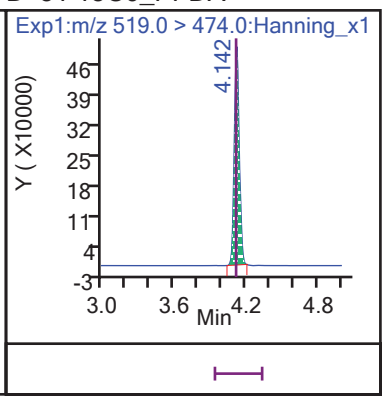
10 Perfluoro-n-decanoic acid (PFDA) (Marked ND)



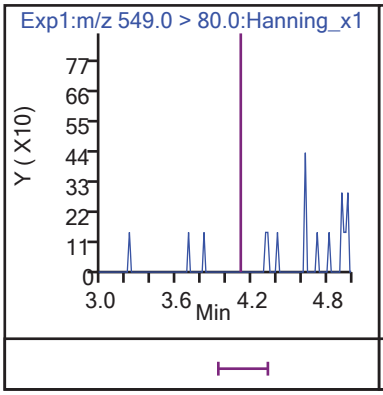


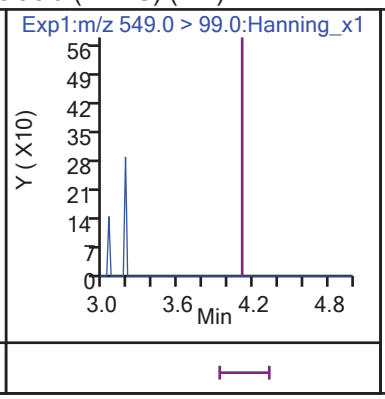


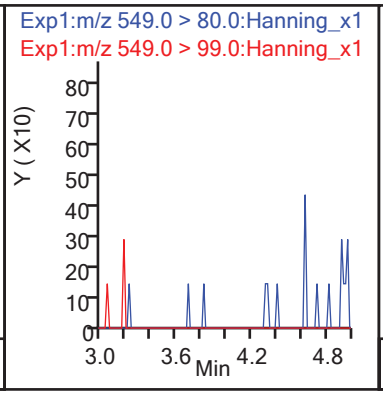
D 51 13C6_PFDA



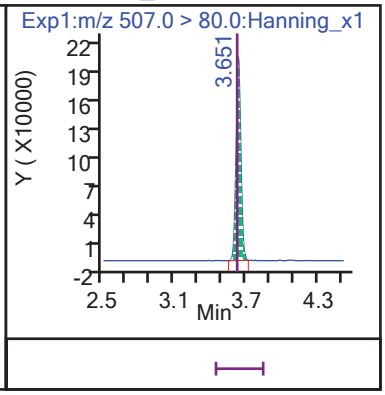
16 Perfluoro-1-nonanesulfonic acid (PFNS) (ND)



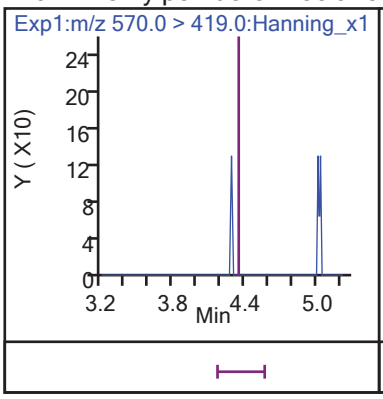


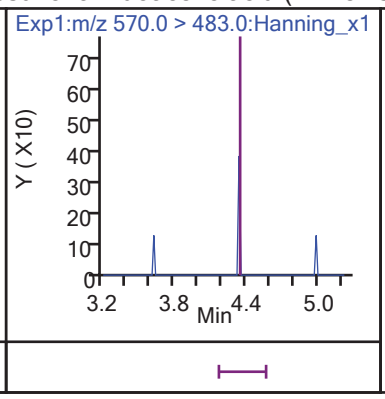


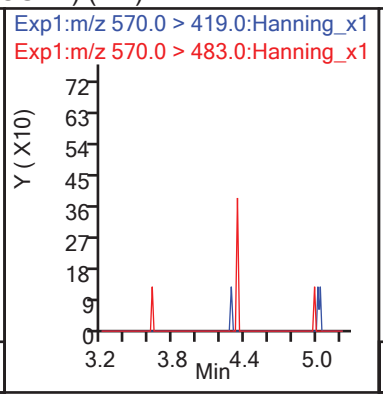
D 54 13C8_PFOS



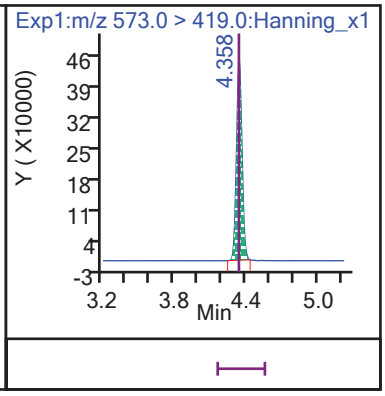
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) (ND)



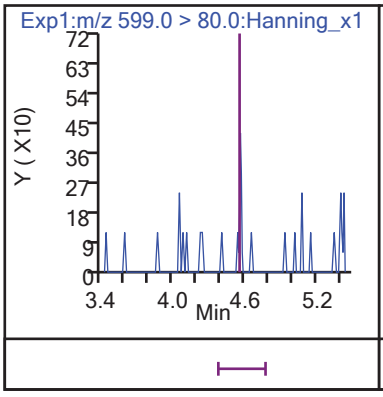


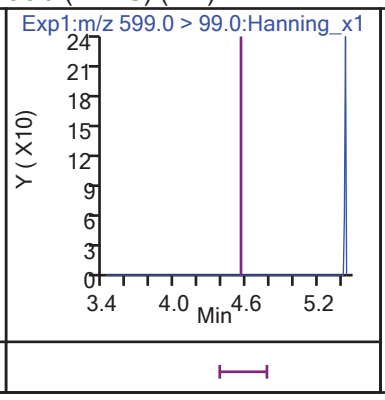


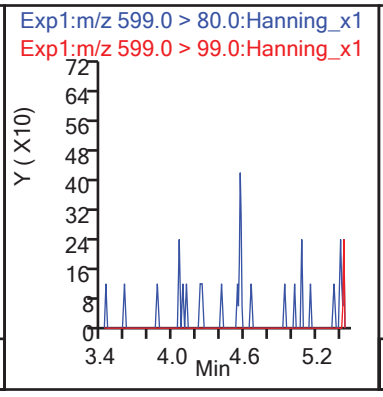
D 58 d3-MeFOSAA



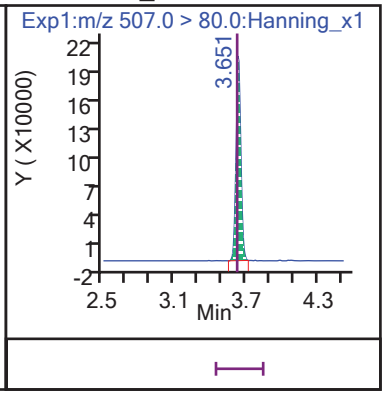
9 Perfluoro-1-decanesulfonic acid (PFDS) (ND)



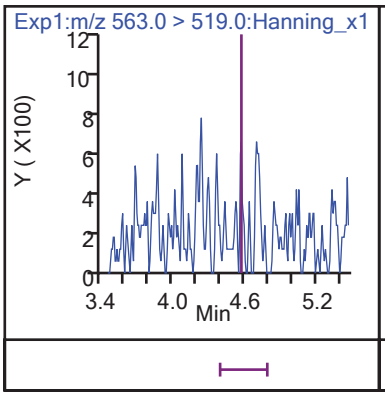


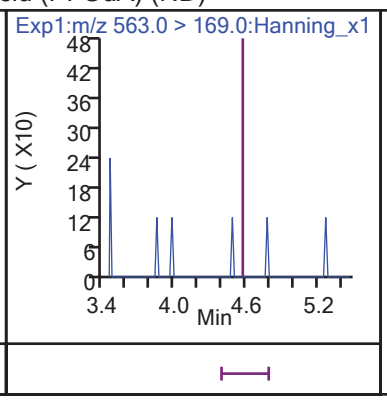


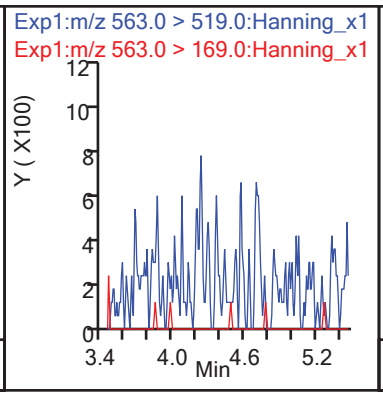
D 54 13C8_PFOS



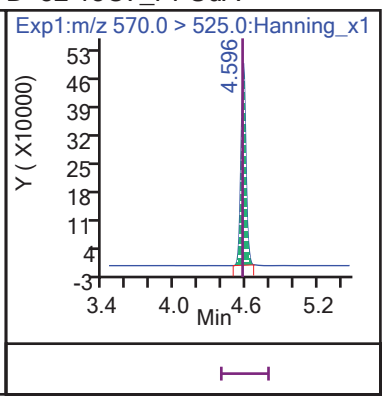
25 Perfluoro-n-undecanoic acid (PFUdA) (ND)



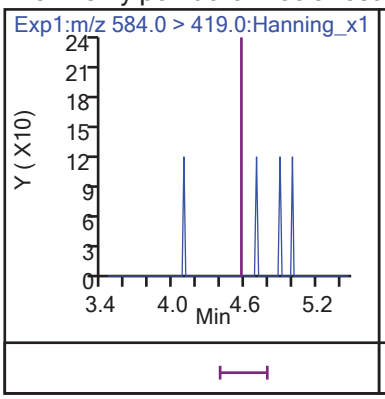


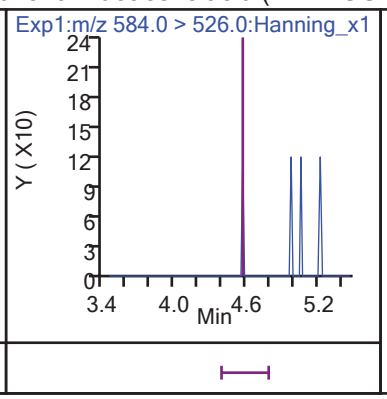


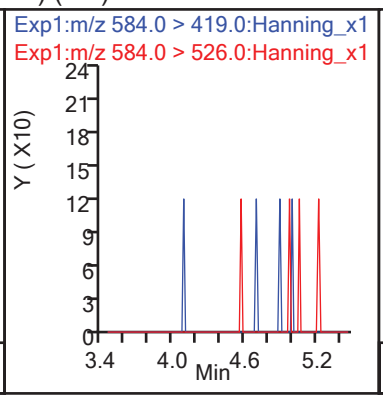
D 52 13C7_PFUdA



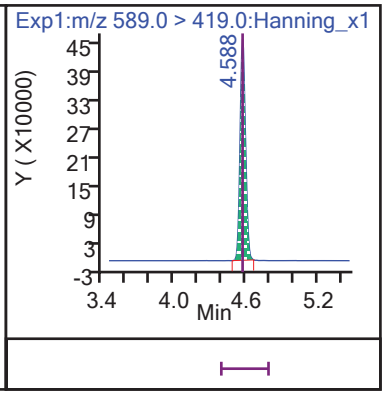
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) (ND)



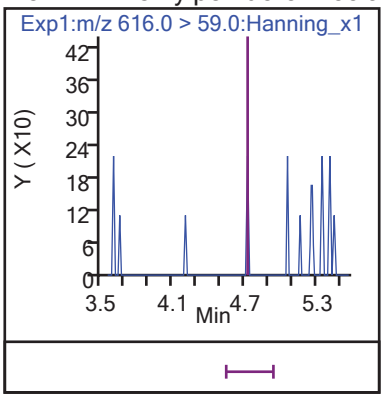




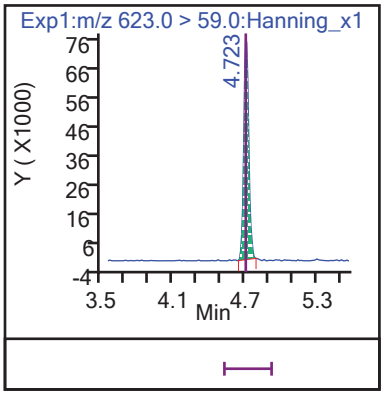
D 60 d5-EtFOSAA



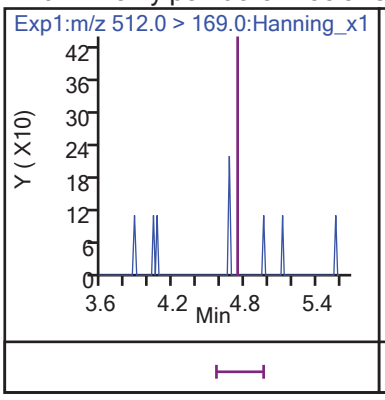
32 2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE) (Marked ND)

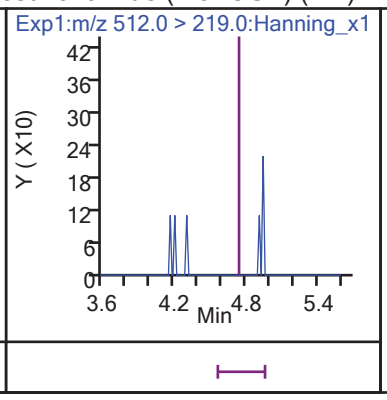


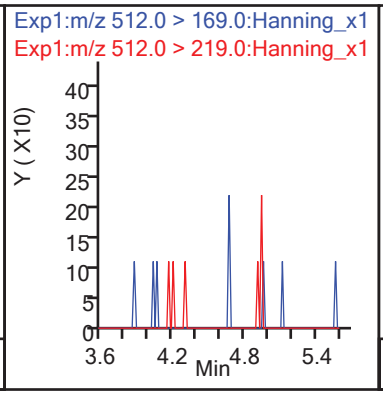
D 61 d7-MeFOSE



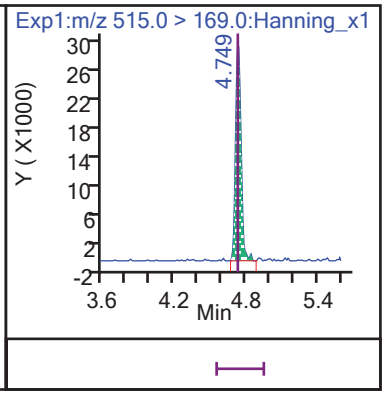
26 N-methylperfluoro-1-octanesulfonamide (MeFOSA) (ND)



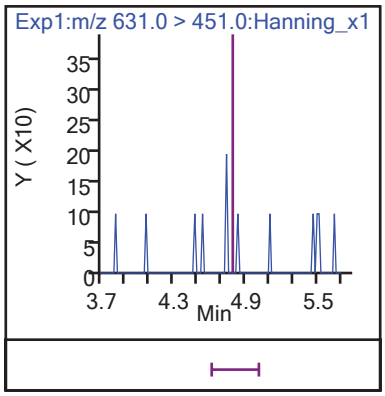




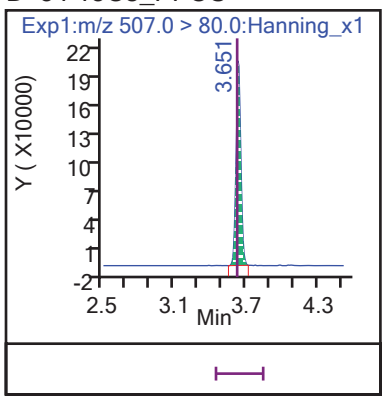
D 57 d3-MeFOSA



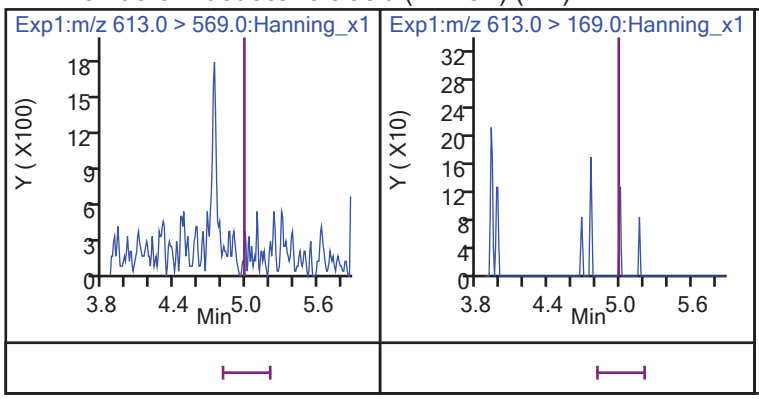
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) (Marked ND)



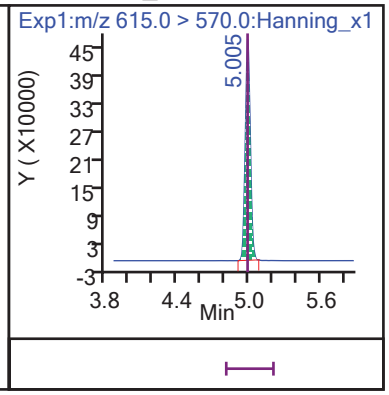
D 54 13C8_PFOS



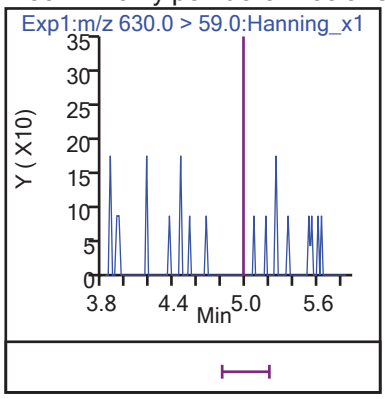
11 Perfluoro-n-dodecanoic acid (PFDoA) (ND)



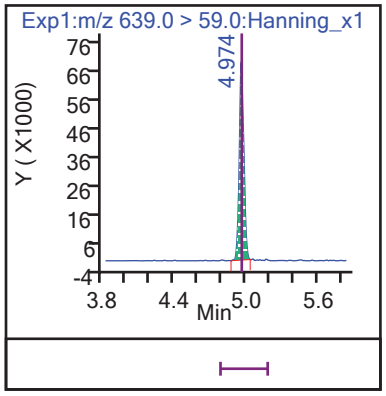
D 38 13C2_PFDoA



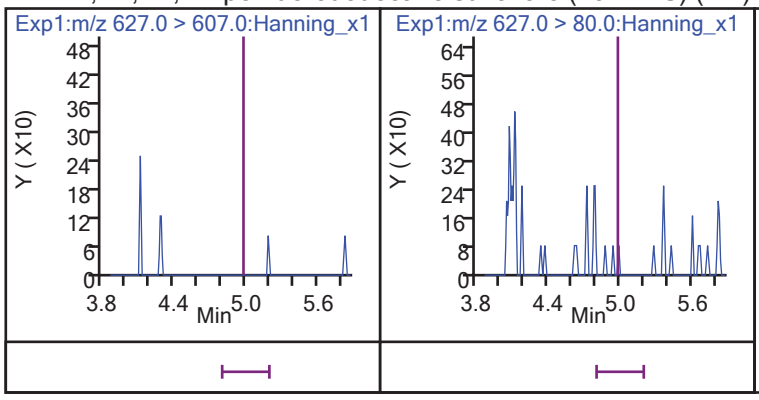
33 2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE) (ND)



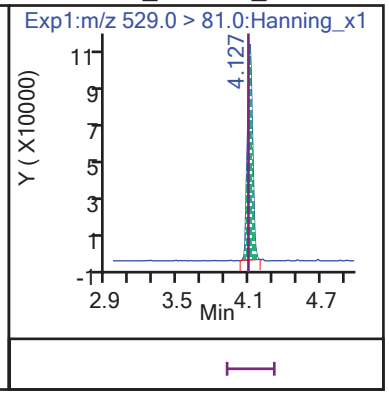
D 62 d9-EtFOSE



4 1H,1H,2H,2H-perfluorododecane sulfonate (10:2FTS) (ND)

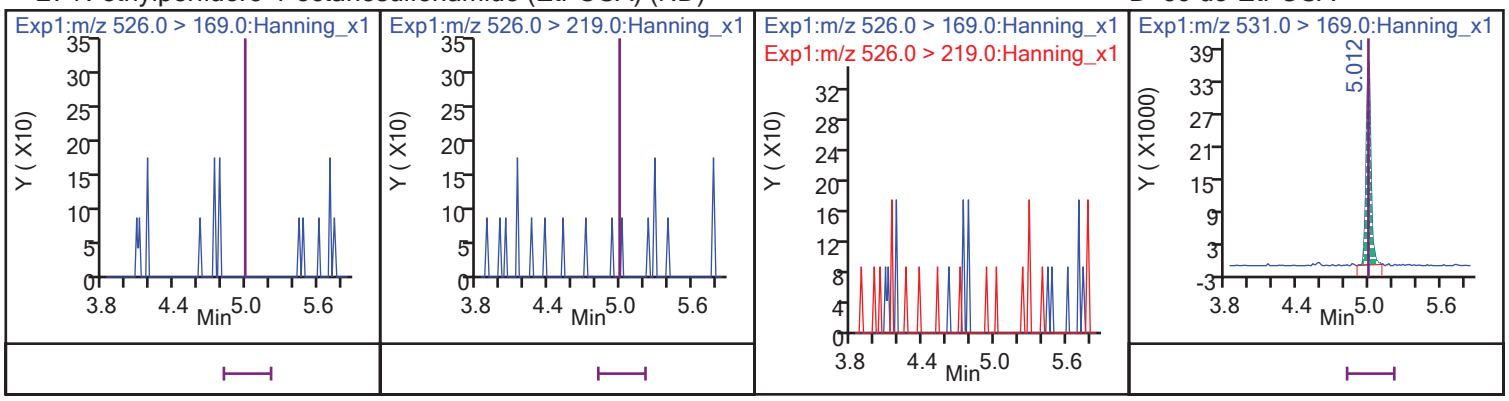


D 65 13C2_8:2 FTS_2



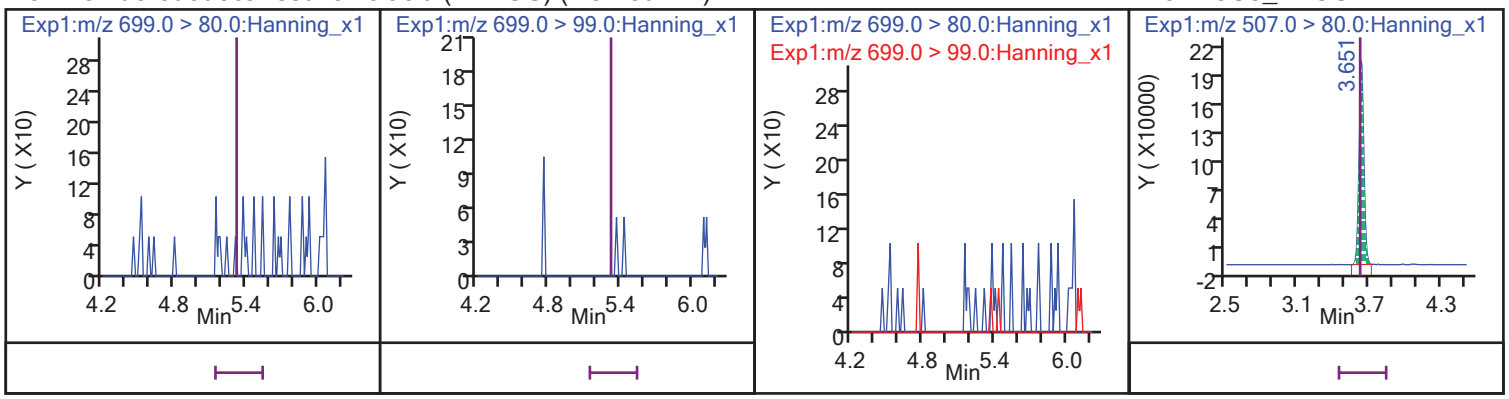
27 N-ethylperfluoro-1-octanesulfonamide (EtFOSA) (ND)

D 59 d5-EtFOSA



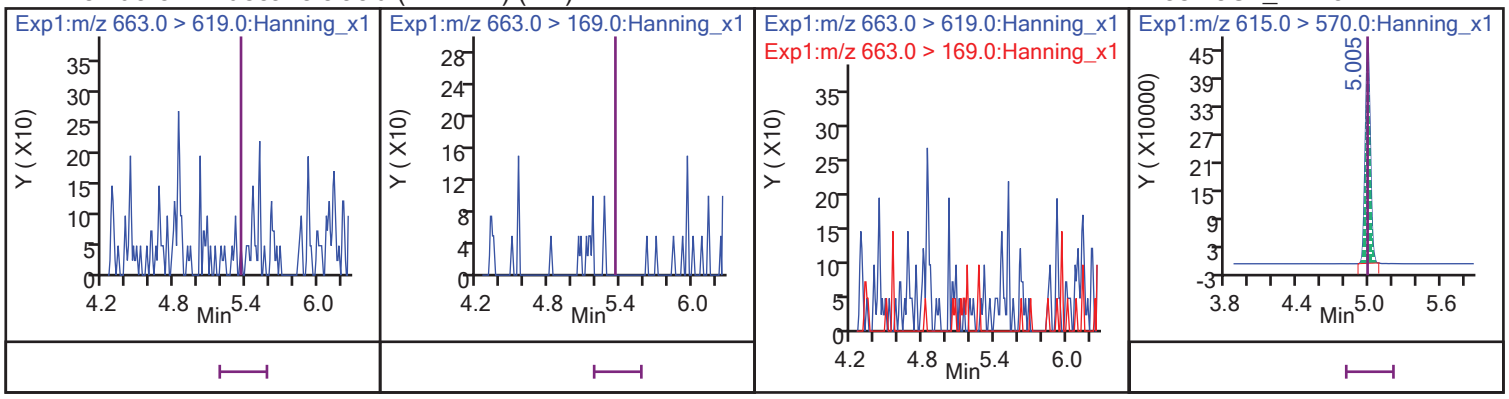
34 Perfluorododecanesulfonic acid (PFDOS) (Marked ND)

D 54 13C8_PFOS



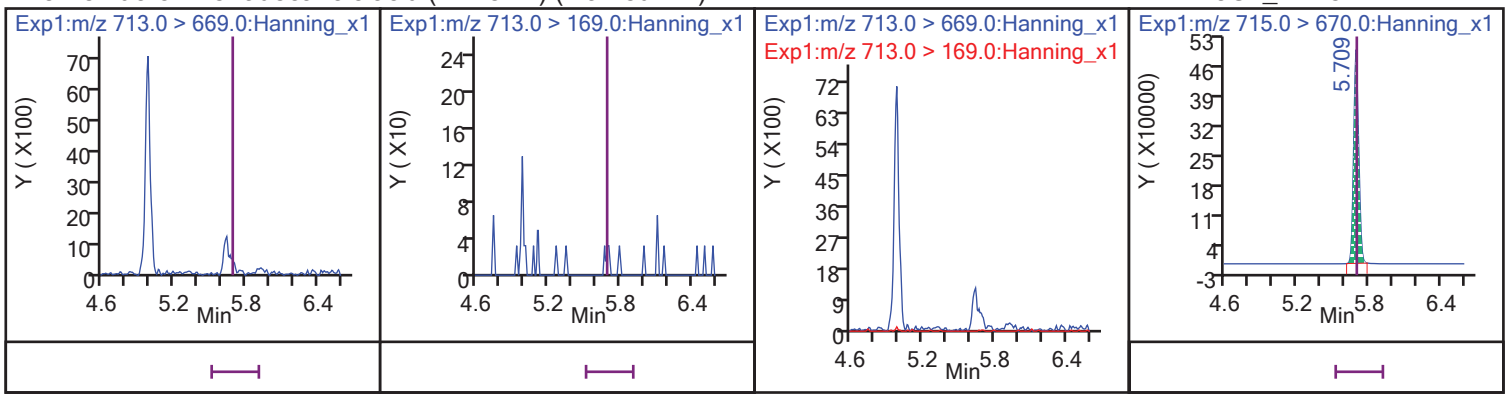
24 Perfluoro-n-tridecanoic acid (PFTrDA) (ND)

D 38 13C2_PFDoA

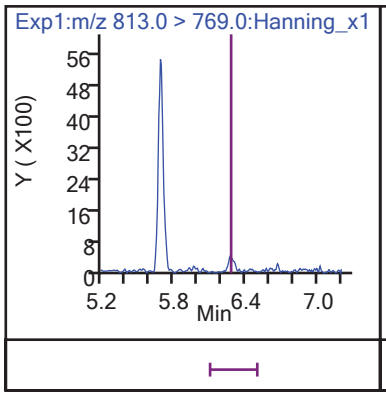


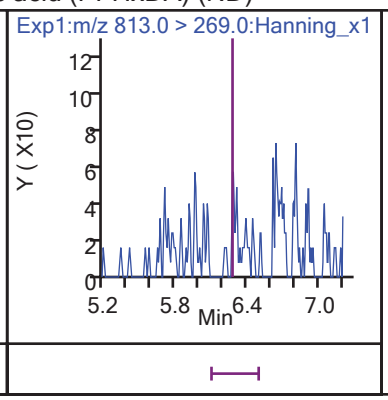
23 Perfluoro-n-tetradecanoic acid (PFTeDA) (Marked ND)

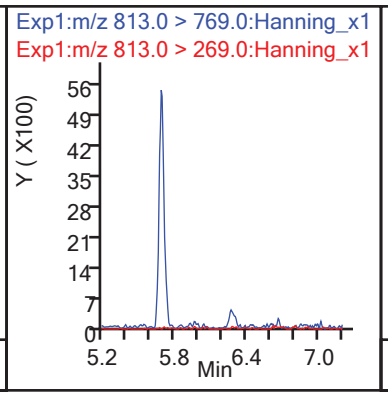
D 42 13C2_PFTeDA



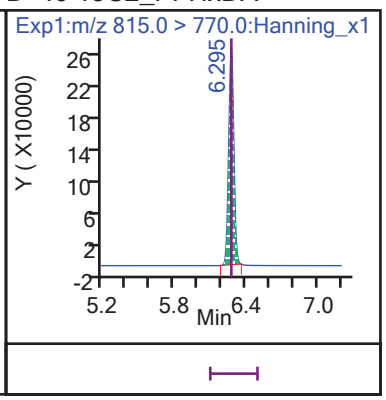
35 Perfluoro-n-hexadecanoic acid (PFHxDA) (ND)



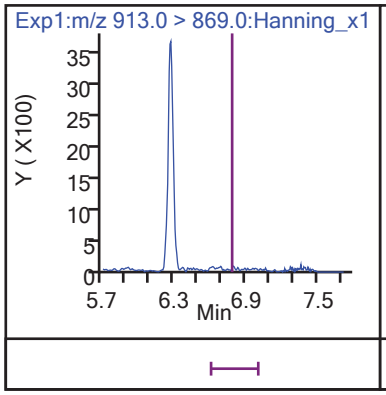


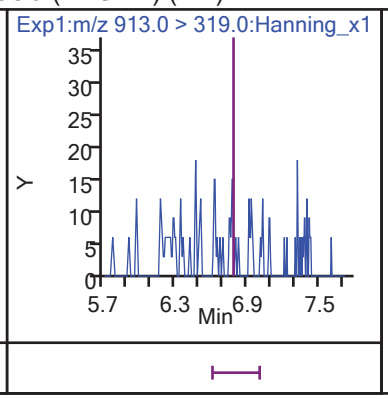


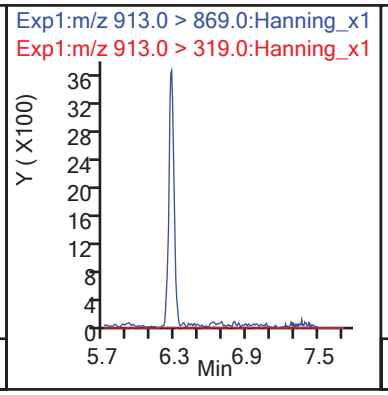
D 40 13C2_PFHxDA



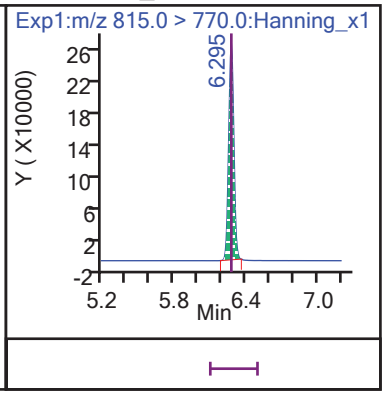
36 Perfluoro-n-octadecanoic acid (PFODA) (ND)







D 40 13C2_PFHxDA



Report Date: 29-Sep-2023 17:46:59 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

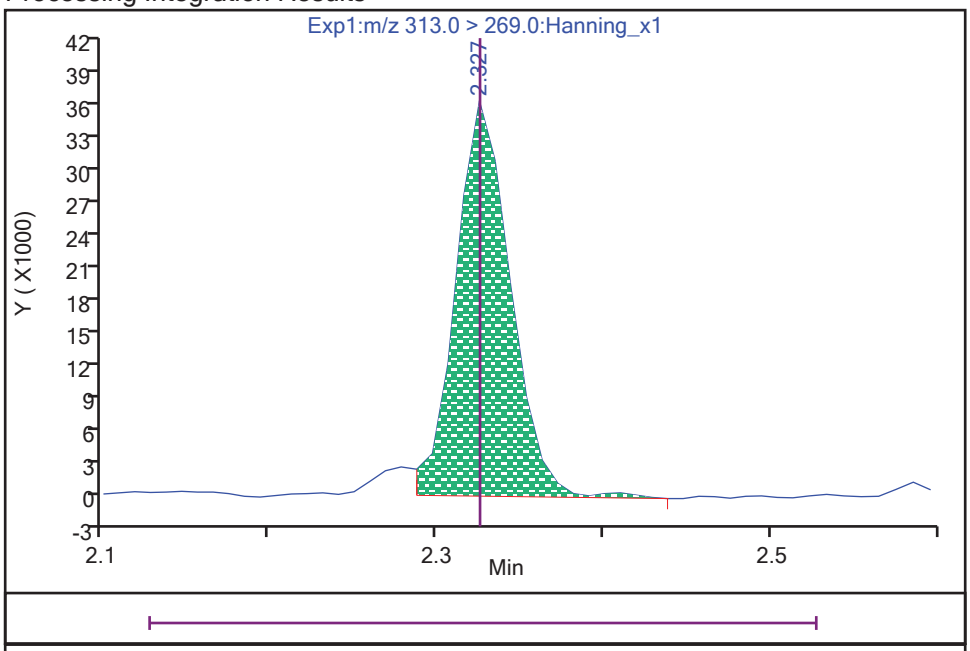
Manual Integration Report

Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Inst. ID:	LCMSMS01.i
Client ID:	WSTF-A08-INF0001-20230914	Lab ID:	YI15029-003
Sample Info:	YI15029-003		
Dil. Factor:	1	Operator:	eqi.svoa

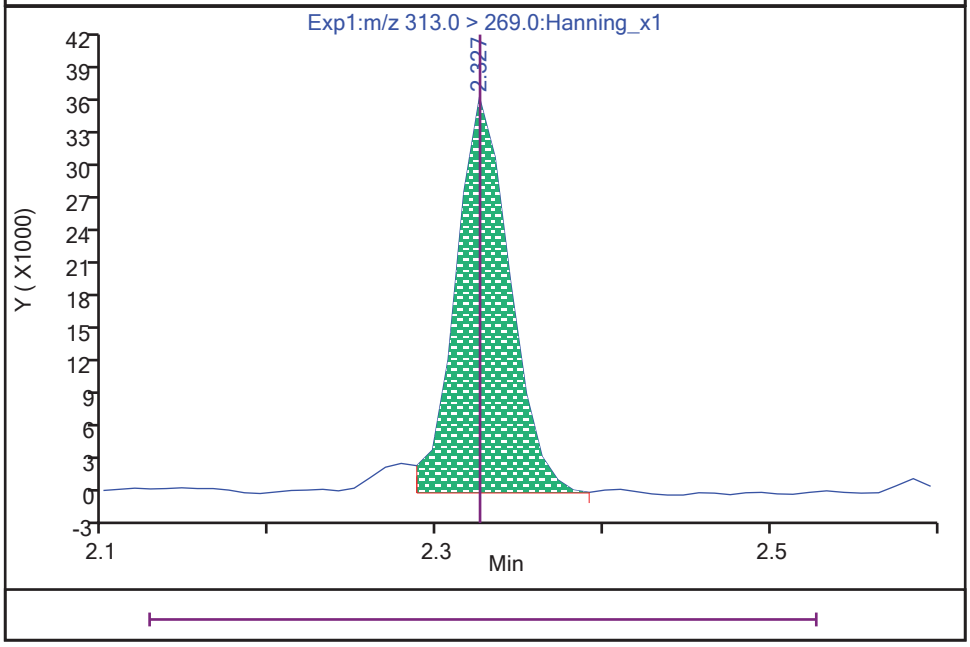
15 PFHxA, CAS: 307-24-4

Processing Integration Results

RT: 2.327
Area: 79774
Conc: 1.8253
Conc Units: ng/L



RT: 2.327
Area: 79100
Conc: 1.8099
Conc Units: ng/L



Data Editor: Olivia.Shugart, 29-Sep-2023 17:28:28
Audit Action: Mint
Audit Reason: M-03, Incorrect Auto Integration

Report Date: 29-Sep-2023 17:46:59 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

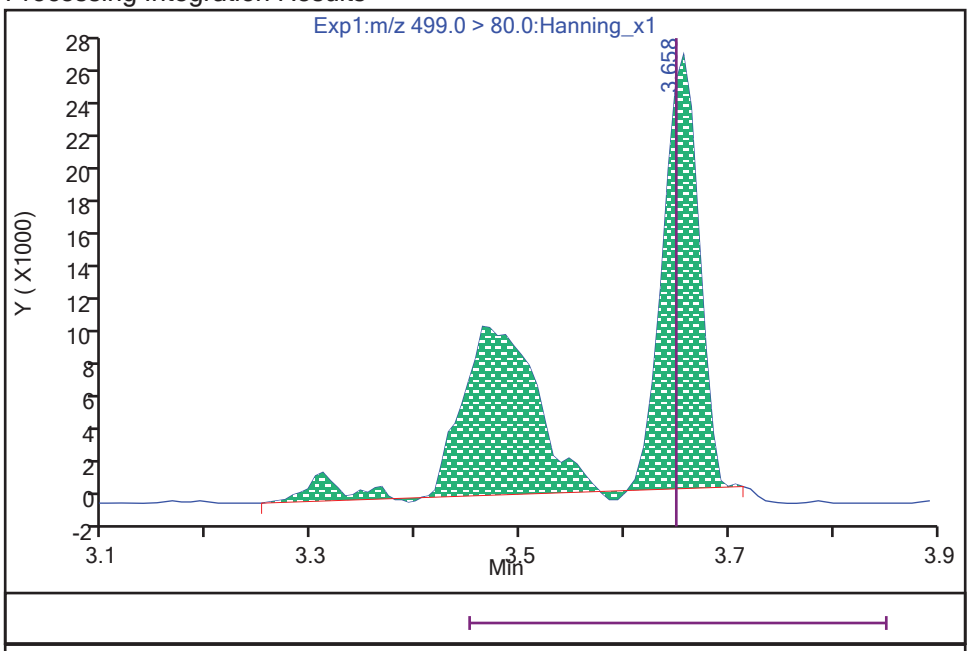
Manual Integration Report

Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Inst. ID:	LCMSMS01.i
Client ID:	WSTF-A08-INF0001-20230914	Lab ID:	YI15029-003
Sample Info:	YI15029-003		
Dil. Factor:	1	Operator:	eqi.svoa

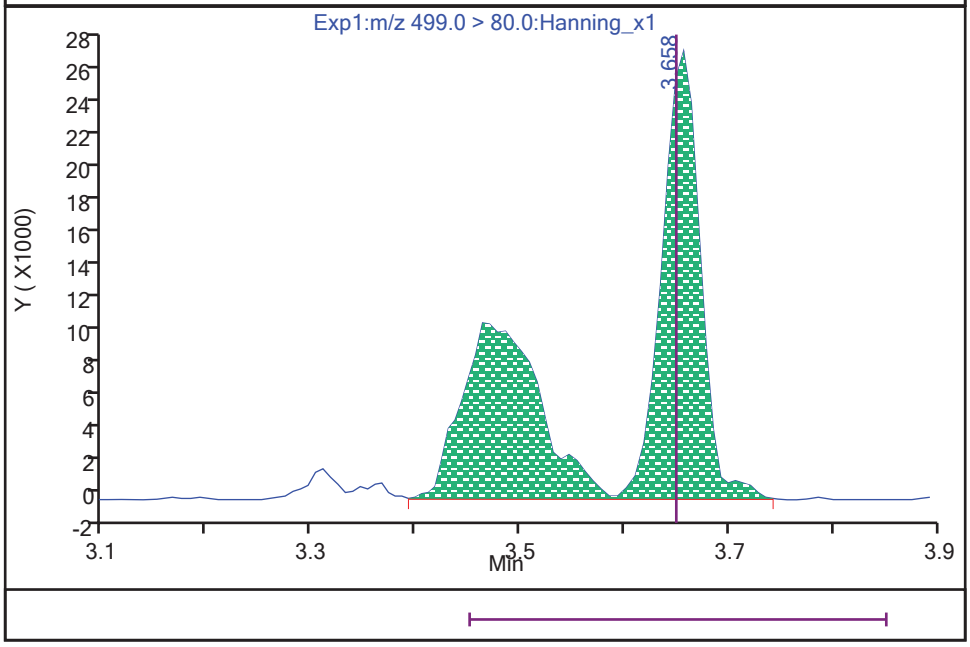
18 PFOS, CAS: 1763-23-1

Processing Integration Results

RT: 3.658
Area: 115822
Conc: 6.7779
Conc Units: ng/L



RT: 3.658
Area: 124429
Conc: 7.2816
Conc Units: ng/L



Data Editor: Olivia.Shugart, 29-Sep-2023 17:29:25
Audit Action: Mint
Audit Reason: M-06, Wrong Isomer

Report Date: 29-Sep-2023 17:46:59 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

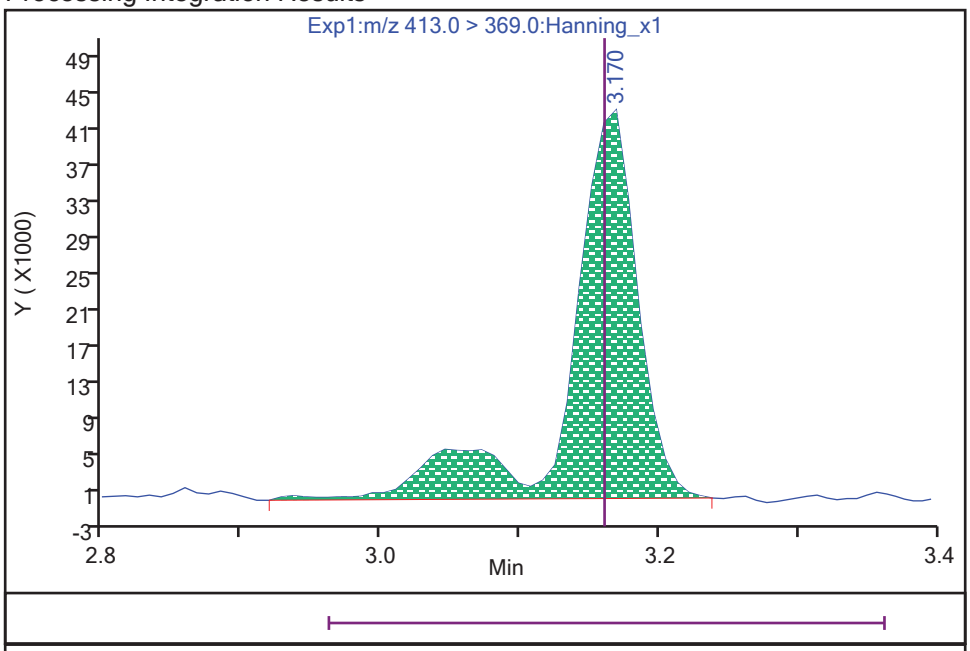
Manual Integration Report

Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Inst. ID:	LCMSMS01.i
Client ID:	WSTF-A08-INF0001-20230914	Lab ID:	YI15029-003
Sample Info:	YI15029-003		
Dil. Factor:	1	Operator:	eqi.svoa

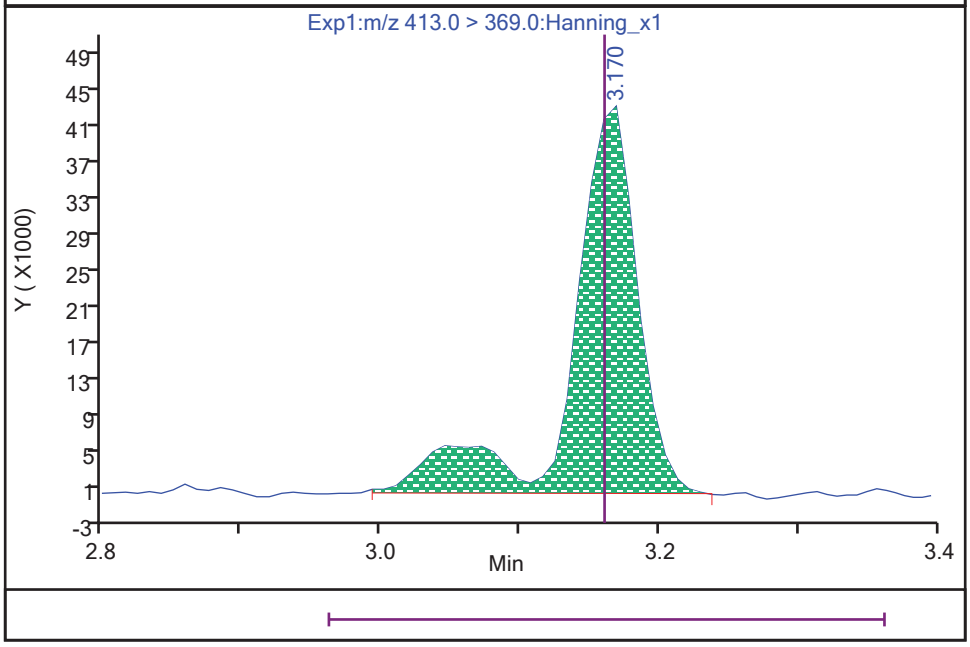
20 PFOA, CAS: 335-67-1

Processing Integration Results

RT: 3.170
Area: 142535
Conc: 2.8779
Conc Units: ng/L



RT: 3.170
Area: 137753
Conc: 2.7814
Conc Units: ng/L



Data Editor: Olivia.Shugart, 29-Sep-2023 17:29:05
Audit Action: Mint
Audit Reason: M-03, Incorrect Auto Integration

YI15029

KE82

TETRA TECH

CHAIN OF CUSTODY

NO. 9132023-01

| | | |

DC#_Title: ENV-FRM-WCOL-0286 v02_Samples Receipt Checklist (SRC)
Effective Date: 8/2/2022

Sample Receipt Checklist (SRC)

Client: TETRA TECH Cooler Inspected by/date: KDRW / 09/15/2023 Lot #: YE15029

Means of receipt: ☐ Pace ☐ Client ☐ UPS ☑ FedEx ☐ Other:

☑ Yes	☐ No		1. Were custody seals present on the cooler?
☑ Yes	☐ No	☐ NA	2. If custody seals were present, were they intact and unbroken?

pH Strip ID: NA Chlorine Strip ID: NA Tested by: NA

Original temperature upon receipt / Derived (Corrected) temperature upon receipt %Solid Snap-Cup ID: NA

5.0 / 5.0 °C NA / NA °C NA / NA °C NA / NA °C

Method: ☐ Temperature Blank ☑ Against Bottles IR Gun ID: 8 IR Gun Correction Factor: 0 °C

Method of coolant: ☑ Wet Ice ☐ Ice Packs ☐ Dry Ice ☐ None

☑ Yes	☐ No	☐ NA	3. Were all coolers received at or below 6.0°C? If no, was Project Manager notified? PM was Notified by: phone / email / face-to-face (circle one).
☐ Yes	☐ No	☑ NA	4. Is the commercial courier's packing slip attached to this form?
☑ Yes	☐ No		5. Were proper custody procedures (relinquished/received) followed?
☑ Yes	☐ No		6. Were sample IDs listed on the COC and all sample containers?
☑ Yes	☐ No		7. Was collection date & time listed on the COC and all sample containers?
☑ Yes	☐ No		8. Did all container label information (ID, date, time) agree with the COC?
☑ Yes	☐ No		9. Were tests to be performed listed on the COC?
☑ Yes	☐ No		10. Did all samples arrive in the proper containers for each test and/or in good condition (unbroken, lids on, etc.)?
☑ Yes	☐ No		11. Was adequate sample volume available?
☑ Yes	☐ No		12. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
☑ Yes	☐ No		13. Were all samples containers accounted for? (No missing/excess)
☐ Yes	☐ No	☑ NA	14. Were VOA, 8015C and RSK-175 samples free of bubbles >"pea-size" (¼"or 6mm in diameter) in any of the VOA vials?
☐ Yes	☐ No	☑ NA	15. Were all DRO/metals/nutrient samples received at a pH of < 2?
☐ Yes	☐ No	☑ NA	16. Were all cyanide samples received at a pH > 12 and sulfide samples received at a pH > 9?
☐ Yes	☐ No	☑ NA	17. Were all applicable NH_3/TKN/cyanide/phenol/625.1/608.3 (< 0.5mg/L) samples free of residual chlorine?
☐ Yes	☐ No	☑ NA	18. Was the quote number listed on the container label? If yes, Quote #

Sample Preservation (Must be completed for any sample(s) incorrectly preserved or with headspace.)

Sample(s) NA were received incorrectly preserved and were adjusted accordingly in sample receiving with NA mL of circle one: H2SO4, HNO3, HCl, NaOH using SR # NA. Time of preservation NA. If more than one preservative is needed, please note in the comments below.

Sample(s) NA were received with bubbles >6 mm in diameter.

Samples(s) NA were received with TRC > 0.5 mg/L (If #19 is ***no***) and were adjusted accordingly in sample receiving with sodium thiosulfate ($Na_2S_2O_3$) with Unique ID: NA.

Comments:

Case Narrative
Tetra Tech
Lot Number: YI15029

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the Pace Quality Assurance Management Plan (QAMP), applicable Shealy standard operating procedures (SOPs), the 2003 NELAC standard, and Shealy policies. Additionally, the DoD QSM version 5.4 has been followed for these samples, and specifically Table B-15 was followed for all PFAS samples. Any exceptions to the QAMP, SOPs, NELAC standards, the DoD QSM, or policies are qualified on the results page or discussed below.

All QC associated with these samples were compliant with DOD QSM 5.4 table B-15 and our PFAS SOP.

Correction factors (CF) are used to calculate the original sample concentration. The CF is the inverse of the concentration factor (sample volume / extract final volume) times the dilution factor (DF). The CF is calculated as follows:

CF = DF * FV / Vo

FV is volume of extract (mL)
Vo is initial sample volume (mL)
DF is dilution factor. For undiluted analysis, DF = 1.

Sample concentration for aqueous samples:
Concentration (ng/L) = Cs*CF,

$$C_s = \frac{\left(\frac{(A_s x C_{is})}{A_{is}}\right) - B}{M1}$$

Where

C_s is on column concentration of target analyte in the sample (ng/L)
C_{is} is concentration of internal standard in the sample (ng/L)
A_s is peak response of target analyte in the sample
A_{is} is peak response of internal standard in the sample
M1 is the average RF from ICAL or the slope from linear regression ICAL
B is the y-intercept from the ICAL

Pace is a DoD/DOE accredited laboratory; however, the following analyses are currently not listed on our DoD/DOE scope of accreditation: Drinking Water: pH EPA 150.1, Turbidity EPA 180.1, Metals EPA 200.7 & 200.8, Mercury EPA 245.1, Anions EPA 300.0, Cyanide EPA 335.4, Nitrates EPA 353.2, Orthophosphate & Phosphorus EPA 365.1, EDB/DBCP EPA 504.1, HPC SIMPLATE, Color SM 2120 B-2011, Alkalinity SM 2320 B-2011, Specific Conductance SM 2510 B-2011, Residue-filterable (TDS) SM 2540 C, Calcium Hardness (CaCO2) SM 3500-Ca B-2011, TRC SM 4500 Cl G-2011, pH SM 4500 H=B-2011, E.Coli, Total Coliform. Non-Potable Water: Metals EPA 200.7, Strontium EPA 200.8, Chlorate EPA 300.0, Cyanide EPA 335.4, Phenolics EPA 420.4, 2-Methyl-4,6-Dinitrophenol EPA 625.1, Propane RSK-175, Specific Conductance SM 2510 B-2011, Salinity SM2520 B, Residue- total SM 2540 B, Sulfite SM 4500 SO32- B-2011, Amenable Cyanide SM 4500-CN- G-2011, BOD & CBOD SM 5210 B, MBAS SM 5540 C-2011, Boron & Titanium SW-846 6010D, Boron, Molybdenum, & Titanium SW-846 6020B, Alcohols & Glycols SW-846 8015C, Pentachlorophenol SW-846 8151A, Ethyl Acetate, Hexane, & n-Hexane SW-846 8260D, SVOC 1,4-Dioxane, 4-Dimethyl aminoazobenzene, 1,4-Naphthoquinone, 3,5-Dinitroaniline, PETN SW-846 8270E, Amenable Cyanide SW-846 9012B. Solid and Chemical Materials: Boron & Titanium SW-846 6010D, Molybdenum SW-846 6020B, Ethylene Glycol SW-846 8015B, Pentachlorophenol SW-846 8151A, Chloroprene SW-846 8260B, SVOC 1,4-Dioxane, 1,3,5-Trinitrobenzene, 1,4- Naphthoquinone, 1,4-Phenylenediamine, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, 3-Methylcholanthrene, 4-Aminobiphenyl, 4-Dimethyl aminoazobenzene, 4-Nitroquinoline-1-oxide, 7,12-Dimethylbenzo(a)anthracene, Chlorobenzilate, Diallate, Ethyl methanesulfonate, Isodrin, Isosafrole, Methyl methanesulfonate, n-Nitrosomethylethylamine, n-Nitrosomorpholine, n-Nitrosopiperidine, Piperonyl butoxide, Pronamide, Safrole, 3,5- Dinitroaniline, PETN SW-846 8270E, Oil & Grease SW-846 9071B.

Pace is a TNI accredited laboratory; however, the following analyses are currently not listed on our TNI scope of accreditation: Drinking Water: VOC (excluding BTEX, MTBE, Naphthalene, & 1,2-dichloroethane) EPA 524.2, E. coli and Total coliforms SM 9223 B-2004, Solid Chemical Material: TOC Walkley-Black, Biological Tissue: All, Non-Potable Water: SGT-HEM EPA 1664B, Silica EPA 200.7, Boron, Calcium, Silicon, Strontium EPA 200.8, Bicarbonate, Carbonate, and Hydroxide Alkalinity SM 2320 B-2011, SM 9221 C E-2006 & SM 9222D-2006, Strontium SW-846 6010D, VOC SM 6200 B-2011, Fecal Coliform Colilert-18, PFAS by Isotope Dilution SOP.

If you have any questions regarding this report, please contact the Pace Project Manager listed on the cover page.

PFAS
Surrogate recovery for the following samples was outside the upper control limit: YI15029-007, YI15029-008, YI15029-009. These samples did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

Sample Summary
Tetra Tech
Lot Number: YI15029
Project Name: NASA White Sands
Project Number: 112G09033

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	WSTF-A03-100-001-GW-240-20230913	Aqueous	09/13/2023 1110	09/15/2023
002	WSTF-A11-600C-005-GW-402-20230913	Aqueous	09/13/2023 1430	09/15/2023
003	WSTF-A08-INF0001-20230914	Aqueous	09/14/2023 1145	09/15/2023
004	WSTF-A08-EFF0001-20230914	Aqueous	09/14/2023 0800	09/15/2023
005	WSTF-A08-INF0002-20230914	Aqueous	09/14/2023 1340	09/15/2023
006	WSTF-A08-EFF0002-20230914	Aqueous	09/14/2023 1350	09/15/2023
007	WSTF-EB-20230913-07	Aqueous	09/13/2023 1550	09/15/2023
008	WSTF-FB-20230913-08	Aqueous	09/13/2023 1600	09/15/2023
009	WSTF-FB-20230914-09	Aqueous	09/14/2023 0925	09/15/2023

(9 samples)

FORM 2
ISOTOPE DILUTION STANDARD RECOVERY

Lab Name: Pace Analytical Services, LLC Lot No.: YI15029

Project No.: 112G09033

AnalyticalMethod: PFAS by ID SOP QSM B-15 Matrix: Water

CLIENT SAMPLE ID	IDS1	IDS2	IDS3	IDS4	IDS5	IDS6	IDS7	IDS8	IDS9
WSTF-A03-100-001-GW-240-20230913	96	113	87	79	84	85	86	91	91
WSTF-A11-600C-005-GW-402-20230913	102	117	98	87	86	92	94	95	98
WSTF-A08-INF0001-20230914	103	129	115	104	83	103	103	101	109
WSTF-A08-EFF0001-20230914	104	102	97	89	87	97	95	97	98
WSTF-A08-INF0002-20230914	95	114	103	95	92	102	99	104	104
WSTF-A08-EFF0002-20230914	112	130	114	103	105	112	112	114	113
WSTF-EB-20230913-07	134	161 *	125	112	101	121	123	128	129
WSTF-FB-20230913-08	114	165 *	119	111	94	107	115	113	123
WSTF-FB-20230914-09	119	153 *	120	104	63	82	117	116	119
YQ85972-001	91	102	100	98	80	95	96	95	98
YQ85972-002	109	124	114	97	90	103	107	113	121

	QC LIMITS
IDS1 = 13C2_4:2FTS	50-150
IDS2 = 13C2_6:2FTS	50-150
IDS3 = 13C2_8:2FTS	50-150
IDS4 = 13C2_PFDoA	50-150
IDS5 = 13C2_PFHxDA	50-150
IDS6 = 13C2_PFTeDA	50-150
IDS7 = 13C3_PFBS	50-150
IDS8 = 13C3_PFHxS	50-150
IDS9 = 13C3-HFPO-DA	50-150

* Recoveries outside QC limits
D IDS Diluted Out

FORM 2
ISOTOPE DILUTION STANDARD RECOVERY

Lab Name: Pace Analytical Services, LLC Lot No.: YI15029

Project No.: 112G09033

AnalyticalMethod: PFAS by ID SOP QSM B-15 Matrix: Water

CLIENT SAMPLE ID	IDS10	IDS11	IDS12	IDS13	IDS14	IDS15	IDS16	IDS17	
WSTF-A03-100-001-GW-240-20230913	96	90	88	94	83	85	89	85	
WSTF-A11-600C-005-GW-402-20230913	94	84	89	95	88	90	98	87	
WSTF-A08-INF0001-20230914	100	104	108	101	103	105	111	99	
WSTF-A08-EFF0001-20230914	85	91	94	92	97	87	96	86	
WSTF-A08-INF0002-20230914	97	93	100	97	103	97	103	103	
WSTF-A08-EFF0002-20230914	110	103	112	110	117	112	113	110	
WSTF-EB-20230913-07	123	121	123	119	120	114	130	112	
WSTF-FB-20230913-08	116	111	111	119	119	101	122	102	
WSTF-FB-20230914-09	114	106	108	109	112	114	119	107	
YQ85972-001	97	94	90	95	101	98	94	89	
YQ85972-002	106	103	103	109	105	103	116	105	

	QC LIMITS
IDS10 = 13C4_PFBA	50-150
IDS11 = 13C4_PFHpA	50-150
IDS12 = 13C5_PFHxA	50-150
IDS13 = 13C5_PFPeA	50-150
IDS14 = 13C6_PFDA	50-150
IDS15 = 13C7_PFUdA	50-150
IDS16 = 13C8_PFOA	50-150
IDS17 = 13C8_PFOS	50-150

* Recoveries outside QC limits
D IDS Diluted Out

FORM 2
ISOTOPE DILUTION STANDARD RECOVERY

Lab Name: Pace Analytical Services, LLC Lot No.: YI15029

Project No.: 112G09033

AnalyticalMethod: PFAS by ID SOP QSM B-15 Matrix: Water

CLIENT SAMPLE ID	IDS18	IDS19	IDS20	IDS21	IDS22	IDS23	IDS24	IDS25	TOT OUT
WSTF-A03-100-001-GW-240-20230913	91	89	64	82	78	73	82	86	0
WSTF-A11-600C-005-GW-402-20230913	90	90	70	87	97	74	87	88	0
WSTF-A08-INF0001-20230914	100	103	81	104	93	69	89	101	0
WSTF-A08-EFF0001-20230914	92	90	73	89	84	83	94	91	0
WSTF-A08-INF0002-20230914	98	101	67	97	93	70	94	86	0
WSTF-A08-EFF0002-20230914	115	105	85	107	102	86	104	99	0
WSTF-EB-20230913-07	113	124	83	111	114	82	122	105	1
WSTF-FB-20230913-08	116	113	73	109	105	79	107	112	1
WSTF-FB-20230914-09	104	113	76	107	94	72	106	97	1
YQ85972-001	98	97	69	92	86	64	88	96	0
YQ85972-002	108	103	66	100	96	69	105	106	0

	QC LIMITS
IDS18 = 13C8_PFOSA	50-150
IDS19 = 13C9_PFNA	50-150
IDS20 = d-EtFOSA	50-150
IDS21 = d5-EtFOSAA	50-150
IDS22 = d9-EtFOSE	50-150
IDS23 = d-MeFOSA	50-150
IDS24 = d3-MeFOSAA	50-150
IDS25 = d7-MeFOSE	50-150

* Recoveries outside QC limits
D IDS Diluted Out

CLIENT SAMPLE ID

YQ85972-001

FORM 4
METHOD BLANK SUMMARY

Lab Name: Pace Analytical Services, LLC
Lot No.: YI15029
Project No.: 112G09033
Lab Sample ID: YQ85972-001
Analytical Method: PFAS by ID SOP QSM B-15
Matrix: Water
Instrument ID: Sciex 4500_LCMSMS1
Lab File ID: YQ85972-001.txt
Extraction Type: SOP SPE
Date Extracted: 09/27/2023
LC Column: Gemini C18 ID: 2.00 (mm)
Date Analyzed: 09/29/2023
Time Analyzed: 02:48

CLIENT SAMPLE ID	LAB SAMPLE ID	LAB FILE ID	DATE/TIME ANALYZED
WSTF-A03-100-001-GW-240-20230913	YI15029-001	YI15029-001.txt	05:06
WSTF-A11-600C-005-GW-402-20230913	YI15029-002	YI15029-002.txt	05:17
WSTF-A08-INF0001-20230914	YI15029-003	YI15029-003.txt	05:28
WSTF-A08-EFF0001-20230914	YI15029-004	YI15029-004.txt	06:00
WSTF-A08-INF0002-20230914	YI15029-005	YI15029-005.txt	06:10
WSTF-A08-EFF0002-20230914	YI15029-006	YI15029-006.txt	06:21
WSTF-EB-20230913-07	YI15029-007	YI15029-007.txt	06:31
WSTF-FB-20230913-08	YI15029-008	YI15029-008.txt	06:42
WSTF-FB-20230914-09	YI15029-009	YI15029-009.txt	06:52
YQ85972-002	YQ85972-002	YQ85972-002.txt	02:59

PFAS by LC/MS/MS - MB

Sample ID: YQ85972-001
Batch: 85972
Analytical Method: PFAS by ID SOP QSM B-15

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 09/27/2023 2024

Parameter	Result	Q	Dil	LOQ	LOD	DL	Units	Analysis Date
9Cl-PF3ONS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
11Cl-PF3OUdS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
8:2 FTS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
6:2 FTS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
10:2 FTS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
4:2 FTS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
GenX	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
ADONA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
EtFOSA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
EtFOSAA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
EtFOSE	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
MeFOSA	8.0	U	1	16	8.0	4.0	ng/L	09/29/2023 0248
MeFOSAA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
MeFOSE	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
PFBS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFDS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFHpS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFNS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFOSA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFPeS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFDOS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
PFHxS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFBA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFDA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFDoA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFHpA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFHxDA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
PFHxA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFNA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFODA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
PFOA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFPeA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFTeDA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFTrDA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFUdA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFOS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		91	50-150
13C2_6:2FTS		102	50-150
13C2_8:2FTS		100	50-150
13C2_PFDoA		98	50-150
13C2_PFHxDA		80	50-150

LOQ = Limit of Quantitation
DL = Detection Limit
LOD = Limit of Detection

U = Not detected at or above the LOD
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria

N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MB

Sample ID: YQ85972-001
Batch: 85972
Analytical Method: PFAS by ID SOP QSM B-15

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 09/27/2023 2024

Surrogate	Q	% Rec	Acceptance Limit
13C2_PFTeDA		95	50-150
13C3_PFBS		96	50-150
13C3_PFHxS		95	50-150
13C3-HFPO-DA		98	50-150
13C4_PFBA		97	50-150
13C4_PFHpA		94	50-150
13C5_PFHxA		90	50-150
13C5_PFPeA		95	50-150
13C6_PFDA		101	50-150
13C7_PFUdA		98	50-150
13C8_PFOA		94	50-150
13C8_PFOS		89	50-150
13C8_PFOSA		98	50-150
13C9_PFNA		97	50-150
d-EtFOSA		69	50-150
d5-EtFOSAA		92	50-150
d9-EtFOSE		86	50-150
d-MeFOSA		64	50-150
d3-MeFOSAA		88	50-150
d7-MeFOSE		96	50-150

LOQ = Limit of Quantitation
DL = Detection Limit
LOD = Limit of Detection

U = Not detected at or above the LOD
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria

N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

FORM 3
LABORATORY CONTROL/LABORATORY CONTROL DUPLICATE SAMPLE RECOVERY

Lab Name: Pace Analytical Services, LLC Lot No.: YI15029

Project No.: 112G09033

Analytical Method: PFAS by ID SOP QSM B-15 Matrix: Water

Client Sample ID: YQ85972-002 Lab Sample ID: YQ85972-002

Instrument ID: _Sciex 4500_LCMSMS1

Concentration Units (ug/L, mg/L, ug/kg): ng/L

ANALYTE	SPIKE ADDED	LCS CONCENTRATION	LCS %REC #	QC LIMITS REC.
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	15	14	93	50-150
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	15	14	94	67-138
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	15	16	104	64-140
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	15	14	89	50-150
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	15	15	101	63-143
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	16	16	98	50-150
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	16	14	86	50-150
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	15	15	100	50-150
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	15	14	94	50-150
Hexafluoropropylene oxide dimer acid (GenX)	32	32	99	50-150
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	16	16	102	50-150
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	16	18	110	61-135
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	16	16	101	68-141
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	16	16	98	65-136
Perfluoro-1-butanesulfonic acid (PFBS)	14	14	98	72-130
Perfluoro-1-decanesulfonic acid (PFDS)	15	13	87	53-142
Perfluoro-1-heptanesulfonic acid (PFHpS)	15	15	98	69-134
Perfluoro-1-nonanesulfonic acid (PFNS)	15	15	98	69-127
Perfluoro-1-octanesulfonamide (PFOSA)	16	16	100	67-137
Perfluoro-1-pentanesulfonic acid (PFPeS)	15	14	94	71-127
Perfluoro-n-butanoic acid (PFBA)	16	15	96	73-129
Perfluoro-n-decanoic acid (PFDA)	16	17	109	71-129
Perfluoro-n-dodecanoic acid (PFDoA)	16	17	104	72-134
Perfluoro-n-heptanoic acid (PFHpA)	16	15	96	72-130
Perfluoro-n-hexadecanoic acid (PFHxDA)	16	16	98	50-150
Perfluoro-n-hexanoic acid (PFHxA)	16	16	98	72-129
Perfluoro-n-nonanoic acid (PFNA)	16	16	100	69-130
Perfluoro-n-octadecanoic acid (PFODA)	16	13	82	50-150
Perfluoro-n-octanoic acid (PFOA)	16	15	95	71-133
Perfluoro-n-pentanoic acid (PFPeA)	16	16	103	72-129
Perfluoro-n-tetradecanoic acid (PFTeDA)	16	15	95	71-132
Perfluoro-n-tridecanoic acid (PFTrDA)	16	16	98	65-144
Perfluoro-n-undecanoic acid (PFUdA)	16	16	98	69-133
Perfluorododecanesulfonic acid (PFDOS)	15	14	92	50-150
Perfluorohexanesulfonic acid (PFHxS)	15	15	102	68-131
Perfluorooctanesulfonic acid (PFOS)	15	14	97	65-140

* Values outside of QC Limits

PFAS by LC/MS/MS - LCS

Sample ID: YQ85972-002
Batch: 85972
Analytical Method: PFAS by ID SOP QSM B-15

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 09/27/2023 2024

Parameter	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	%Rec Limit	Analysis Date
9Cl-PF3ONS	15	14		1	94	50-150	09/29/2023 0259
11Cl-PF3OUdS	15	14		1	93	50-150	09/29/2023 0259
8:2 FTS	15	14		1	94	67-138	09/29/2023 0259
6:2 FTS	15	16		1	104	64-140	09/29/2023 0259
10:2 FTS	15	14	M-03	1	89	50-150	09/29/2023 0259
4:2 FTS	15	15		1	101	63-143	09/29/2023 0259
GenX	32	32		1	99	50-150	09/29/2023 0259
ADONA	15	15		1	100	50-150	09/29/2023 0259
EtFOSA	16	16		1	102	50-150	09/29/2023 0259
EtFOSAA	16	18	M-03	1	110	61-135	09/29/2023 0259
EtFOSE	16	16		1	98	50-150	09/29/2023 0259
MeFOSA	16	16		1	101	68-141	09/29/2023 0259
MeFOSAA	16	16	M-03	1	98	65-136	09/29/2023 0259
MeFOSE	16	14		1	86	50-150	09/29/2023 0259
PFBS	14	14		1	98	72-130	09/29/2023 0259
PFDS	15	13		1	87	53-142	09/29/2023 0259
PFHpS	15	15		1	98	69-134	09/29/2023 0259
PFNS	15	15		1	98	69-127	09/29/2023 0259
PFOSA	16	16		1	100	67-137	09/29/2023 0259
PFPeS	15	14		1	94	71-127	09/29/2023 0259
PFDOS	15	14		1	92	50-150	09/29/2023 0259
PFHxS	15	15		1	102	68-131	09/29/2023 0259
PFBA	16	15		1	96	73-129	09/29/2023 0259
PFDA	16	17		1	109	71-129	09/29/2023 0259
PFDoA	16	17		1	104	72-134	09/29/2023 0259
PFHpA	16	15		1	96	72-130	09/29/2023 0259
PFHxDA	16	16		1	98	50-150	09/29/2023 0259
PFHxA	16	16		1	98	72-129	09/29/2023 0259
PFNA	16	16		1	100	69-130	09/29/2023 0259
PFODA	16	13		1	82	50-150	09/29/2023 0259
PFOA	16	15		1	95	71-133	09/29/2023 0259
PFPeA	16	16		1	103	72-129	09/29/2023 0259
PFTeDA	16	15		1	95	71-132	09/29/2023 0259
PFTrDA	16	16		1	98	65-144	09/29/2023 0259
PFUdA	16	16		1	98	69-133	09/29/2023 0259
PFOS	15	14	M-03	1	97	65-140	09/29/2023 0259

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		109	50-150
13C2_6:2FTS		124	50-150
13C2_8:2FTS		114	50-150
13C2_PFDoA		97	50-150
13C2_PFHxDA		90	50-150

LOQ = Limit of Quantitation
DL = Detection Limit
LOD = Limit of Detection

U = Not detected at or above the LOD
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria

N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: YQ85972-002
Batch: 85972
Analytical Method: PFAS by ID SOP QSM B-15

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 09/27/2023 2024

Surrogate	Q	% Rec	Acceptance Limit
13C2_PFTeDA		103	50-150
13C3_PFBS		107	50-150
13C3_PFHxS		113	50-150
13C3-HFPO-DA		121	50-150
13C4_PFBA		106	50-150
13C4_PFHpA		103	50-150
13C5_PFHxA		103	50-150
13C5_PFPeA		109	50-150
13C6_PFDA		105	50-150
13C7_PFUdA		103	50-150
13C8_PFOA		116	50-150
13C8_PFOS		105	50-150
13C8_PFOSA		108	50-150
13C9_PFNA		103	50-150
d-EtFOSA	M-03	66	50-150
d5-EtFOSAA		100	50-150
d9-EtFOSE		96	50-150
d-MeFOSA		69	50-150
d3-MeFOSAA		105	50-150
d7-MeFOSE		106	50-150

LOQ = Limit of Quantitation
DL = Detection Limit
LOD = Limit of Detection

U = Not detected at or above the LOD
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria

N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Pace Environmental Services, LLC
Initial Calibration Signal Ratios Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
3	092023A007.d	CCV 200_SVLC-3079	20-Sep-2023 17:56:11
4	092023A008.d	CCV 500_SVLC-3080	20-Sep-2023 18:06:40
5	092023A009.d	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11
6	092023A010.d	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49
7	092023A011.d	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28
8	092023A012.d	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08
9	092023A013.d	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48
10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Column: 1 Detector: LCMS-Q3

Compound	Ratio Level 2	Ratio Level 3	Ratio Level 4	Ratio Level 5	Ratio Level 6	Ratio Level 7	Ratio Level 8	Ratio Level 9	Ratio Level 10	Average Ratio	Avg. +/-3 SD Ratio Limits	StdD Limit	50% Limit
7 PFBS	2.941	3.318	3.731	3.494	3.545	3.663	3.707	3.566	3.642	3.511	2.737-4.285	0.25802	1.755
1 4:2 FTS	0.502	1.021	1.256	1.316	1.497	1.749	1.642	1.610	1.601	1.354	0.187-2.521	0.38897	0.677
15 PFHxA	17.692	14.482	14.916	16.944	15.149	16.898	16.208	15.694	15.617	15.955	12.558-19.353	1.13249	7.977
22 PFPeS	3.182	3.234	3.431	3.258	3.502	3.375	3.424	3.617	3.480	3.389	2.983-3.794	0.13514	1.694
28 GenX	0.726	0.751	0.736	0.755	0.768	0.764	0.783	0.772	0.734	0.754	0.672-0.835	0.02715	0.377
13 PFHpA	3.008	2.909	3.074	3.043	2.757	2.920	3.056	2.998	3.027	2.976	2.667-3.286	0.10320	1.488
14 PFHxS	3.598	4.191	3.678	3.425	3.357	3.675	3.262	3.449	3.501	3.570	2.781-4.360	0.26322	1.785
29 ADONA	2.332	2.566	2.287	2.253	2.399	2.410	2.270	2.191	2.176	2.320	1.950-2.690	0.12344	1.160
2 6:2 FTS	1.005	1.349	1.410	1.259	1.483	1.263	1.320	1.393	1.362	1.316	0.904-1.727	0.13715	0.658
20 PFOA	2.839	2.658	2.560	2.426	2.395	2.819	2.722	2.659	2.505	2.620	2.162-3.077	0.15250	1.310
12 PFHpS	3.921	2.992	3.110	3.324	3.396	2.977	3.149	3.286	3.046	3.244	2.375-4.113	0.28958	1.622
17 PFNA	4.500	5.760	5.220	5.328	5.071	5.125	5.138	5.018	4.757	5.101	4.086-6.117	0.33840	2.550
18 PFOS	3.420	3.949	4.313	3.832	3.954	3.960	4.090	4.116	4.369	4.000	3.206-4.793	0.26450	2.000
19 PFOSA	28.603	43.825	41.617	43.988	35.433	40.705	41.056	43.965	42.594	40.198	25.153-55.242	5.01483	20.099
3 8:2 FTS	1.065	1.192	1.499	1.321	1.275	1.465	1.397	1.441	1.433	1.343	0.875-1.810	0.15577	0.671
16 PFNS	3.058	3.350	3.443	3.372	3.100	3.014	3.114	3.330	3.346	3.236	2.757-3.715	0.15961	1.618
10 PFDA	7.012	9.195	11.455	10.385	9.779	10.308	10.118	10.131	9.695	9.786	6.305-13.267	1.16041	4.893
6 N-MeFOSAA	0.951	1.712	1.472	1.461	1.558	1.575	1.611	1.535	1.568	1.493	0.841-2.146	0.21753	0.746
9 PFDS	2.709	3.493	3.129	2.981	3.036	3.069	3.162	3.060	2.932	3.063	2.469-3.657	0.19795	1.531
5 N-EtFOSAA	1.440	1.677	1.764	1.890	1.723	1.575	1.662	1.675	1.741	1.683	1.321-2.044	0.12051	0.841
25 PFUdA	10.796	9.671	8.858	11.564	11.038	10.573	10.485	10.574	11.132	10.521	8.050-12.991	0.82355	5.260
26 MeFOSA	0.920	0.972	1.111	1.039	0.904	1.084	1.049	1.062	1.027	1.018	0.797-1.239	0.07371	0.509
11 PFDoA	9.687	10.173	9.361	8.727	8.236	9.610	8.988	8.622	9.002	9.156	7.435-10.876	0.57355	4.578
4 10:2 FTS	4.856	1.543	2.159	2.288	2.627	2.086	2.350	2.543	2.311	2.529	-0.182-5.240	0.90377	1.264
27 EtFOSA	1.116	1.131	0.908	1.070	1.011	0.950	0.971	0.961	1.003	1.013	0.787-1.239	0.07522	0.506
34 PFDOS	3.585	2.528	3.149	3.615	3.371	3.274	3.196	3.303	3.308	3.258	2.344-4.172	0.30464	1.629
24 PFTrDA	3.227	3.309	3.413	3.738	3.755	3.489	3.934	4.097	3.691	3.628	2.748-4.508	0.29331	1.814
23 PFTeDA	11.176	8.823	8.743	9.381	9.052	9.106	9.020	9.185	9.127	9.290	7.146-11.434	0.71465	4.645
35 PFHxDA	12.970	11.360	11.623	11.976	11.779	11.887	11.972	11.924	12.024	11.946	10.624-13.268	0.44063	5.973
36 PFODA	11.901	11.293	11.529	11.440	11.524	11.594	11.729	11.913	11.487	11.601	10.981-12.220	0.20640	5.800

Report Date: 22-Sep-2023 09:40:04 AIM Revision: 2.0.2023.0816

Pace Environmental Services, LLC

Initial Calibration RF Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
3	092023A007.d	CCV 200_SVLC-3079	20-Sep-2023 17:56:11
4	092023A008.d	CCV 500_SVLC-3080	20-Sep-2023 18:06:40
5	092023A009.d	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11
6	092023A010.d	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49
7	092023A011.d	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28
8	092023A012.d	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08
9	092023A013.d	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48
10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Curve Legend: Ex. Avg:H Wt:C2 Org:F Dep:R

Curve Type: Avg, Ln, Qd Response Type: H-Height, A-Area
Wt: Curve Weighting, C-1/Conc, C2-1/Conc^2, R-1/Rsp, R2-1/Rsp^2, N-None
Org: Origin, F-Force, I-Include, N-Neither
Dep: Dependent Variable, C-Concentration, R-Response

%Rec = (Measured Amount / True Amount) * 100

Column: 1 Detector: LCMS-Q3

Compound	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
D 46 13C4_PFBA	931	906	925	936	983	885	852	827	825	Avg:A Wt:C2	897		RSD=6.0	
	103	101	103	104	109	98	95	92	92	Org:N Dep:R				
8 PFBA	0.851753	0.853451	0.803939	0.774163	0.676711	0.837058	0.829124	0.849346	0.789300	Avg:A Wt:C2	0.807205		RSD=7.0	
	105	105	99	95	83	103	102	105	97	Org:N Dep:R				
D 50 13C5_PFPeA	775	755	761	776	801	705	682	676	691	Avg:A Wt:C2	736		RSD=6.4	
	105	102	103	105	108	95	92	91	93	Org:N Dep:R				
21 PFPeA	1.088320	1.210925	1.126458	1.086135	0.984418	1.176324	1.181436	1.149907	1.107253	Avg:A Wt:C2	1.123464		RSD=6.0	
	96	107	100	96	87	104	105	102	98	Org:N Dep:R				
D 44 13C3_PFBS	334	309	305	312	332	302	300	274	287	Avg:A Wt:C2	306		RSD=6.2	
	109	100	99	101	108	98	97	89	93	Org:N Dep:R				
7 PFBS	0.975047	1.200219	1.200355	1.078225	1.023519	1.180846	1.179777	1.244620	1.157247	Avg:A Wt:C2	1.137762		RSD=8.0	
	85	105	105	94	89	103	103	109	101	Org:N Dep:R				

Compound	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
1 4:2 FTS	1.570336	1.972779	1.651439	1.607044	1.430419	1.570098	1.750803	1.566949	1.578494	Avg:A Wt:C2	1.633151		RSD=9.4	
	96	120	101	98	87	96	107	95	96	Org:N Dep:R				
D 63 13C2_4:2 FTS_2	36.7425	34.2754	33.7633	34.1617	34.7703	35.6656	31.7193	32.5180	32.9508	Avg:A Wt:C2	34.0630		RSD=4.6	
	107	100	99	100	102	104	93	95	96	Org:N Dep:R				
D 49 13C5_PFHxA	824	731	792	768	752	717	758	711	728	Avg:A Wt:C2	754		RSD=4.9	
	109	96	105	101	99	95	100	94	96	Org:N Dep:R				
15 PFHxA	0.836037	1.004760	0.860212	0.885064	0.818266	0.991754	0.896038	0.894255	0.816962	Avg:A Wt:C2	0.889261		RSD=7.7	
	94	112	96	99	92	111	100	100	91	Org:N Dep:R				
22 PFPeS	1.137335	1.219263	1.108903	1.097721	0.995269	1.104169	1.107026	1.212705	1.108633	Avg:A Wt:C2	1.121225		RSD=5.9	
	101	108	98	97	88	98	98	108	98	Org:N Dep:R				
28 GenX	0.765206	0.718449	0.694203	0.673384	0.657594	0.709563	0.725998	0.803634	0.736808	Avg:A Wt:C2	0.720538		RSD=6.2	
	106	99	96	93	91	98	100	111	102	Org:N Dep:R				
D 66 13C3_GenX	150	148	159	159	152	148	150	136	135	Avg:A Wt:C2	149		RSD=5.7	
	100	99	107	106	102	99	100	91	91	Org:N Dep:R				
13 PFHpA	0.844325	0.891142	0.839620	0.858526	0.707373	0.813402	0.924209	0.887821	0.858553	Avg:A Wt:C2	0.847219		RSD=7.3	
	99	105	99	101	83	96	109	104	101	Org:N Dep:R				
D 47 13C4_PFHpA	1124	1066	1089	1044	1119	1062	934	922	915	Avg:A Wt:C2	1031		RSD=8.2	
	109	103	105	101	108	103	90	89	88	Org:N Dep:R				
D 45 13C3_PFHxS	319	309	310	314	334	293	290	275	304	Avg:A Wt:C2	305		RSD=5.7	
	104	101	101	102	109	95	95	90	99	Org:N Dep:R				
14 PFHxS	1.178329	1.205525	1.174779	1.119152	0.985909	1.202485	1.158646	1.221785	1.076081	Avg:A Wt:C2	1.146966		RSD=6.6	
	102	105	102	97	85	104	101	106	93	Org:N Dep:R				
29 ADONA	4.780411	5.111176	4.583129	4.448174	4.256819	5.002695	4.671396	4.919684	4.157848	Avg:A Wt:C2	4.659037		RSD=7.1	
	102	109	98	95	91	107	100	105	89	Org:N Dep:R				
D 64 13C2_6:2 FTS_2	34.7358	31.8778	32.7120	32.7505	35.0939	32.1574	31.8417	28.2299	29.9431	Avg:A Wt:C2	32.1491		RSD=6.6	
	108	99	101	101	109	100	99	87	93	Org:N Dep:R				
2 6:2 FTS	1.553620	1.695392	1.759893	1.657784	1.638071	1.673145	1.700030	1.859474	1.679703	Avg:A Wt:C2	1.690790		RSD=5.0	
	91	100	104	98	96	98	100	109	99	Org:N Dep:R				
D 53 13C8_PFOA	872	785	850	839	881	783	769	729	761	Avg:A Wt:C2	808		RSD=6.7	
	107	97	105	103	109	96	95	90	94	Org:N Dep:R				
20 PFOA	0.947964	0.982921	0.871150	0.873567	0.742242	0.985724	0.962789	0.951898	0.846563	Avg:A Wt:C2	0.907202		RSD=8.9	
	104	108	96	96	81	108	106	104	93	Org:N Dep:R				
12 PFHpS	0.899647	0.841061	0.879515	0.836353	0.714821	0.827686	0.884081	0.914158	0.767245	Avg:A Wt:C2	0.840507		RSD=7.7	
	107	100	104	99	85	98	105	108	91	Org:N Dep:R				
D 54 13C8_PFOS	299	257	277	265	276	267	250	244	252	Avg:A Wt:C2	265		RSD=6.4	
	112	97	104	99	104	100	94	91	95	Org:N Dep:R				
D 56 13C9_PFNA	894	751	821	817	777	782	735	677	729	Avg:A Wt:C2	776		RSD=8.2	
	115	96	105	105	100	100	94	87	93	Org:N Dep:R				
17 PFNA	0.863459	1.103173	0.856630	0.955943	0.864550	0.947736	0.963933	1.028275	0.867777	Avg:A Wt:C2	0.939053		RSD=9.1	
	91	117	91	101	92	100	102	109	92	Org:N Dep:R				
18 PFOS	1.068238	1.131865	1.135767	1.093328	0.959254	1.152294	1.145156	1.135505	1.133739	Avg:A Wt:C2	1.106127		RSD=5.5	
	96	102	102	98	86	104	103	102	102	Org:N Dep:R				

Compound	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
30 9Cl-PF3ONS	2.378936	2.976351	2.584125	2.769250	2.300018	2.669911	2.805868	3.239607	2.897564	Avg:A Wt:C2	2.735737		RSD=10.7	
	86	108	94	101	84	97	102	118	105	Org:N Dep:R				
D 55 13C8_PFOSA	459	458	440	444	492	449	438	419	447	Avg:A Wt:C2	450		RSD=4.4	
	102	101	97	98	109	99	97	93	99	Org:N Dep:R				
19 PFOSA	0.993622	1.081290	1.138577	0.997636	0.888555	1.070686	1.019550	1.107423	0.969521	Avg:A Wt:C2	1.029651		RSD=7.5	
	96	105	110	96	86	103	99	107	94	Org:N Dep:R				
D 65 13C2_8:2 FTS_2	30.9048	30.9965	32.5591	30.6900	33.8855	28.4637	29.8116	25.3893	25.3374	Avg:A Wt:C2	29.7820		RSD=9.9	
	103	104	109	103	113	95	100	85	85	Org:N Dep:R				
3 8:2 FTS	1.531405	1.521486	1.387937	1.615114	1.166491	1.600515	1.416873	1.544678	1.659631	Avg:A Wt:C2	1.493792		RSD=10.1	
	102	101	92	108	78	107	94	103	111	Org:N Dep:R				
16 PFNS	0.850920	1.074451	0.838700	0.907531	0.790833	0.883897	0.933239	0.975797	0.913986	Avg:A Wt:C2	0.907706		RSD=9.2	
	93	118	92	99	87	97	102	107	100	Org:N Dep:R				
D 51 13C6_PFDA	752	722	765	751	819	697	708	607	668	Avg:A Wt:C2	721		RSD=8.5	
	104	100	106	104	113	96	98	84	92	Org:N Dep:R				
10 PFDA	0.945284	1.042678	0.969870	0.943501	0.838587	1.013221	0.981566	1.062801	0.895483	Avg:A Wt:C2	0.965888		RSD=7.3	
	97	107	100	97	86	104	101	110	92	Org:N Dep:R				
D 58 d3-MeFOSAA	165	157	166	160	162	154	151	141	146	Avg:A Wt:C2	156		RSD=5.4	
	106	100	106	102	103	99	96	90	93	Org:N Dep:R				
6 N-MeFOSAA	0.770387	0.960248	0.758380	0.807325	0.725133	0.864978	0.878768	0.872209	0.861573	Avg:A Wt:C2	0.833222		RSD=8.8	
	92	115	91	96	87	103	105	104	103	Org:N Dep:R				
9 PFDS	0.719484	0.921065	0.795597	0.779704	0.737780	0.802985	0.868605	0.828281	0.776728	Avg:A Wt:C2	0.803359		RSD=7.8	
	89	114	99	97	91	99	108	103	96	Org:N Dep:R				
D 60 d5-EtFOSAA	143	143	131	128	142	123	118	107	110	Avg:A Wt:C2	127		RSD=10.7	
	112	112	102	100	111	96	92	84	86	Org:N Dep:R				
5 N-EtFOSAA	0.840057	0.966961	0.976673	1.038640	0.862880	1.026185	1.065643	1.105700	1.038806	Avg:A Wt:C2	0.991283		RSD=9.1	
	84	97	98	104	87	103	107	111	104	Org:N Dep:R				
D 52 13C7_PFUdA	689	684	646	732	683	649	656	588	596	Avg:A Wt:C2	658		RSD=6.9	
	104	103	98	111	103	98	99	89	90	Org:N Dep:R				
25 PFUdA	0.903564	0.953994	0.933502	0.835610	0.838728	0.934143	0.849400	0.926267	0.874415	Avg:A Wt:C2	0.894402		RSD=5.1	
	101	106	104	93	93	104	94	103	97	Org:N Dep:R				
D 61 d7-MeFOSE	113	109	124	120	136	115	110	109	111	Avg:A Wt:C2	116		RSD=7.7	
	96	94	106	103	116	98	94	93	95	Org:N Dep:R				
32 MeFOSE	0.885931	1.036212	0.933499	0.933911	0.752493	0.964046	0.983777	0.934163	0.936167	Avg:A Wt:C2	0.928911		RSD=8.4	
	95	111	100	100	81	103	105	100	100	Org:N Dep:R				
26 MeFOSA	0.929062	0.947166	0.920095	1.045998	0.790786	1.111457	0.954982	1.080221	0.980801	Avg:A Wt:C2	0.973396		RSD=9.9	
	95	97	94	107	81	114	98	110	100	Org:N Dep:R				
D 57 d3-MeFOSA	69.1665	61.4095	67.7365	60.4695	69.4670	59.2885	62.2480	56.9660	60.8515	Avg:A Wt:C2	63.0670		RSD=7.2	
	109	97	107	95	110	94	98	90	96	Org:N Dep:R				
31 11Cl-PF3OUDS	1.529209	1.905461	1.818053	1.841926	1.614814	1.800816	1.990140	1.945358	1.953518	Avg:A Wt:C2	1.822144		RSD=8.6	
	83	104	99	101	88	98	109	106	107	Org:N Dep:R				
D 62 d9-EtFOSE	111	101	109	98.3870	115	106	111	92.0195	104	Avg:A Wt:C2	105		RSD=6.9	
	105	95	103	93	109	100	105	87	99	Org:N Dep:R				

Compound	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
11 PFDoA	1.020683	1.104147	0.933013	0.979857	0.874597	1.127705	1.008037	1.053824	1.043929	Avg:A Wt:C2	1.016199		RSD=7.8	
	100	108	91	96	86	110	99	103	102	Org:N Dep:R				
D 38 13C2_PFDoA	667	693	697	684	705	608	643	616	598	Avg:A Wt:C2	657		RSD=6.3	
	101	105	106	104	107	92	97	93	91	Org:N Dep:R				
D 59 d5-EtFOSA	59.6725	59.9830	60.8975	66.3875	60.2940	62.5970	53.7710	55.5200	57.3185	Avg:A Wt:C2	59.6046		RSD=6.3	
	100	100	102	111	101	105	90	93	96	Org:N Dep:R				
33 EtFOSE	1.128979	0.909839	0.930799	0.988708	0.810020	0.972944	0.886426	1.042550	0.899044	Avg:A Wt:C2	0.952145		RSD=9.9	
	118	95	97	103	85	102	93	109	94	Org:N Dep:R				
4 10:2 FTS	1.400365	1.262356	1.286903	1.387250	1.183170	1.358365	1.409961	1.526296	1.468759	Avg:A Wt:C2	1.364825		RSD=7.8	
	102	92	94	101	86	99	103	111	107	Org:N Dep:R				
27 EtFOSA	1.329591	1.274945	0.985591	1.050845	1.010333	1.022723	1.166698	1.110944	1.062694	Avg:A Wt:C2	1.112707		RSD=10.9	
	119	114	88	94	90	91	104	99	95	Org:N Dep:R				
34 PFDOS	0.627375	0.681750	0.658493	0.686678	0.621623	0.699217	0.725147	0.746202	0.699033	Avg:A Wt:C2	0.682835		RSD=6.1	
	91	99	96	100	91	102	106	109	102	Org:N Dep:R				
24 PFTrDA	0.427575	0.443832	0.412712	0.441792	0.413576	0.512395	0.475469	0.525290	0.479061	Avg:A Wt:C2	0.459078		RSD=9.0	
	93	96	89	96	90	111	103	114	104	Org:N Dep:R				
D 42 13C2_PFTeDA	715	668	715	725	749	684	688	639	676	Avg:A Wt:C2	695		RSD=4.8	
	102	96	102	104	107	98	98	91	97	Org:N Dep:R				
23 PFTeDA	1.042388	1.126243	0.982133	0.995008	0.913775	1.029467	0.995289	1.044974	0.989657	Avg:A Wt:C2	1.013215		RSD=5.7	
	102	111	96	98	90	101	98	103	97	Org:N Dep:R				
35 PFHxDA	1.320745	1.344680	1.181893	1.275687	1.079468	1.259602	1.250893	1.314731	1.166903	Avg:A Wt:C2	1.243845		RSD=6.9	
	106	108	95	102	86	101	100	105	93	Org:N Dep:R				
D 40 13C2_PFHxDA	447	432	464	440	484	432	431	399	438	Avg:A Wt:C2	441		RSD=5.3	
	101	97	105	99	109	98	97	90	99	Org:N Dep:R				
36 PFODA	0.939098	0.982548	0.899946	0.947768	0.809585	0.967764	0.959732	1.016298	0.893700	Avg:A Wt:C2	0.935160		RSD=6.5	
	100	105	96	101	86	103	102	108	95	Org:N Dep:R				

Pace Environmental Services, LLC
Initial Calibration Ion Suppression Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
3	092023A007.d	CCV 200_SVLC-3079	20-Sep-2023 17:56:11
4	092023A008.d	CCV 500_SVLC-3080	20-Sep-2023 18:06:40
5	092023A009.d	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11
6	092023A010.d	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49
7	092023A011.d	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28
8	092023A012.d	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08
9	092023A013.d	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48
10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Column: 1 Detector: LCMS-Q3

Compound	Response Level 2	Response Level 3	Response Level 4	Response Level 5	Response Level 6	Response Level 7	Response Level 8	Response Level 9	Response Level 10	RPD
* 43 13C3_PFBA	10505	8099	9506	8343	11803	9704	8601	8386	7851	7.22
* 39 13C2_PFHxA	313	838	839	1600	1677	2592	5716	5792	9074	46.66
* 41 13C2_PFOA		261	261	913	1385	3015	7171	10959	10016	47.46
* 48 13C4_PFOS	6033	6458	4330	2852	3958	4512	6101	4147	4019	10.01
* 37 13C2_PFDA			522	648	1525		8315	6943	15599	46.76

13C3_PFBA ((|7851 - 10505| / (7851 + 10505)) / 2) * 100 = 7.23
13C2_PFHxA ((|9074 - 313| / (9074 + 313)) / 2) * 100 = 46.67
13C2_PFOA ((|10016 - 261| / (10016 + 261)) / 2) * 100 = 47.46
13C4_PFOS ((|4019 - 6033| / (4019 + 6033)) / 2) * 100 = 10.02
13C2_PFDA ((|15599 - 522| / (15599 + 522)) / 2) * 100 = 46.76

Pace Environmental Services, LLC
Initial Calibration Response Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
3	092023A007.d	CCV 200_SVLC-3079	20-Sep-2023 17:56:11
4	092023A008.d	CCV 500_SVLC-3080	20-Sep-2023 18:06:40
5	092023A009.d	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11
6	092023A010.d	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49
7	092023A011.d	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28
8	092023A012.d	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08
9	092023A013.d	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48
10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Quantitation Standards (* - Istd) (D - Iso Dil Std)

* 43 13C3_PFBA	* 39 13C2_PFHxA	* 41 13C2_PFOA
* 48 13C4_PFOS	* 37 13C2_PFDA	D 46 13C4_PFBA
D 50 13C5_PFPeA	D 44 13C3_PFBS	D 63 13C2_4:2 FTS_2
D 49 13C5_PFHxA	D 66 13C3_GenX	D 47 13C4_PFHpA
D 45 13C3_PFHxS	D 64 13C2_6:2 FTS_2	D 53 13C8_PFOA
D 54 13C8_PFOS	D 56 13C9_PFNA	D 55 13C8_PFOSA
D 65 13C2_8:2 FTS_2	D 51 13C6_PFDA	D 58 d3-MeFOSAA
D 60 d5-EtFOSAA	D 52 13C7_PFUdA	D 61 d7-MeFOSE
D 57 d3-MeFOSA	D 62 d9-EtFOSE	D 38 13C2_PFDoA
D 59 d5-EtFOSA	D 42 13C2_PFTeDA	D 40 13C2_PFHxDA

Column: 1 Detector: LCMS-Q3

Compound	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
* 43 13C3_PFBA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	10505	8099	9506	8343	11803	9704	8601	8386	7851	
* 39 13C2_PFHxA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	313	838	839	1600	1677	2592	5716	5792	9074	
* 41 13C2_PFOA		2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
		261	261	913	1385	3015	7171	10959	10016	
* 48 13C4_PFOS	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	6033	6458	4330	2852	3958	4512	6101	4147	4019	
* 37 13C2_PFDA			2000.00	2000.00	2000.00		2000.00	2000.00	2000.00	
			522	648	1525		8315	6943	15599	
D 46 13C4_PFBA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1861830	1812383	1850403	1871451	1966070	1770319	1704059	1654323	1650030	
8 PFBA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#46
	79291	154678	371903	724404	1330462	3704649	7064385	10538193	13023689	
D 50 13C5_PFPeA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1550831	1509433	1521100	1551610	1602317	1409821	1363024	1352430	1381885	
21 PFPeA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#50
	84390	182781	428364	842629	1577349	4146015	8051629	11663764	15300960	
D 44 13C3_PFBS	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	668885	618326	610023	623958	663225	604825	599208	548709	574710	

Compound	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
7 PFBS	88.400	176.80	442.00	884.00	1768.00	4420.00	8840.00	13260	17680	#44
	28827	65604	161826	297363	600080	1578393	3124638	4527852	5879320	
1 4:2 FTS	93.400	186.80	467.00	934.00	1868.00	4670.00	9340.00	14010	18680	#63
	5389	12631	26039	51276	92907	261513	518690	713866	971596	
D 63 13C2_4:2 FTS_2	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	367425	342754	337633	341617	347703	356656	317193	325180	329508	
D 49 13C5_PFHxA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1648994	1461662	1583474	1536838	1504823	1434359	1515483	1422542	1455551	
15 PFHxA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#49
	68931	146862	340531	680100	1231345	3556328	6789649	9540866	11891301	
22 PFPeS	93.800	187.60	469.00	938.00	1876.00	4690.00	9380.00	14070	18760	#44
	35679	70716	158629	321233	619162	1566059	3111059	4681246	5976396	
28 GenX	200.00	400.00	1000.00	2000.00	4000.00	10000	20000	30000	40000	#66
	22935	42436	110424	213710	401087	1052086	2175729	3280568	3984871	
D 66 13C3_GenX	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	1498617	1476653	1590658	1586835	1524827	1482724	1498441	1360723	1352072	
13 PFHpA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#47
	94881	190061	457079	896341	1582404	4320927	8628581	12280663	15714393	
D 47 13C4_PFHpA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	2247499	2132781	2177552	2088094	2237014	2124866	1867235	1844315	1830335	
D 45 13C3_PFHxS	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	638509	617605	619096	628720	667188	585138	580146	550576	608091	
14 PFHxS	91.000	182.00	455.00	910.00	1820.00	4550.00	9100.00	13650	18200	#45
	34233	67753	165461	320153	598586	1600735	3058436	4591078	5954634	
29 ADONA	94.200	188.40	471.00	942.00	1884.00	4710.00	9420.00	14130	18840	#45
	143765	297360	668207	1317225	2675373	6893713	12764531	19136682	23817055	
D 64 13C2_6:2 FTS_2	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	347358	318778	327120	327505	350939	321574	318417	282299	299431	
2 6:2 FTS	94.800	189.60	474.00	948.00	1896.00	4740.00	9480.00	14220	18960	#64
	5116	10247	27288	51470	108994	255031	513170	746447	953603	
D 53 13C8_PFOA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1743505	1569912	1700498	1678084	1761004	1566306	1537698	1458544	1522519	
20 PFOA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#53
	82639	154310	370347	732959	1307092	3859863	7402392	10412893	12889078	
12 PFHpS	95.200	190.40	476.00	952.00	1904.00	4760.00	9520.00	14280	19040	#45
	27343	49451	129592	250296	454028	1152659	2441385	3593659	4441601	
D 54 13C8_PFOS	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	597564	514885	553769	530037	552943	534495	499127	488047	504185	
D 56 13C9_PFNA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1787694	1501061	1642152	1634740	1553601	1564561	1470404	1353344	1457019	
17 PFNA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#56
	77180	165593	351679	781359	1343165	3706976	7086853	10437074	12643672	
18 PFOS	92.800	185.60	464.00	928.00	1856.00	4640.00	9280.00	13920	18560	#54
	29619	54082	145917	268890	492223	1428877	2652123	3857093	5304578	
30 9Cl-PF3ONS	93.200	186.40	466.00	932.00	1864.00	4660.00	9320.00	13980	18640	#54
	66245	142827	333425	683997	1185298	3325036	6526258	11051751	13615667	
D 55 13C8_PFOSA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	918881	915185	880039	887849	984551	898268	876171	838761	894827	
19 PFOSA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#55
	45651	98958	250498	442875	874828	2404408	4466502	6966472	8675533	
D 65 13C2_8:2 FTS_2	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	309048	309965	325591	306900	338855	284637	298116	253893	253374	
3 8:2 FTS	95.800	191.60	479.00	958.00	1916.00	4790.00	9580.00	14370	19160	#65
	4534	9036	21646	47486	75734	218216	404652	563567	805692	
16 PFNS	96.000	192.00	480.00	960.00	1920.00	4800.00	9600.00	14400	19200	#54
	24407	53109	111467	230892	419794	1133853	2235862	3428890	4423851	

Compound	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
D 51 13C6_PFDA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1504648	1444559	1529929	1502156	1637053	1394405	1416501	1213113	1335838	
10 PFDA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#51
	71116	150621	370958	708643	1372811	3532101	6951948	9669731	11962208	
D 58 d3-MeFOSAA	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	1652416	1571626	1659116	1596631	1616242	1544277	1506478	1413871	1463138	
6 N-MeFOSAA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#58
	12730	30183	62912	128900	234398	667883	1323845	1849787	2521199	
9 PFDS	96.400	192.80	482.00	964.00	1928.00	4820.00	9640.00	14460	19280	#54
	20723	45717	106179	199197	393264	1034352	2089684	2922655	3775164	
D 60 d5-EtFOSAA	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	1428832	1428807	1305493	1284815	1421368	1233253	1184263	1074073	1102495	
5 N-EtFOSAA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#60
	12003	27632	63752	133446	245294	632773	1262001	1781404	2290556	
D 52 13C7_PFUdA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1377877	1368593	1292844	1464123	1366459	1298528	1312073	1176781	1192919	
25 PFUdA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#52
	62250	130563	301718	611718	1146087	3032527	5572375	8175097	10431059	
D 61 d7-MeFOSE	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	225074	218768	248343	239766	271807	229424	219886	217777	222751	
32 MeFOSE	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#61
	9970	22669	57957	111960	204533	552938	1081594	1525794	2085322	
26 MeFOSA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#57
	6426	11633	31162	63251	109867	329483	594457	923038	1193664	
D 57 d3-MeFOSA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	138333	122819	135473	120939	138934	118577	124496	113932	121703	
31 11Cl-PF3OUDS	94.200	188.40	471.00	942.00	1884.00	4710.00	9420.00	14130	18840	#54
	43040	92419	237097	459832	841112	2266752	4678596	6707696	9278085	
D 62 d9-EtFOSE	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	222254	201684	217727	196774	229814	211278	222813	184039	208785	
11 PFDoA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#38
	68110	153012	325245	670466	1232770	3426098	6478764	9741590	12495370	
D 38 13C2_PFDoA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1334596	1385794	1394385	1368498	1409529	1215246	1285422	1232538	1196956	
D 59 d5-EtFOSA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	119345	119966	121795	132775	120588	125194	107542	111040	114637	
33 EtFOSE	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#62
	12546	18350	50665	97276	186154	513904	987536	1439024	1877068	
4 10:2 FTS	96.400	192.80	482.00	964.00	1928.00	4820.00	9640.00	14460	19280	#65
	4172	7544	20196	41042	77298	186361	405200	560348	717496	
27 EtFOSA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#59
	7934	15295	30010	69763	121834	320097	627345	925194	1218241	
34 PFDOS	96.800	193.60	484.00	968.00	1936.00	4840.00	9680.00	14520	19360	#54
	18145	33979	88246	176159	332723	904422	1751791	2643960	3411636	
24 PFTrDA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#38
	28532	61506	143870	302296	582947	1556715	3055894	4855799	5734147	
D 42 13C2_PFTeDA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1429698	1335564	1430593	1450169	1497923	1368490	1375742	1277586	1352622	
23 PFTeDA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#42
	74515	150417	351258	721465	1368765	3522039	6846303	10012833	13386312	
35 PFHxDA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#40
	59004	116046	274053	561511	1043870	2721304	5394151	7859640	10214919	
D 40 13C2_PFHxDA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	893496	863001	927505	880327	967023	864179	862448	797085	875387	
36 PFODA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#40
	41954	84794	208676	417173	782887	2090804	4138594	6075567	7823336	

Pace Environmental Services, LLC
Initial Calibration RT Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
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10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Column: 1 Detector: LCMS-Q3

Compound	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Avg. RT	%Rsd RT
D 46 13C4_PFBA	1.645	1.650	1.650	1.651	1.652	1.650	1.650	1.651	1.650	1.650	0.133
8 PFBA	1.652	1.650	1.650	1.651	1.652	1.650	1.650	1.651	1.650	1.650	0.053
D 50 13C5_PFPeA	1.966	1.972	1.964	1.964	1.966	1.964	1.971	1.964	1.964	1.965	0.159
21 PFPeA	1.966	1.972	1.964	1.964	1.966	1.964	1.971	1.964	1.972	1.966	0.176
D 44 13C3_PFBS	2.005	2.020	2.012	2.012	2.014	2.012	2.011	2.012	2.011	2.011	0.183
7 PFBS	2.005	2.020	2.012	2.012	2.014	2.012	2.019	2.012	2.011	2.012	0.218
1 4:2 FTS	2.254	2.270	2.261	2.261	2.263	2.261	2.260	2.261	2.270	2.262	0.238
D 63 13C2_4:2 FTS_2	2.263	2.261	2.261	2.261	2.263	2.261	2.269	2.261	2.261	2.262	0.132
* 39 13C2_PFHxA	2.301	2.298	2.317	2.289	2.301	2.308	2.297	2.299	2.308	2.301	0.344
D 49 13C5_PFHxA	2.301	2.298	2.298	2.298	2.301	2.298	2.297	2.299	2.298	2.298	0.044
15 PFHxA	2.301	2.298	2.298	2.298	2.301	2.298	2.297	2.299	2.298	2.298	0.044
22 PFPeS	2.329	2.326	2.326	2.326	2.329	2.326	2.335	2.327	2.326	2.327	0.114
28 GenX	2.413	2.420	2.411	2.411	2.413	2.411	2.419	2.411	2.420	2.413	0.168
D 66 13C3_GenX	2.413	2.420	2.411	2.411	2.413	2.411	2.419	2.411	2.411	2.412	0.150
13 PFHpA	2.679	2.685	2.677	2.677	2.679	2.677	2.684	2.677	2.685	2.680	0.134
D 47 13C4_PFHpA	2.671	2.685	2.677	2.677	2.679	2.677	2.684	2.677	2.677	2.678	0.161
D 45 13C3_PFHxS	2.696	2.702	2.694	2.694	2.696	2.694	2.692	2.694	2.694	2.694	0.115
14 PFHxS	2.696	2.702	2.694	2.694	2.696	2.694	2.700	2.694	2.694	2.695	0.127
29 ADONA	2.721	2.727	2.727	2.719	2.730	2.727	2.725	2.727	2.727	2.725	0.130
D 64 13C2_6:2 FTS_2	3.086	3.092	3.083	3.092	3.095	3.083	3.091	3.092	3.092	3.090	0.142
2 6:2 FTS	3.086	3.083	3.092	3.092	3.095	3.083	3.091	3.092	3.092	3.090	0.142
* 41 13C2_PFOA		3.136	3.101	3.092	3.095	3.136	3.118	3.128	3.136	3.117	0.611
D 53 13C8_PFOA	3.121	3.127	3.118	3.119	3.122	3.118	3.118	3.128	3.119	3.121	0.125
20 PFOA	3.113	3.127	3.127	3.119	3.122	3.118	3.118	3.128	3.119	3.121	0.172
12 PFHpS	3.130	3.136	3.127	3.127	3.130	3.127	3.135	3.136	3.136	3.132	0.133
* 48 13C4_PFOS	3.591	3.622	3.614	3.589	3.616	3.622	3.604	3.606	3.614	3.608	0.333
D 54 13C8_PFOS	3.599	3.614	3.605	3.597	3.607	3.605	3.604	3.606	3.605	3.604	0.131
D 56 13C9_PFNA	3.607	3.605	3.605	3.606	3.607	3.605	3.612	3.606	3.614	3.607	0.088
17 PFNA	3.607	3.614	3.605	3.606	3.607	3.605	3.612	3.614	3.614	3.609	0.108
18 PFOS	3.607	3.605	3.605	3.606	3.607	3.605	3.612	3.614	3.605	3.607	0.095
30 9Cl-PF3ONS	3.897	3.895	3.895	3.895	3.897	3.895	3.903	3.895	3.895	3.896	0.061
D 55 13C8_PFOSA	4.031	4.038	4.029	4.030	4.039	4.038	4.036	4.038	4.038	4.035	0.099
19 PFOSA	4.039	4.038	4.037	4.030	4.039	4.038	4.036	4.038	4.046	4.037	0.108

Compound	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Avg. RT	%Rsd RT
D 65 13C2_8:2 FTS_2	4.078	4.085	4.077	4.070	4.078	4.084	4.075	4.077	4.085	4.078	0.124
3 8:2 FTS	4.063	4.077	4.084	4.077	4.078	4.077	4.083	4.077	4.077	4.077	0.143
16 PFNS	4.078	4.092	4.084	4.085	4.086	4.084	4.090	4.084	4.085	4.085	0.098
D 51 13C6_PFDA	4.093	4.100	4.092	4.085	4.101	4.092	4.098	4.100	4.092	4.094	0.128
10 PFDA	4.086	4.100	4.092	4.085	4.101	4.092	4.098	4.100	4.100	4.094	0.154
* 37 13C2_PFDA			4.069	4.100	4.116		4.090	4.107	4.100	4.096	0.397
D 58 d3-MeFOSAA	4.311	4.318	4.309	4.301	4.311	4.310	4.317	4.310	4.310	4.310	0.112
6 N-MeFOSAA	4.320	4.318	4.318	4.318	4.320	4.318	4.317	4.318	4.318	4.318	0.021
9 PFDS	4.524	4.531	4.530	4.523	4.532	4.531	4.529	4.531	4.530	4.528	0.077
D 60 d5-EtFOSAA	4.539	4.531	4.545	4.538	4.547	4.538	4.545	4.546	4.538	4.540	0.119
5 N-EtFOSAA	4.547	4.553	4.553	4.546	4.555	4.546	4.552	4.553	4.553	4.550	0.079
D 52 13C7_PFUdA	4.547	4.553	4.545	4.546	4.555	4.546	4.552	4.553	4.553	4.550	0.087
25 PFUdA	4.539	4.553	4.553	4.546	4.547	4.553	4.552	4.553	4.553	4.550	0.108
D 61 d7-MeFOSE	4.684	4.700	4.682	4.692	4.693	4.691	4.690	4.691	4.683	4.689	0.123
32 MeFOSE	4.710	4.709	4.700	4.700	4.701	4.700	4.708	4.709	4.700	4.703	0.093
26 MeFOSA	4.718	4.726	4.734	4.717	4.719	4.717	4.725	4.717	4.717	4.721	0.120
D 57 d3-MeFOSA	4.710	4.717	4.717	4.717	4.719	4.717	4.716	4.709	4.708	4.714	0.091
31 11Cl-PF3OUDS	4.770	4.786	4.777	4.777	4.778	4.777	4.776	4.777	4.768	4.776	0.105
D 62 d9-EtFOSE	4.946	4.945	4.944	4.945	4.954	4.944	4.943	4.944	4.944	4.945	0.063
11 PFDoA	4.954	4.969	4.968	4.953	4.962	4.960	4.967	4.960	4.960	4.961	0.117
D 38 13C2_PFDoA	4.954	4.969	4.960	4.953	4.962	4.960	4.967	4.960	4.960	4.960	0.108
D 59 d5-EtFOSA	4.978	4.985	4.976	4.969	4.978	4.976	4.983	4.976	4.976	4.977	0.093
33 EtFOSE	4.970	4.961	4.968	4.969	4.962	4.960	4.967	4.960	4.960	4.964	0.081
4 10:2 FTS	4.978	4.969	4.968	4.969	4.962	4.968	4.975	4.968	4.968	4.969	0.094
27 EtFOSA	4.986	5.000	4.992	4.985	4.986	4.984	4.991	4.984	4.984	4.987	0.105
34 PFDOS	5.299	5.307	5.297	5.298	5.308	5.298	5.306	5.298	5.298	5.301	0.089
24 PFTrDA	5.326	5.335	5.334	5.334	5.336	5.335	5.333	5.334	5.334	5.333	0.050
D 42 13C2_PFTeDA	5.662	5.662	5.669	5.662	5.670	5.662	5.668	5.662	5.662	5.664	0.056
23 PFTeDA	5.662	5.669	5.669	5.662	5.670	5.669	5.668	5.662	5.662	5.666	0.062
35 PFHxDA	6.247	6.247	6.254	6.247	6.248	6.247	6.254	6.247	6.247	6.248	0.049
D 40 13C2_PFHxDA	6.247	6.247	6.254	6.247	6.248	6.247	6.246	6.247	6.247	6.247	0.040
36 PFODA	6.759	6.759	6.759	6.753	6.760	6.759	6.758	6.759	6.759	6.758	0.028

Pace Environmental Services, LLC
Initial Calibration Verification Report

Data File: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b\092023A016.d
Injection Date: 20-Sep-2023 19:31:39 Injection Vol: 10.0 uL
Sample Type: ICV Auto Sampler: 80
Sample Info: ICV_3035 Misc. Info:
Inst. ID: LCMSMS01.i Operator: eqi.svoa

Method: LCMSMS01_PFAS-ID2 Version: V16 30-Jun-2022 10:54:24
Calib Method: PFAS-ID2 Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: ICV-43 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			1000.00	951.58	95	70 - 130
D 46 13C4_PFBA	1871451	2058575			110	50 - 150
D 50 13C5_PFPeA	1551610	1680287			108	50 - 150
21 PFPeA			1000.00	959.09	96	70 - 130
7 PFBS			1000.00	1021.39	102	70 - 130
D 44 13C3_PFBS	623958	682309			109	50 - 150
1 4:2 FTS			1000.00	931.11	93	70 - 130
D 63 13C2_4:2 FTS_2	341617	369093			108	50 - 150
D 49 13C5_PFHxA	1536838	1639784			107	50 - 150
15 PFHxA			1000.00	1006.51	101	70 - 130
22 PFPeS			1000.00	969.55	97	70 - 130
D 66 13C3_GenX	1586835	1545590			97	50 - 150
28 GenX			1000.00	1023.14	102	70 - 130
13 PFHpA			1000.00	917.44	92	70 - 130
D 47 13C4_PFHpA	2088094	2241866			107	50 - 150
14 PFHxS			1000.00	975.79	98	70 - 130
D 45 13C3_PFHxS	628720	666029			106	50 - 150
29 ADONA			1000.00	932.12	93	70 - 130
2 6:2 FTS			1000.00	1027.30	103	70 - 130
D 64 13C2_6:2 FTS_2	327505	332531			102	50 - 150
20 PFOA			1000.00	844.76	84	70 - 130
D 53 13C8_PFOA	1678084	1835963			109	50 - 150
12 PFHpS			1000.00	936.25	94	70 - 130
D 54 13C8_PFOS	530037	577270			109	50 - 150
18 PFOS			1000.00	930.35	93	70 - 130
17 PFNA			1000.00	961.00	96	70 - 130
D 56 13C9_PFNA	1634740	1773290			108	50 - 150
30 9Cl-PF3ONS			1000.00	858.36	86	70 - 130
19 PFOSA			1000.00	909.29	91	70 - 130
D 55 13C8_PFOSA	887849	974966			110	50 - 150
D 65 13C2_8:2 FTS_2	306900	340790			111	50 - 150
3 8:2 FTS			1000.00	983.24	98	70 - 130
D 51 13C6_PFDA	1502156	1682916			112	50 - 150
16 PFNS			1000.00	942.52	94	70 - 130
10 PFDA			1000.00	925.31	93	70 - 130
D 58 d3-MeFOSAA	1596631	1672774			105	50 - 150

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			1000.00	999.27	100	70 - 130
9 PFDS			1000.00	966.42	97	70 - 130
D 60 d5-EtFOSAA	1284815	1362314			106	50 - 150
5 N-EtFOSAA			1000.00	995.40	100	70 - 130
25 PFUdA			1000.00	877.01	88	70 - 130
D 52 13C7_PFUdA	1464123	1474471			101	50 - 150
D 61 d7-MeFOSE	239766	248568			104	50 - 150
32 MeFOSE			1000.00	1144.65	114	70 - 130
D 57 d3-MeFOSA	120939	132128			109	50 - 150
26 MeFOSA			1000.00	1196.69	120	70 - 130
31 11Cl-PF3OUDS			1000.00	963.92	96	70 - 130
D 62 d9-EtFOSE	196774	226507			115	50 - 150
D 38 13C2_PFDoA	1368498	1398396			102	50 - 150
11 PFDoA			1000.00	895.01	90	70 - 130
D 59 d5-EtFOSA	132775	128467			97	50 - 150
33 EtFOSE			1000.00	897.58	90	70 - 130
4 10:2 FTS			968.00	999.92	103	70 - 130
27 EtFOSA			1000.00	994.72	99	70 - 130
34 PFDOS			1000.00	1057.29	106	70 - 130
24 PFTrDA			1000.00	941.90	94	70 - 130
23 PFTeDA			1000.00	1015.74	102	70 - 130
D 42 13C2_PFTeDA	1450169	1611657			111	50 - 150
35 PFHxDA			1000.00	920.07	92	70 - 130
D 40 13C2_PFHxDA	880327	921252			105	50 - 150
36 PFODA			1000.00	991.11	99	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A001.d
Injection Date: 29-Sep-2023 02:27:48 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 97
Sample Info: CCV 200A_SVLC-3079 Misc. Info:
Inst. ID: LCMSMS01.i Operator: eqi.svoa

Method: LCMSMS01_PFAS-ID2 Version: V16 30-Jun-2022 10:54:24
Calib Method: PFAS-ID2 Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-3 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			200.00	204.44	102	70 - 130
D 46 13C4_PFBA	1871451	1858941			99	50 - 150
D 50 13C5_PFPeA	1551610	1482989			96	50 - 150
21 PFPeA			200.00	211.32	105	70 - 130
7 PFBS			176.80	191.82	108	70 - 130
D 44 13C3_PFBS	623958	662185			106	50 - 150
1 4:2 FTS			186.80	196.94	105	70 - 130
D 63 13C2_4:2 FTS_2	341617	347875			102	50 - 150
D 49 13C5_PFHxA	1536838	1622949			106	50 - 150
15 PFHxA			200.00	222.54	111	70 - 130
22 PFPeS			187.60	192.74	102	70 - 130
D 66 13C3_GenX	1586835	1416346			89	50 - 150
28 GenX			400.00	399.09	99	70 - 130
13 PFHpA			200.00	194.99	97	70 - 130
D 47 13C4_PFHpA	2088094	2388048			114	50 - 150
14 PFHxS			182.00	193.58	106	70 - 130
D 45 13C3_PFHxS	628720	621967			99	50 - 150
29 ADONA			188.40	206.89	109	70 - 130
2 6:2 FTS			189.60	203.85	107	70 - 130
D 64 13C2_6:2 FTS_2	327505	334928			102	50 - 150
20 PFOA			200.00	202.14	101	70 - 130
D 53 13C8_PFOA	1678084	1754642			105	50 - 150
12 PFHpS			190.40	197.55	103	70 - 130
D 54 13C8_PFOS	530037	557998			105	50 - 150
18 PFOS			185.60	199.39	107	70 - 130
17 PFNA			200.00	202.50	101	70 - 130
D 56 13C9_PFNA	1634740	1582813			97	50 - 150
30 9Cl-PF3ONS			186.40	208.17	111	70 - 130
19 PFOSA			200.00	202.22	101	70 - 130
D 55 13C8_PFOSA	887849	903613			102	50 - 150
D 65 13C2_8:2 FTS_2	306900	285342			93	50 - 150
3 8:2 FTS			191.60	244.58	127	70 - 130
D 51 13C6_PFDA	1502156	1410047			94	50 - 150
16 PFNS			192.00	224.77	117	70 - 130
10 PFDA			200.00	203.45	101	70 - 130
D 58 d3-MeFOSAA	1596631	1615067			101	50 - 150

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			200.00	228.29	114	70 - 130
9 PFDS			192.80	206.68	107	70 - 130
D 60 d5-EtFOSAA	1284815	1384036			108	50 - 150
5 N-EtFOSAA			200.00	223.52	111	70 - 130
25 PFUdA			200.00	239.87	119	70 - 130
D 52 13C7_PFUdA	1464123	1328072			91	50 - 150
D 61 d7-MeFOSE	239766	218216			91	50 - 150
32 MeFOSE			200.00	200.05	100	70 - 130
D 57 d3-MeFOSA	120939	136442			113	50 - 150
26 MeFOSA			200.00	216.29	108	70 - 130
31 11Cl-PF3OUDS			188.40	196.11	104	70 - 130
D 62 d9-EtFOSE	196774	197334			100	50 - 150
D 38 13C2_PFDoA	1368498	1306907			95	50 - 150
11 PFDoA			200.00	203.45	101	70 - 130
D 59 d5-EtFOSA	132775	124637			94	50 - 150
33 EtFOSE			200.00	206.12	103	70 - 130
4 10:2 FTS			192.80	226.55	117	70 - 130
27 EtFOSA			200.00	201.05	100	70 - 130
34 PFDOS			193.60	213.71	110	70 - 130
24 PFTrDA			200.00	212.89	106	70 - 130
23 PFTeDA			200.00	216.48	108	70 - 130
D 42 13C2_PFTeDA	1450169	1411980			97	50 - 150
35 PFHxDA			200.00	214.64	107	70 - 130
D 40 13C2_PFHxDA	880327	959143			109	50 - 150
36 PFODA			200.00	194.23	97	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A019.d
Injection Date: 29-Sep-2023 05:38:47 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 78
Sample Info: CCV 1000A_SVLC-3076 Misc. Info:
Inst. ID: LCMSMS01.i Operator: eqi.svoa

Method: LCMSMS01_PFAS-ID2 Version: V16 30-Jun-2022 10:54:24
Calib Method: PFAS-ID2 Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-5 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			1000.00	937.93	93	70 - 130
D 46 13C4_PFBA	1858941	1885510			101	50 - 150
D 50 13C5_PFPeA	1482989	1524389			103	50 - 150
21 PFPeA			1000.00	985.03	98	70 - 130
7 PFBS			884.00	869.04	98	70 - 130
D 44 13C3_PFBS	662185	652494			99	50 - 150
1 4:2 FTS			934.00	871.02	93	70 - 130
D 63 13C2_4:2 FTS_2	347875	355051			102	50 - 150
D 49 13C5_PFHxA	1622949	1478759			91	50 - 150
15 PFHxA			1000.00	1018.15	101	70 - 130
22 PFPeS			938.00	929.95	99	70 - 130
D 66 13C3_GenX	1416346	1445358			102	50 - 150
28 GenX			2000.00	2041.57	102	70 - 130
13 PFHpA			1000.00	924.14	92	70 - 130
D 47 13C4_PFHpA	2388048	2278356			95	50 - 150
14 PFHxS			910.00	874.40	96	70 - 130
D 45 13C3_PFHxS	621967	643096			103	50 - 150
29 ADONA			942.00	942.51	100	70 - 130
2 6:2 FTS			948.00	1003.63	105	70 - 130
D 64 13C2_6:2 FTS_2	334928	350504			105	50 - 150
20 PFOA			1000.00	954.77	95	70 - 130
D 53 13C8_PFOA	1754642	1754525			100	50 - 150
12 PFHpS			952.00	957.41	100	70 - 130
D 54 13C8_PFOS	557998	530535			95	50 - 150
18 PFOS			928.00	1006.72	108	70 - 130
17 PFNA			1000.00	934.08	93	70 - 130
D 56 13C9_PFNA	1582813	1609468			102	50 - 150
30 9Cl-PF3ONS			932.00	881.63	94	70 - 130
19 PFOSA			1000.00	943.44	94	70 - 130
D 55 13C8_PFOSA	903613	969848			107	50 - 150
D 65 13C2_8:2 FTS_2	285342	289647			102	50 - 150
3 8:2 FTS			958.00	999.83	104	70 - 130
D 51 13C6_PFDA	1410047	1484036			105	50 - 150
16 PFNS			960.00	942.64	98	70 - 130
10 PFDA			1000.00	993.94	99	70 - 130
D 58 d3-MeFOSAA	1615067	1520700			94	50 - 150

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			1000.00	999.21	99	70 - 130
9 PFDS			964.00	944.46	97	70 - 130
D 60 d5-EtFOSAA	1384036	1304695			94	50 - 150
5 N-EtFOSAA			1000.00	1002.35	100	70 - 130
25 PFUdA			1000.00	931.09	93	70 - 130
D 52 13C7_PFUdA	1328072	1385774			104	50 - 150
D 61 d7-MeFOSE	218216	220786			101	50 - 150
32 MeFOSE			1000.00	1095.74	109	70 - 130
D 57 d3-MeFOSA	136442	131594			96	50 - 150
26 MeFOSA			1000.00	1006.28	100	70 - 130
31 11Cl-PF3OUDS			942.00	954.08	101	70 - 130
D 62 d9-EtFOSE	197334	194773			99	50 - 150
D 38 13C2_PFDoA	1306907	1370546			105	50 - 150
11 PFDoA			1000.00	946.65	94	70 - 130
D 59 d5-EtFOSA	124637	122442			98	50 - 150
33 EtFOSE			1000.00	1011.65	101	70 - 130
4 10:2 FTS			964.00	1036.96	107	70 - 130
27 EtFOSA			1000.00	1018.83	101	70 - 130
34 PFDOS			968.00	1008.51	104	70 - 130
24 PFTrDA			1000.00	921.58	92	70 - 130
23 PFTeDA			1000.00	989.91	98	70 - 130
D 42 13C2_PFTeDA	1411980	1439219			102	50 - 150
35 PFHxDA			1000.00	993.73	99	70 - 130
D 40 13C2_PFHxDA	959143	925588			97	50 - 150
36 PFODA			1000.00	941.69	94	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A029.d
Injection Date: 29-Sep-2023 07:24:33 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 87
Sample Info: CCV 1000B_SVLC-3076 Misc. Info:
Inst. ID: LCMSMS01.i Operator: eqi.svoa

Method: LCMSMS01_PFAS-ID2 Version: V16 30-Jun-2022 10:54:24
Calib Method: PFAS-ID2 Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-5 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			1000.00	979.83	97	70 - 130
D 46 13C4_PFBA	1858941	2164026			116	50 - 150
D 50 13C5_PFPeA	1482989	1755198			118	50 - 150
21 PFPeA			1000.00	969.78	96	70 - 130
7 PFBS			884.00	876.04	99	70 - 130
D 44 13C3_PFBS	662185	773904			117	50 - 150
1 4:2 FTS			934.00	936.48	100	70 - 130
D 63 13C2_4:2 FTS_2	347875	415461			119	50 - 150
D 49 13C5_PFHxA	1622949	1829432			113	50 - 150
15 PFHxA			1000.00	987.70	98	70 - 130
22 PFPeS			938.00	879.62	93	70 - 130
D 66 13C3_GenX	1416346	1820551			129	50 - 150
28 GenX			2000.00	1903.91	95	70 - 130
13 PFHpA			1000.00	920.11	92	70 - 130
D 47 13C4_PFHpA	2388048	2706503			113	50 - 150
14 PFHxS			910.00	1013.90	111	70 - 130
D 45 13C3_PFHxS	621967	731751			118	50 - 150
29 ADONA			942.00	996.65	105	70 - 130
2 6:2 FTS			948.00	947.34	99	70 - 130
D 64 13C2_6:2 FTS_2	334928	421132			126	50 - 150
20 PFOA			1000.00	1061.03	106	70 - 130
D 53 13C8_PFOA	1754642	1856813			106	50 - 150
12 PFHpS			952.00	918.37	96	70 - 130
D 54 13C8_PFOS	557998	640990			115	50 - 150
18 PFOS			928.00	959.87	103	70 - 130
17 PFNA			1000.00	955.58	95	70 - 130
D 56 13C9_PFNA	1582813	1919539			121	50 - 150
30 9Cl-PF3ONS			932.00	886.72	95	70 - 130
19 PFOSA			1000.00	948.55	94	70 - 130
D 55 13C8_PFOSA	903613	1102445			122	50 - 150
D 65 13C2_8:2 FTS_2	285342	341393			120	50 - 150
3 8:2 FTS			958.00	942.96	98	70 - 130
D 51 13C6_PFDA	1410047	1699302			121	50 - 150
16 PFNS			960.00	983.82	102	70 - 130
10 PFDA			1000.00	1048.22	104	70 - 130
D 58 d3-MeFOSAA	1615067	1903074			118	50 - 150

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			1000.00	976.42	97	70 - 130
9 PFDS			964.00	952.26	98	70 - 130
D 60 d5-EtFOSAA	1384036	1593528			115	50 - 150
5 N-EtFOSAA			1000.00	1012.22	101	70 - 130
25 PFUdA			1000.00	900.54	90	70 - 130
D 52 13C7_PFUdA	1328072	1611811			121	50 - 150
D 61 d7-MeFOSE	218216	279222			128	50 - 150
32 MeFOSE			1000.00	993.65	99	70 - 130
D 57 d3-MeFOSA	136442	166760			122	50 - 150
26 MeFOSA			1000.00	935.01	93	70 - 130
31 11Cl-PF3OUDS			942.00	939.69	99	70 - 130
D 62 d9-EtFOSE	197334	224769			114	50 - 150
D 38 13C2_PFDoA	1306907	1482062			113	50 - 150
11 PFDoA			1000.00	978.31	97	70 - 130
D 59 d5-EtFOSA	124637	146398			117	50 - 150
33 EtFOSE			1000.00	988.22	98	70 - 130
4 10:2 FTS			964.00	904.38	93	70 - 130
27 EtFOSA			1000.00	992.76	99	70 - 130
34 PFDOS			968.00	922.45	95	70 - 130
24 PFTrDA			1000.00	1046.06	104	70 - 130
23 PFTeDA			1000.00	975.02	97	70 - 130
D 42 13C2_PFTeDA	1411980	1685064			119	50 - 150
35 PFHxDA			1000.00	1001.42	100	70 - 130
D 40 13C2_PFHxDA	959143	1084519			113	50 - 150
36 PFODA			1000.00	936.27	93	70 - 130

SCIEX
The Power of Precision

SCIEX Triple Quad 4500/4500MD Systems

Planned Maintenance Procedure



GEN-IDV-08-6710-G

November 2021

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(GEN-IDV-09-10816-D)

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Introduction 1

Note: For regulatory and safety information for the mass spectrometer, refer to the document: *System User Guide*.

The planned maintenance (PM) procedure is designed to help maintain overall system performance.

Planned maintenance is not intended to take the place of an Operational Qualification (OQ) nor is it intended to verify the instrument specifications. Separate Installation Qualification (IQ) and OQ services are available. Contact a SCIEX representative.

The procedure must be performed by a trained SCIEX Field Service Employee (FSE).

The procedure has been developed for the SCIEX Triple Quad 4500/4500MD System with the Turbo V Ion Source. It does not apply to any other products or processes.

The procedure does not address any customer-specific analytical protocol (performance qualification) or method validation.

Note: If an issue is identified and the system requires repair, then the customer is responsible for the cost of the repair, except to the extent that the system and required repairs are covered by a SCIEX warranty or service contract. Open a separate service call for the repair. Do not charge repair service call hours to planned maintenance procedures.

Planned Maintenance Tasks 2

Note: Perform all procedures using the Turbo V Ion Source, unless otherwise specified.

Pre-Planned Maintenance

Note: Guideline values are for reference only. The pre-PM test results are not required to meet or exceed these values.

Pre-PM Tasks

Task	Complete	N/A
Ask the customer about system performance since the last visit and record comments.	✓	—
If the customer maintains a log for the system, then review it.	○	◉
Review the work to be performed with the customer.	✓	—

PC Health Check

Task	Complete	N/A
Inspect the status of the RAID 1 hard drives.	✓	—

Vacuum System Tests

Task			Complete
Record the turbo pump operational values.			✓
Parameter	**Results**		
Temperature (°C)	43		
Current (A)	3.9		
Voltage (V)	23		
Power (W)	85		
Driving frequency (Hz)	800		
Inspect the vacuum gauge filament using the appropriate service tool (Analyst Service Diagnostics (ASD) for Analyst software or Tuning Tools for SCIEX OS) and identify the filament position. If the mass spectrometer is using filament 2, then order a replacement vacuum gauge as a separate service call.	1	◉	✓
	2	○	

Pre-PM Pressure Test

Pre-PM Pressure Test is Complete	✓

Test	Guideline	Result
Vacuum chamber pressure with CAD gas off	0.4×10^{-5} torr ≤ $P_{CAD\,0}$ ≤ 1.1×10^{-5} torr	0.5e-5
Pressure difference (CAD_{12} minus CAD_0)	1.8×10^{-5} torr ≤ ($P_{CAD\,12} - P_{CAD\,0}$) ≤ 2.8×10^{-5} torr	2.1e-5

Inspect for Contamination

Task	Complete	N/A
Inspect for front-end contamination. Refer to Inspect for Contamination.	✓	—

Record Probe Position

Task	Result
Record the vertical and horizontal probe positions.	0.5, 5.0

Pre-PM System Tests

Q1 Positive MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
175.133	≥ 8.0×10^6	2.9e7	0.6 to 0.8	1.08
500.380	≥ 8.0×10^6	3.2e7	0.6 to 0.8	1.10
906.673	≥ 2.0×10^7	5.4e7	0.6 to 0.8	1.19
1,952.427	≥ 8.8×10^5	1.1e7	0.6 to 0.8	n/a

Q3 Positive MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
175.133	≥ 8.0×10^6	3.2e7	0.6 to 0.8	0.68
500.380	≥ 8.0×10^6	2.5e7	0.6 to 0.8	0.69
906.673	≥ 2.0×10^7	5.0e7	0.6 to 0.8	0.65
1,952.427	≥ 8.8×10^5	1.1e7	0.6 to 0.8	0.70

Q1 Negative MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
933.636	$\geq 1.8 \times 10^7$	2.6e7	0.6 to 0.8	0.81
1,863.306	$\geq 1.4 \times 10^6$	4.5e6	0.6 to 0.8	0.79

Q3 Negative MS Test is Complete	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
933.636	$\geq 1.8 \times 10^7$	3.6e7	0.6 to 0.8	0.85
1,863.306	$\geq 2.0 \times 10^6$	5.5e6	0.6 to 0.8	1.10

Reserpine MS/MS Transmission Test is Complete	✓

- **Test solution:** Reserpine solution 0.167 pmol/µL
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s (both MS and MS/MS)
- **Scan mode:** Product Ion (MS2)
- **Product Of:** 609.3 (or as calibrated)
- **Product Ion:** 195.1
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 609.3 and 195.1, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Guideline	Result
Transmission efficiency $\frac{Intensity\ for\ ion\ at\ m/z\ 195.1}{Intensity\ for\ ion\ at\ m/z\ 609.3\ (or\ as\ calibrated)} \times 100 \geq 10\%$	10.4%

Planned Maintenance

Mass Spectrometer Maintenance

Task	Complete	N/A
Shut down the system and then disconnect the mains supply power cable.	✓	—
If required, replace the roughing pump oil. The recommended interval is every 3 years. **Note:** If an oil change is not required, then inspect the oil level and top up the oil, if required. **CAUTION: Potential System Damage. Do not mix different types of oil. Mixing mineral oil with synthetic oil can cause pump failure.**	✓	—
If required, replace the roughing pump oil exhaust filter. The recommended interval is every 3 years.	○	◉
Confirm that there is no excessive roughing pump oil leakage. Clean up any oil.	✓	—
Make sure that the roughing pump exhaust is properly routed to the ventilation system.	✓	—

Task	Complete	N/A
Inspect the exhaust system: • Make sure that all of the gas fittings at the rear bulkhead are tight. • Make sure that all of the exhaust hoses are free of kinks. • Make sure that all of the hoses at the waste bottle are secure, and that there are no signs of leaks. • Make sure that the waste bottle is upright. • Make sure that the exhaust hose is securely connected to the lab ventilation system. • Make sure that no liquid is trapped in the exhaust lines.	✓	—
Clean or replace the four air filters in the base of the mass spectrometer chassis.	✓	—
(If applicable) Clean the turbo pump filter screen.	○	◉
(If applicable) Verify the operation of the SCIEX-supplied bench cooling fans.	◉	○
Clean the curtain plate.	✓	—
Clean the orifice plate.	✓	—
Clean the QJet Ion Guide and IQ0 lens.	✓	—
(If contamination is detected) Clean the Q0 region and the IQ1 lens.	◉	○
Inspect the cable connections: • Make sure that the power cables for the mass spectrometer, LC system, roughing pump, syringe pump, gas generator, and UPS are securely connected. • Make sure that the communications cables for the GPIB/Ethernet ports, LC connections, and roughing pump are securely connected.	✓	—

Task	Complete	N/A
Verify system support functions — gas: • Make sure that the input gas pressures at the regulators are within specifications. • Make sure that there is no liquid present in the gas lines.	✓	—
Examine the expiry date on the battery system for the UPS (sold by SCIEX), and then recommend replacement of the battery tray, if required.	○	◉
Start up the system.	✓	—

Turbo V Ion Source Maintenance

Task	Complete	N/A
If necessary, replace the electrode in the TurboIonSpray and APCI probes.	◉	○
With the TurboIonSpray probe installed, make sure that the temperature reaches the recommended set point of 500 °C.	✓	—
(If applicable) With the APCI probe installed, make sure that the temperature reaches the recommended set point of 400 °C.	○	◉
Examine the ion source and, if visible signs of contamination are present, clean the inner surfaces using lint-free wipes and a 50:50 methanol:water solution. **Note:** Remove the corona discharge needle before cleaning.	◉	○

Software Maintenance

Note: This task is not applicable to MD systems.

Task	Complete	N/A
(Obtain customer approval first) Install any applicable HotFixes for the control software. **Note:** Make sure that the compatible instrument firmware is installed.	○	◉
(Analyst software) (Obtain customer approval first) Install the Analyst Diagnostic Tool if it is not already installed.	○	◉

Post-Planned Maintenance

Voltage Tests

Task		Complete
Inspect the RF tuning voltages at the QPS amplifier module and then, if required, tune the coil boxes.		✓
Inspect the detector voltage. Optimize, if required.		✓
Detector voltage	+1900/-1900	

Post-PM Pressure Test

Post-PM Pressure Test is Complete	✓

Test	Specification	Result
Vacuum chamber pressure with CAD gas off	0.4×10^{-5} torr ≤ $P_{CAD\,0}$ ≤ 1.1×10^{-5} torr	0.5e-5
Pressure difference (CAD_{12} minus CAD_0)	1.8×10^{-5} torr ≤ ($P_{CAD\,12} - P_{CAD\,0}$) ≤ 2.8×10^{-5} torr	2.5e-5

Inspect for Contamination

Task	Complete	N/A
Inspect for front-end contamination. Refer to Inspect for Contamination.	✓	—

Post-PM System Tests

Q1 Positive MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
175.133	≥ 8.0×10^6	2.4e7	0.6 to 0.8	0.70
500.380	≥ 8.0×10^6	2.9e7	0.6 to 0.8	0.72
906.673	≥ 2.0×10^7	3.8e7	0.6 to 0.8	0.68
1,952.427	≥ 8.8×10^5	4.9e6	0.6 to 0.8	0.73

Q1 Positive MS Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1,000	50	0.6 to 0.8	
	2,000	100	0.6 to 0.8	

Q3 Positive MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
175.133	$\geq 8.0 \times 10^6$	3.5e7	0.6 to 0.8	0.66
500.380	$\geq 8.0 \times 10^6$	3.1e7	0.6 to 0.8	0.72
906.673	$\geq 2.0 \times 10^7$	5.4e7	0.6 to 0.8	0.72
1,952.427	$\geq 8.8 \times 10^5$	1.0e7	0.6 to 0.8	0.72

Q3 Positive MS Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1,000	50	0.6 to 0.8	
	2,000	100	0.6 to 0.8	

Q1 Negative MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
933.636	$\geq 1.8 \times 10^7$	2.7e7	0.6 to 0.8	0.73
1,863.306	$\geq 1.4 \times 10^6$	4.6e6	0.6 to 0.8	0.71

Q1 Negative MS Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1,000	50	0.6 to 0.8	
	2,000	100	0.6 to 0.8	

Q3 Negative MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
933.636	$\geq 1.8 \times 10^7$	2.0e7	0.6 to 0.8	0.68
1,863.306	$\geq 2.0 \times 10^6$	2.4e6	0.6 to 0.8	0.65

Q3 Negative MS Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1,000	50	0.6 to 0.8	
	2,000	100	0.6 to 0.8	

Reserpine MS/MS Transmission Test is Complete	✓

- **Test solution:** Reserpine solution 0.167 pmol/µL
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s (both MS and MS/MS)
- **Scan mode:** Product Ion (MS2)
- **Product Of:** 609.3 (or as calibrated)
- **Product Ion:** 195.1
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 609.3 and 195.1, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Specification	Result
Transmission efficiency $\frac{Intensity\ for\ ion\ at\ m/z\ 195.1}{Intensity\ for\ ion\ at\ m/z\ 609.3\ (or\ as\ calibrated)} \times 100 \geq 10\%$	10%

Post-PM Tasks

Task	Complete	N/A
Delete any unnecessary files.	✓	—
Back up the Data folder for the control software.	✓	—
(If applicable) Defragment the hard drive.	○	◉
(Not applicable for MD instrument families) If the customer has a Software Support Plan, then perform the Software Health Check: • (Obtain customer approval first) Install any compatible HotFixes and updates for SCIEX add-on software.	○	◉

Restore Probe Position

Task	Complete	N/A
Restore vertical and horizontal probe positions to those recorded during Record Probe Position	✓	—

StatusScope Remote Monitoring Service Tasks

The StatusScope remote monitoring service is not applicable for MD systems.

Task	Complete	N/A
Note: Installation of the StatusScope remote monitoring service is available only to warranty and eligible contract customers. Refer to sciex.com/instrument-service-and-support/statusscope-remote-monitoring for a list of eligible contracts. If the StatusScope remote monitoring service is not installed, then perform these tasks: • If the customer does not want the StatusScope remote monitoring service installed, then skip the remaining steps in this section. • If the customer wants the StatusScope remote monitoring service installed, then complete the steps in this section.		—
Verify the connection to the server for the StatusScope remote monitoring service. **Note:** Use the **StatusScopePortCheck.exe**. The utility is included with the StatusScope installer.	○	◉
Install the agent for the StatusScope remote monitoring service.	○	◉
Ask the customer to log on to SCIEX Now to verify that the instrument is connected to the server for the StatusScope remote monitoring service. **Note:** The instrument is shown under the account of the **Primary Contact**.	○	◉

Wrap-up

Task	Complete	N/A
Review the work performed with the customer.	✓	—
Record the test results in this document and then attach all of the test data.	✓	—
Review the routine maintenance schedule and the procedures with the customer.	✓	—
Complete this document: • Review the test results with the customer. • (SCIEX OS) Create the folder D:/SCIEX OS Data/PM. Save reports and data in this folder. • Provide the customer with the completed document.	✓	—

Service Request Number 3

Service request number		5471360	
Organization		Pace South Carolina	
Mass spectrometer serial number		BJ29321608	
FSE name	Lynne Russell	Date (yyyy-mm-dd)	2022-05-20

Service Request Number

Comments and Exceptions

Inspect for Contamination A

Perform a Q1 and Q3 charging test to determine whether front end contamination is present.

1. Run the **Pos PPG** method for 10 minutes, monitoring the Total Ion Count (TIC) for degradation of the signal or a decrease in sensitivity.
2. Change the polarity to Negative, and then scan for one minute.
3. Change the polarity to Positive, and then make sure that the **IS** parameter returns to the original value.
4. Run the method.

   If the signal sensitivity is restored temporarily but the Total Ion Count (TIC) again degrades by more than 5% over a 10 minute run, then a possible front-end contamination is indicated.
5. Repeat the test in Negative polarity using the Q1 Neg PPG method.

Guidelines for Cleaning the Front End

If charging tests indicate that cleaning is necessary, then clean the front-end components, including the QJet Ion Guide, IQ0 lens, Q0 quadrupole, and IQ1 lens.

Removing the ion optics is considered a repair activity. FSEs must open a separate service repair call.

Note: This procedure does not provide troubleshooting for all technical root causes of signal degradation or charging effect. Signal degradation might also result from a contaminated TurboIonSpray probe or electrode, method parameters that are not optimized, or other factors.

Extract Dilution Preparations

DILUTION	1X	5X	10X	20X	50X	100X	200X
D8421-ID DILUTION PREP							
EXTRACT (µL)	ALIQUOT	200	100	50	100	50	25
SUR 1 (µL)	0	0	0	0	39.2	39.6	39.8
SUR 2 (µL)	0	0	0	0	39.2	39.6	39.8
1:1 H2O:MeOH w/ 0.1% Acetic Acid (µL)	0	800	900	950	4822	4871	4895
TOTAL (µL)	200	1000	1000	1000	5000	5000	5000
REFORTIFIED ID-AQ/ID-SOLID DILUTION PREP							
EXTRACT (µL)	ALIQUOT	200	100	50	20	10	5
ES-100ppb (µL)	0	16	18	19	19.6	19.8	19.9
MeOH (µL)	0	753	847	894	922	931	936
WATER (µL)	0	31	35	37	38.4	38.8	39
TOTAL (µL)	75	1000	1000	1000	1000	999.6	999.9
UNFORTIFIED ID-AQ/ID-SOLID DILUTION PREP							
EXTRACT (µL)	ALIQUOT	200	100	50	20	10	5
ES-100ppb (µL)	0	0	0	0	0	0	0
MeOH (µL)	0	768	864	912	941	950	955
WATER (µL)	0	32	36	38	39	40	40
TOTAL (µL)	75	1000	1000	1000	1000	1000	1000
In-vial 50X ID Screen							
In-vial 50X ID Screen		240µL 96%MeOH	+	5µL SUR 100ppb	+	5µL sample extract	
DAI DILUTION PREP							
SAMPLE (µL)	500	100	50	25	10	5	5
ES (µL)	25	25	25	25	25	25	50
MeOH (µL)	475	475	475	475	475	475	950
Water (µL)	0	400	450	475	490	495	995
TOTAL (µL)	1000	1000	1000	1000	1000	1000	2000
1633 DILUTION PREP							
EXTRACT (µL)	ALIQUOT	200	100	NA	NA	NA	NA
1% Amm.-MeOH (uL)	0	754	854	NA	NA	NA	NA
Water (µL)	0	40	40	NA	NA	NA	NA
Acetic Acid (µL)	0	6	6	NA	NA	NA	NA
TOTAL (µL)	75	1000	1000	NA	NA	NA	NA

NOTE: Serial dilution will be performed for dilutions higher than 200X.

Report Date: 22-Sep-2023 09:40:04 AIM Revision: 2.0.2023.0816

Pace Environmental Services, LLC

Batch Run Log Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24

Instrument: LCMSMS01.i Integrator: picker

Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28

Method Lock: Unknown Lock Date:

Calib Method: PFAS-ID2 No.Compounds: 66

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
71	CCV 100_SVLC-3078	20-Sep-2023 17:45:42	092023A006.d	ICal					Analytes	L-2	1.00		
72	CCV 200_SVLC-3079	20-Sep-2023 17:56:11	092023A007.d	ICal					Analytes	L-3	1.00		
73	CCV 500_SVLC-3080	20-Sep-2023 18:06:40	092023A008.d	ICal					Analytes	L-4	1.00		
74	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11	092023A009.d	ICal					Analytes	L-5	1.00		
75	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49	092023A010.d	ICal					Analytes	L-6	1.00		
76	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28	092023A011.d	ICal					Analytes	L-7	1.00		
77	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08	092023A012.d	ICal					Analytes	L-8	1.00		
78	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48	092023A013.d	ICal					Analytes	L-9	1.00		
79	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28	092023A014.d	ICal					Analytes	L-10	1.00		
94	ID BLK B3	20-Sep-2023 19:21:07	092023A015.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
80	ICV_3035	20-Sep-2023 19:31:39	092023A016.d	ICV					Analytes	ICV-43	1.00		
81	ISOMER_3086	20-Sep-2023 19:42:20	092023A017.d	CheckStd					IsomerCheck	Smp	1.00		
82	ID IBLK A1	20-Sep-2023 19:52:49	092023A018.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
3	YQ85065-002	20-Sep-2023 20:13:49	092023A020.d	LCS		Soil	1	85065	Analytes	100x PDS	0.1000		
4	YQ84992-002	20-Sep-2023 20:24:24	092023A021.d	LCS		Aqueous	1	84992	Analytes	100x PDS	0.2000		
5	YI18013-005	20-Sep-2023 20:34:56	092023A022.d	Client	IDW02-00	Soil	1	85065	Surrogates	Smp	0.1000		
6	YH31010-001	20-Sep-2023 20:45:31	092023A023.d	Client	Cannon_IDW_WW_082923	Aqueous	1	84992	Surrogates	Smp	0.1000		NCM SUR RX CNF RO
7	YI07022-001	20-Sep-2023 20:56:06	092023A024.d	Client	NASA-TCGAC2-INF-20230906	Aqueous	10U	84992	Surrogates	Smp	0.1000		
8	YI07022-002	20-Sep-2023 21:06:42	092023A025.d	Client	NASA-TCGAC-EF3-20230906	Aqueous	1	84992	Surrogates	Smp	0.1000		
9	YI07022-002MS	20-Sep-2023 21:17:19	092023A026.d	MS		Aqueous	1	84992	Analytes	100x PDS	0.2000		
10	YI07022-002MD	20-Sep-2023 21:27:56	092023A027.d	MSD		Aqueous	1	84992	Analytes	100x PDS	0.2000		
11	YI07042-001	20-Sep-2023 21:38:35	092023A028.d	Client	IDW-2023Q3-AQ01	Aqueous	1	84992	Surrogates	Smp	0.1000		NCM SUR HI ND, RX 6:2
12	YI09009-002	20-Sep-2023 21:49:06	092023A029.d	Client	507-Train A Lag EFF	Aqueous	5U	84992	Surrogates	Smp	0.1000		
17	CCV 1000A_SVLC-3076	20-Sep-2023 22:42:03	092023A034.d	CCV					Analytes	L-5	1.00		
100	CCB C1	20-Sep-2023 22:52:39	092023A035.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
18	YQ85086-001	20-Sep-2023 23:03:21	092023A036.d	MBlk		Aqueous	1	85086	Surrogates	Smp	0.1000		
19	YQ85086-002	20-Sep-2023 23:13:56	092023A037.d	LCS		Aqueous	1	85086	Analytes	100x PDS	0.2000		
20	YI06019-003	20-Sep-2023 23:24:33	092023A038.d	Client	ESHEP03-GS01-001FD	Aqueous	1	85086	Surrogates	Smp	0.1000		NCM SUR HI ND
21	YI18013-002	20-Sep-2023 23:35:12	092023A039.d	Client	FB-091523	Aqueous	1	85086	Surrogates	Smp	0.1000		
22	YI18013-007	20-Sep-2023 23:45:45	092023A040.d	Client	FRB-091623	Aqueous	1	85086	Surrogates	Smp	0.1000		
23	YI09009-003	20-Sep-2023 23:56:18	092023A041.d	Client	507-Train B Lag EFF	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X
24	YI09009-004	21-Sep-2023 00:06:53	092023A042.d	Client	507-Train C Lag EFF	Aqueous	1	85086	Surrogates	Smp	0.1000		
25	YI09009-005	21-Sep-2023 00:17:29	092023A043.d	Client	507-Train A Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 10X, RX 4:2
26	YI09009-006	21-Sep-2023 00:28:05	092023A044.d	Client	507-Train B Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 10X, RX 4:2
27	YI09009-007	21-Sep-2023 00:38:41	092023A045.d	Client	507-Train C Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		NCM SUR HI ND, RR 5X
28	YI09009-008	21-Sep-2023 00:49:17	092023A046.d	Client	507-Raw	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 20X, RX BA, 4:2
29	YI09009-010	21-Sep-2023 00:59:54	092023A047.d	Client	001-A	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X, NCM SUR HI ND, RX 6:2, BA
30	CCV 1000B_SVLC-3076	21-Sep-2023 01:10:30	092023A048.d	CCV					Analytes	L-5	1.00		
100	CCB C2	21-Sep-2023 01:21:09	092023A049.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
31	YI09009-011	21-Sep-2023 01:31:50	092023A050.d	Client	001-A-D	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X, NCM SUR HI ND, RX 6:2
32	YI09011-001	21-Sep-2023 01:42:23	092023A051.d	Client	508-Treated	Aqueous	1	85086	Surrogates	Smp	0.1000		
33	YI09011-001MS	21-Sep-2023 01:52:56	092023A052.d	MS		Aqueous	1	85086	Analytes	100x PDS	0.2000		
34	YI09011-001MD	21-Sep-2023 02:03:33	092023A053.d	MSD		Aqueous	1	85086	Analytes	100x PDS	0.2000		
35	YI09011-002	21-Sep-2023 02:14:08	092023A054.d	Client	508- Train A Lag Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
36	YI09011-003	21-Sep-2023 02:24:43	092023A055.d	Client	508- Train B Lag Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		
37	YI09011-004	21-Sep-2023 02:35:19	092023A056.d	Client	508- Train C Lag Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		
38	YI09011-005	21-Sep-2023 02:45:57	092023A057.d	Client	508- Train A Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X
39	YI09011-006	21-Sep-2023 02:56:33	092023A058.d	Client	508- Train B Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		
40	YI09011-007	21-Sep-2023 03:07:10	092023A059.d	Client	508- Train C Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		
41	YI09011-008	21-Sep-2023 03:17:50	092023A060.d	Client	508-Raw	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X, NCM SUR HI ND
42	YI09011-010	21-Sep-2023 03:28:24	092023A061.d	Client	002-A	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X, NCM SUR HI ND
43	CCV 1000C_SVLC-3076	21-Sep-2023 03:38:58	092023A062.d	CCV					Analytes	L-5	1.00		
100	CCB C3	21-Sep-2023 03:49:35	092023A063.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
44	YI09009-001	21-Sep-2023 04:00:17	092023A064.d	Client	507-Treated	Aqueous	1	84992	Surrogates	Smp	0.1000		RR 5X
45	YI09009-001MS	21-Sep-2023 04:10:51	092023A065.d	MS		Aqueous	1	84992	Analytes	100x PDS	0.2000		
46	YI09009-001MD	21-Sep-2023 04:21:27	092023A066.d	MSD		Aqueous	1	84992	Analytes	100x PDS	0.2000		
47	CCV 1000D_SVLC-3076	21-Sep-2023 04:32:03	092023A067.d	CCV					Analytes	L-5	1.00		
100	CCB C4	21-Sep-2023 04:42:41	092023A068.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		

Report Date: 29-Sep-2023 17:47:21 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

Batch Run Log Report

Batch: \\organics\LL\LCMSMS01.i\092823A-DOD.b

Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24

Instrument: LCMSMS01.i Integrator: picker

Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28

Method Lock: Unknown Lock Date:

Calib Method: PFAS-ID2 No.Compounds: 66

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
97	CCV 200A_SVLC-3079	29-Sep-2023 02:27:48	092823A001.d	CCV					Analytes	L-3	1.00		
98	ID IBLK A1	29-Sep-2023 02:38:22	092823A002.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
62	YQ85972-001	29-Sep-2023 02:48:57	092823A003.d	MBlk		Aqueous	1	85972	Surrogates	Smp	0.1000		
63	YQ85972-002	29-Sep-2023 02:59:33	092823A004.d	LCS		Aqueous	1	85972	Analytes	100x PDS	0.2000		
64	YI14063-002	29-Sep-2023 03:10:10	092823A005.d	Client	OU2-EFF-0923B	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
65	YI14063-002MS	29-Sep-2023 03:20:47	092823A006.d	MS		Aqueous	1	85972	Analytes	100x PDS	0.2000		
66	YI14063-002MD	29-Sep-2023 03:31:27	092823A007.d	MSD		Aqueous	1	85972	Analytes	100x PDS	0.2000		
67	YI15020-001	29-Sep-2023 03:42:05	092823A008.d	Client	SAN-MH03_091323	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
68	YI15020-002	29-Sep-2023 03:52:44	092823A009.d	Client	TripBlank_091323	Aqueous	1	85972	Surrogates	Smp	0.1000		
69	YI15022-001	29-Sep-2023 04:03:24	092823A010.d	Client	TOC03A-20230914	Aqueous	1	85972	Surrogates	Smp	0.1000		
70	YI15022-001MS	29-Sep-2023 04:14:03	092823A011.d	MS		Aqueous	1	85972	Analytes	100x PDS	0.2000		
71	YI15022-001MD	29-Sep-2023 04:24:41	092823A012.d	MSD		Aqueous	1	85972	Analytes	100x PDS	0.2000		
72	YI15022-002	29-Sep-2023 04:35:10	092823A013.d	Client	TOC-DUP01-20230914	Aqueous	1	85972	Surrogates	Smp	0.1000		
73	YI15022-003	29-Sep-2023 04:45:39	092823A014.d	Client	TOC03B-20230914	Aqueous	1	85972	Surrogates	Smp	0.1000		RR-10X
74	YI15022-004	29-Sep-2023 04:56:11	092823A015.d	Client	TOC03C-20230914	Aqueous	1	85972	Surrogates	Smp	0.1000		RR-10X
75	YI15029-001	29-Sep-2023 05:06:49	092823A016.d	Client	WSTF-A03-100-001-GW-240-	Aqueous	1	85972	Surrogates	Smp	0.1000		
76	YI15029-002	29-Sep-2023 05:17:27	092823A017.d	Client	WSTF-A11-600C-005-GW-402	Aqueous	1	85972	Surrogates	Smp	0.1000		
77	YI15029-003	29-Sep-2023 05:28:06	092823A018.d	Client	WSTF-A08-INF0001-2023091	Aqueous	1	85972	Surrogates	Smp	0.1000		
78	CCV 1000A_SVLC-3076	29-Sep-2023 05:38:47	092823A019.d	CCV					Analytes	L-5	1.00		
99	CCB C1	29-Sep-2023 05:49:26	092823A020.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
79	YI15029-004	29-Sep-2023 06:00:06	092823A021.d	Client	WSTF-A08-EFF0001-2023091	Aqueous	1	85972	Surrogates	Smp	0.1000		
80	YI15029-005	29-Sep-2023 06:10:45	092823A022.d	Client	WSTF-A08-INF0002-2023091	Aqueous	1	85972	Surrogates	Smp	0.1000		
81	YI15029-006	29-Sep-2023 06:21:26	092823A023.d	Client	WSTF-A08-EFF0002-2023091	Aqueous	1	85972	Surrogates	Smp	0.1000		
82	YI15029-007	29-Sep-2023 06:31:57	092823A024.d	Client	WSTF-EB-20230913-07	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
83	YI15029-008	29-Sep-2023 06:42:24	092823A025.d	Client	WSTF-FB-20230913-08	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
84	YI15029-009	29-Sep-2023 06:52:55	092823A026.d	Client	WSTF-FB-20230914-09	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
85	YI18040-002	29-Sep-2023 07:03:26	092823A027.d	Client	IDW03-00	Aqueous	1	85972	Surrogates	Smp	0.1000		RR-50X
86	YI18040-003	29-Sep-2023 07:14:00	092823A028.d	Client	IDW04-00	Aqueous	1	85972	Surrogates	Smp	0.1000		RR-CO DNR
87	CCV 1000B_SVLC-3076	29-Sep-2023 07:24:33	092823A029.d	CCV					Analytes	L-5	1.00		
99	CCB C2	29-Sep-2023 07:35:07	092823A030.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		

Analyst: MVP2 **Level 2 Analyst:** ERL

Status: Level 2 review released

Matrix: Aqueous

Printed: 10/02/23 1720

Prep Batch: 85972

PFAS Prep by ID SOP QSMB-15 - PFAS Aqueous Preparation

Start Date: 09/27/2023 2024
End Date: 09/27/2023 2346

Conc Analyst: MVP2
Conc Start Date: 09/27/2023 2301
Conc End Date: 09/27/2023 2332

Surrogate: SVLC3050
Surrogate Vol. (mL): 0.100

Ext Solvent: MECH>96%MECH/4%H2O
Reagents Vol. (mL): 10
Chem ID: 23-1612>23-1612/PFAS-23-059

Balance ID: Balance # 20-1123

Sample ID	QC Code	Client Sample ID	Run	Analysis Method	Container + Sample (g)	Container Empty (g)	Initial Vol. (mL)	Spike ID	Spike Vol. (mL)	Final Vol. (mL)	Comments
YQ85972-001	MB		1	PFAS by ID SOP QSMB-15	250		250.000		0.000	5.0	Init: 284.59 g Fin: 31.11 g
YQ85972-002	LCS		1	PFAS by ID SOP QSMB-15	250		250.000	SVLC3054	0.200	5.0	Init: 277.70 g Fin: 32.59 g
YI14063-002	Sample	CU2-EFF-0923B	2	PFAS by ID SOP QSMB-15	324.65	32.34	292.310		0.000	5.0	
YI14063-002MS	MS		2	PFAS by ID SOP QSMB-15	326.15	31.46	294.690	SVLC3054	0.200	5.0	Witness: ERL; Turbo Vap LV#1, 66°C
YI14063-002MD	MSD		2	PFAS by ID SOP QSMB-15	320.12	32.13	287.990	SVLC3054	0.200	5.0	Sorbent dry start/end:1st: 2137/2142 :2nd: 2211/2216;
YI15020-001	Sample	SAN-MH03_091323	1	PFAS by ID SOP QSMB-15	321.37	32.54	288.830		0.000	5.0	Buffer:LCMS23-738; Amm+MeOHLCMS23-737(4mL); QC Water: PFAS-23-060
YI15020-002	Sample	TripBlank_091323	1	PFAS by ID SOP QSMB-15	306.26	31.36	274.900		0.000	5.0	Bottletop: 21-2031; Pipettes: 21-1600, 23-1762;
YI15022-001	Sample	TOC03A-20230914	1	PFAS by ID SOP QSMB-15	299.98	31.97	268.010		0.000	5.0	QC Bottles: M3-180-01BB; Falcon tubes: 23-1748;
YI15022-001MS	MS		1	PFAS by ID SOP QSMB-15	296.13	31.88	264.250	SVLC3054	0.200	5.0	MeOH Ext: 4mL, Filt: 2mL;
YI15022-001MD	MSD		1	PFAS by ID SOP QSMB-15	303.65	32.34	271.310	SVLC3054	0.200	5.0	Reservoirs: 23-1537; GCB/WAX 500/50: 23-1618, 23-1710;
YI15022-002	Sample	TOC-DUP01-20230914	1	PFAS by ID SOP QSMB-15	295.64	31.64	264.000		0.000	5.0	
YI15022-003	Sample	TOC03B-20230914	1	PFAS by ID SOP QSMB-15	290.06	32.21	257.850		0.000	5.0	
YI15022-004	Sample	TOC03C-20230914	1	PFAS by ID SOP QSMB-15	293.31	31.61	261.700		0.000	5.0	
YI15029-001	Sample	WSTF-A03-100-001-GW-240-20230913	1	PFAS by ID SOP QSMB-15	314.87	32.37	282.500		0.000	5.0	
YI15029-002	Sample	WSTF-A11-600C-005-GW-402-20230913	1	PFAS by ID SOP QSMB-15	319.15	33.75	285.400		0.000	5.0	

Analyst: MVP2 **Level 2 Analyst:** ERL

Status: Level 2 review released

Matrix: Aqueous

Printed: 10/02/23 1720

Prep Batch: 85972

PFAS Prep by ID SOP QSMB-15 - PFAS Aqueous Preparation

Start Date: 09/27/2023 2024
End Date: 09/27/2023 2346

Conc Analyst: MVP2
Conc Start Date: 09/27/2023 2301
Conc End Date: 09/27/2023 2332

Surrogate: SVLC3050
Surrogate Vol. (mL): 0.100

Ext Solvent: MECH+96%MECH/4%H2O
Reagents Vol. (mL): 10
Chem ID: 23-1612>23-1612/PFAS-23-059

Balance ID: Balance # 20-1123

Sample ID	QC Code	Client Sample ID	Run	Analysis Method	Container + Sample (g)	Container Empty (g)	Initial Vol. (mL)	Spike ID	Spike Vol. (mL)	Final Vol. (mL)	Comments
YI15029-003	Sample	WSTF-A08-INF0001-20230914	1	PFAS by ID SOP QSMB-15	311.3	31.5	279.800		0.000	5.0	
YI15029-004	Sample	WSTF-A08-EFF0001-20230914	1	PFAS by ID SOP QSMB-15	309.58	32	277.580		0.000	5.0	
YI15029-005	Sample	WSTF-A08-INF0002-20230914	1	PFAS by ID SOP QSMB-15	305.12	32	273.120		0.000	5.0	
YI15029-006	Sample	WSTF-A08-EFF0002-20230914	1	PFAS by ID SOP QSMB-15	319.33	32.59	286.740		0.000	5.0	
YI15029-007	Sample	WSTF-EB-20230913-07	1	PFAS by ID SOP QSMB-15	310	31.31	278.690		0.000	5.0	
YI15029-008	Sample	WSTF-FB-20230913-08	1	PFAS by ID SOP QSMB-15	302.2	33.43	268.770		0.000	5.0	
YI15029-009	Sample	WSTF-FB-20230914-09	1	PFAS by ID SOP QSMB-15	301.61	31.71	269.900		0.000	5.0	
YI18040-002	Sample	IDW03-00	1	PFAS by ID SOP QSMB-15	327.33	31.92	295.410		0.000	5.0	
YI18040-003	Sample	IDW04-00	1	PFAS by ID SOP QSMB-15	322.38	33.05	289.330		0.000	5.0	

(end of report) **Total Samples: 18**

Appendix C
Surveyor's Report

LIBBIN UNDERWOOD ENGINEERING & SURVEYING
OFFICE: 1430 WEST AMADOR, LAS CRUCES, NM 88005
MAILING ADDRESS: 1121 BIRCH DR., LAS CRUCES, NM 88001
OFFICE PHONE: (575) 647-4329 FAX: (575) 523-5286
ZACK@LUENGINEERING.NET | LARRY@LUENGINEERING.NET

Monitoring Well Surveying Report

Project: WSTF Monitoring Well Survey
Project #: 2394

Prepared for: Tetra Tech, Inc.
201 East Pine Street, Suite 1000
Orlando, FL 32804
Phone: 407-480-3982
Fax: 407-839-2066
C/O Sarah Damphousse
e-mail: sarah.damphousse@tetratech.com

Report Prepared by: Joel Engel
Senior Survey Technician

Zack Libbin, PE
Principal Engineer

Under direction of: Larry O Underwood, PE/PLS
Principal Surveyor
NM PE/PLS 5983

Libbin Underwood Engineering & Surveying
Office Address: 1430 West Amador, Las Cruces, New Mexico
Mailing Address: 1121 Birch Dr., Las Cruces, NM 88001
Office Phone: 575-647-4329
zack@luengineering.net
larry@luengineering.net

Field Surveying date: September 15, 2023
Report Submittal date: November 21, 2023

1.0 Introduction

Tetra Tech Inc. (Tetra Tech) contracted Libbin Underwood Engineering & Surveying (Subcontractor, LU Engineering) to provide surveying services at National Aeronautics and Space Administration (NASA) White Sands Test Facility (WSTF) located in Doña Ana County, New Mexico. Professional Surveying was needed to support an Environmental Site Inspection in the eastern and western portions of the WSTF Facility.

2.0 Scope of Work

The scope of work performed at NASA WSTF for the Environmental Remediation Project was the point survey of two permanent monitoring wells contracted by Tetra Tech. Surveying Services provided by Libbin Underwood Engineering & Surveying included data collection on two different ground water monitoring wells, in Doña Ana County, NM. The point survey was completed using accurate and precise Trimble GNSS equipment, and technology.

Surveying services were required for two wells. The survey at each location was performed to obtain precise horizontal location and vertical elevation. Tetra Tech identified and provided access to the points to be surveyed in the field on September 15, 2023.

One horizontal measurement and two vertical measurements were required per well. The two vertical measurements are (1) the top of the polyvinyl chloride (PVC) riser pipe top of casing (TOC) and (2) the top of ground immediately adjacent to the outer casing. All the vertical measurements were taken from marked positions on each well or, if missing a mark, in a north direction.

There was no facility benchmark data provided, nor any access given to any benchmarks during escorted controlled access. The survey data shall be referenced to set benchmarks which place the project on: New Mexico State Plane Coordinate System, North American Datum 1983 (NAD83) and North American Vertical Datum 1988 (NAVD88).

The base unit for surveying all horizontal coordinates is reported in meters. The base unit for surveying all vertical elevations is reported in feet. All survey data is presented to the nearest 0.03 meter horizontally (equivalent of 0.1 ft) and the nearest 0.003 meter vertically (equivalent of 0.01 ft).

3.0 Site Background

(Provided by Tetra Tech)
NASA WSTF is located in Doña Ana County, 18 miles northeast of Las Cruces, New Mexico and 65 miles north of El Paso, Texas. Access to the site is provided via a paved road (NASA Road) that intersects U.S. Highway 70 one mile west of Organ, New Mexico. The installation occupies approximately 60,500 acres. WSTF administrative and testing facilities are located on the White Sands Missile Range (WSMR), owned by the Department of Defense, Department of the Army. NASA is the operator of the facility under an inter-agency agreement with the U.S.

Army. Tetra Tech is conducting a Site Inspection, which consists of sampling soil and groundwater for laboratory analysis of various contaminants of concern. Installation of two new monitoring wells is proposed to access site groundwater for investigation purposes. Once well installation is complete, a top-of-well casing and ground-surface survey at each well location is required to generate data for measuring groundwater level elevations.

4.0 Monitoring Well Survey

Surveying measurements were made by Libbin Underwood Engineering & Surveying using GNSS technology and equipment. Survey observations were made in the field using a Trimble R8-3 as the base with a R10 rover. The base made static observations and data collection which was post processed using the National Geodetic Survey (NGS) Online Position User Service (OPUS). The corrections near each well site and RTK measurements on each well were used to determine horizontal and vertical locations/coordinates.

A two-man surveying field crew from Libbin Underwood Engineering & Surveying completed a static observation of at least two hours at the two well sites on September 15, 2023. OPUS post processing was performed following the static observations greater than two hours to allow for OPUS adjustments. Each observation lasted for a duration of two hours of static observation with GNSS RTK shots around said site.

For well #600C-005-GW, located on the WSTF, the GNSS Static observation on the base point #200 (a 5/8-inch rebar) began at approximately 9:00 am MST and lasted until 11:00 am. An “X” was chiseled in the concrete footing of the well and was used as the benchmark for vertical data. RTK observations were then taken on the concrete footing next to well casing (chiseled “X”), on top of casing (top of the pipe) on the north side, and on the natural ground next to the concrete footing (see 5.0 Results and Survey Data and Exhibit A for horizontal and vertical data).

For well #100-001-GW, the GNSS Static observation on base point#100 (a 5/8-inch rebar), began at approximately 11:30am MST, and lasted until 1:30 pm. An “X” was chiseled in the concrete footing of the well, used as the benchmark vertical data. GNSS RTK observations were then taken on the concrete footing next to well casing (chiseled “X”), on top of casing (top of the pipe) on the north side, and on the natural ground next to the concrete footing (see 5.0 Results and Survey Data and Exhibit B for horizontal and vertical data).

5.0 Results and Survey Data

Coordinates for well locations are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983 (NAD83). Vertical data for well elevations are referenced the North American Vertical Datum 1988 (NAVD88).

The units of measurements for all reported horizontal coordinate data are expressed in meters to the nearest 0.03 meters (equivalent to 0.1 ft). The units of measurement for all reported vertical data are expressed in feet to the nearest 0.01 ft.

Table 1. Summary of monitoring well location New Mexico State Plane coordinates

Well Number	Point	Northing (meters)	Easting (meters)	Elevation (feet)
#600C-005-GW	Base Pt #200	168079.11	460173.62	4417.03
	Chiseled "X"	168060.35	460152.70	4416.30
	Top of Casing	168059.66	460152.37	4419.03
#100-001-GW	Base Pt #100	167162.80	466410.47	4811.95
	Chiseled "X"	167181.18	466408.26	4810.83
	Top of Casing	167180.70	466407.77	4813.86

Attached:
Exhibit A (Map and table of coordinates for well #100-001-GW)
Exhibit B (Map and table of coordinates for well #600C-005-GW)

Provided Digitally:
.csv file coordinates #600C-005-GW
.csv file coordinates #100-001-GW
NGS OPUS Solution Report Base Point 200
NGS OPUS Solution Report Base Point 100

6.0 Surveyor Certification

Surveying measurements and this report were prepared by Libbin Underwood Engineering & Surveying on behalf of Tetra Tech.

The survey measurements performed, and preparation of this report were performed under the direction of Larry O. Underwood, a Registered Professional Engineer and Land Surveyor in the State of New Mexico.

Measurements and coordinates reported are of precision and accuracy exceeding minimum requirements of the scope of work for this project (to 0.03 meter horizontally (equivalent of 0.1 ft) and 0.003 meter vertically (equivalent of 0.01 ft)) and standard of practice for this project.

I hereby certify that I am a Registered Professional Surveyor Under the Laws of the State of New Mexico, that surveying measurements and this report was prepared under my direction, that it is true and correct to the best of my knowledge and belief, meeting or exceeding the minimum requirements of the standards for land surveys in the State of New Mexico.

Larry O. Underwood

Larry O. Underwood, NMPLS #5983

11/21/23

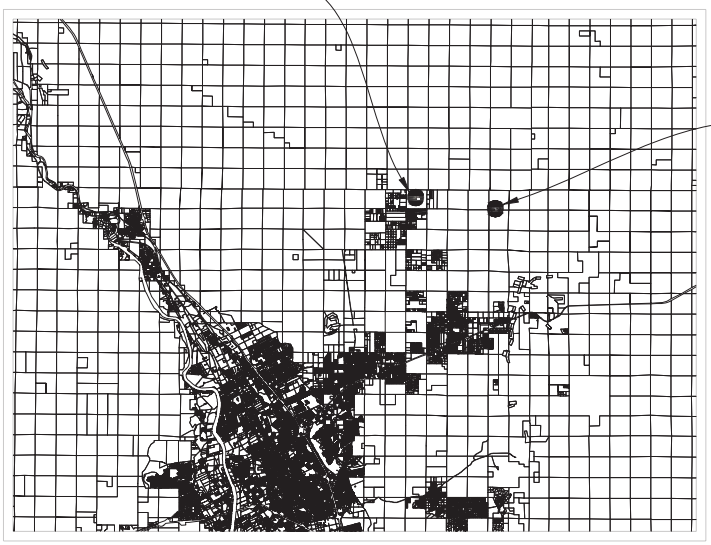


EXHIBIT A

EAST WELL

WELL No.100-001-GW

SCALE: 1 MM = 10 M NOVEMBER 20, 2023



VICINITY MAP
NTS

N

#100-001-GW				
POINT	ELEV (ft)	NORTHING (m)	EASTING (m)	DESCRIPTION
605	4813.86	167180.70	466407.77	WELL



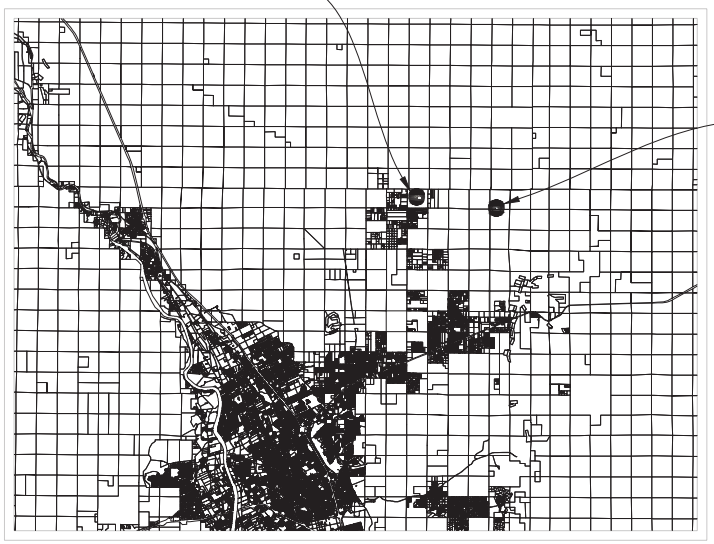
LIBBIN UNDERWOOD
ENGINEERING & SURVEYING
1430 W. AMADOR AVE, LAS CRUCES, NM | (575) 647-4329

PROJECT: 2394 | DRAWN BY: JME/CRF | SHEET 1 OF 1

EXHIBIT B

WEST WELL
WELL No.600C-005-GW

SCALE: 1 MM = 10 M NOVEMBER 20, 2023



VICINITY MAP
NTS

N

#600C-005-GW				
POINT	ELEV (ft)	NORTHING (m)	EASTING (m)	DESCRIPTION
500	4419.03	168059.66	460152.37	N RIM TOP CASING



LIBBIN UNDERWOOD
ENGINEERING & SURVEYING
1430 W. AMADOR AVE, LAS CRUCES, NM | (575) 647-4329

PROJECT: 2394 | DRAWN BY: JME/CRF | SHEET 1 OF 1

Appendix D
Investigation-Derived Waste Documentation

APPENDIX D

IDW MANAGEMENT DOCUMENTATION

Work Order

NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Waste Tracking Number
NMV8QG	1	888-785-7225	D572431

GENERATOR

5. Generator's Name and Mailing Address
Tetra Tech NASA
12600 Nasa Road
Las Cruces, NM 88012
Generator's Phone: 915-282-9243

Generator's Site Address (if different than mailing address)
same

6. Transporter 1 Company Name
dba AC Enviro
Advanced Chemical Transport, Inc. 511 Hwy 213 Chaparral NM 88061
U.S. EPA ID Number
ODL060760

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
Rhino Environmental Services, Inc.
1.7 Miles North of TX/NM Stateline
Otero County, NM
Facility's Phone:
U.S. EPA ID Number
DP1051

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	
1.	Non-DOT Regulated Material Solid (Oil, Dirt, Sand, Absorbents and or Diesel Fuel)	1	CM	20	YD	
2.						
3.						
4.						

13. Special Handling Instructions and Additional Information
Project Number 469400 Document #: D572431
1) TER-
Bin # 24387
Cell O

14. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name | Signature | Month | Day | Year

INT'L

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

TRANSPORTER

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name	Signature	Month	Day	Year
Adrian Villalpando		10	10	23
Transporter 2 Printed/Typed Name	**Signature**	**Month**	**Day**	**Year**

DESIGNATED FACILITY

17. Discrepancy

17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator) U.S. EPA ID Number
Facility's Phone:

17c. Signature of Alternate Facility (or Generator) Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name	Signature	Month	Day	Year
Erick Perez	Erick Perez	10	13	23

TRANSPORTER #1

NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Waste Tracking Number
NMVSOG	1	888-785-7225	D572422

GENERATOR

5. Generator's Name and Mailing Address
Texas Tech NASA
12600 Nasa Road
Las Cruces, NM 88012
Generator's Phone: 915-282-9243

Generator's Site Address (if different than mailing address)
Same

6. Transporter 1 Company Name
Advanced Chemical Transport, Inc. dba ACTenviro 5111 Hwy 213 Chaparral NM 88081
U.S. EPA ID Number: 006065102

7. Transporter 2 Company Name
U.S. EPA ID Number:

8. Designated Facility Name and Site Address
Rhino Environmental Services, Inc.
1.7 Miles North of TX/NM Stateline
Otero County, NM
Facility's Phone:
U.S. EPA ID Number: DP1051

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	
1.	Non-DOT Regulated Material Solid (Oil, Dirt, Sand, Absorbents and or Diesel Fuel)	1	CM	20	YD	
2.						
3.						
4.						

10/13/23 11:05 AM @ SAFETY CLEAN

13. Special Handling Instructions and Additional Information
Project Number 459400 Document #: D572422
1) TER: _____
Rhino Approval # _____ Bin #24310 cell 0

14. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Albert Soto | Signature | Month 10 | Day 13 | Year 23

INT'L

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

TRANSPORTER

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Adrian Villapando | Signature | Month | Day | Year

Transporter 2 Printed/Typed Name | Signature | Month | Day | Year

DESIGNATED FACILITY

17. Discrepancy

17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator) | U.S. EPA ID Number
Facility's Phone:

17c. Signature of Alternate Facility (or Generator) | Month | Day | Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name: Erick Perez | Signature | Month 10 | Day 13 | Year 23

169-BLC-O 5 11977 (Rev. 9/09)

TRANSPORTER #1

EPS SK SHIP# 241114944

Please print or type. Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: NMCESQG
2. Page 1 of: 1
3. Emergency Response Phone: 1-800-468-1760
4. Manifest Tracking Number: 008896610 SKS

5. Generator's Name and Mailing Address
Tetra Tech NASA
12600 NASA RD.
LAS CRUCES NM 88012-0000
Generator's Phone: 407-808-1414

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name: SAFETY-KLEEN SYSTEMS INC
U.S. EPA ID Number: TXR000081205

7. Transporter 2 Company Name: CLEAN HARBORS ENV SERVICES INC
U.S. EPA ID Number: MAD039322250

8. Designated Facility Name and Site Address
CLEAN HARBORS LAPORTE
500 INDEPENDENCE PARKWAY SOUTH
LA PORTE, TX 77571
Facility's Phone: 281-884-5500
U.S. EPA ID Number: TXD982290140

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
	1. NONE, NON HAZARDOUS, NON D.O.T. REGULATED, (GROUND WATER), N/A	5	~~BM~~ DF	1650	P	OUTS 6091
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
TSD:LT 92998034 TE336169 CSG:

24H EMERGENCY#800-468-1760-CH/SK/TFI-Contract retained by generator confers agency authority

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Robert Siegel
Signature:
Month: 10 Day: 10 Year: 23

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: David Pinoda
Signature:
Month: 10 Day: 10 Year: 2023

Transporter 2 Printed/Typed Name:
Signature:
Month: Day: Year:

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator)
U.S. EPA ID Number:
Facility's Phone:

18c. Signature of Alternate Facility (or Generator)
Month: Day: Year:

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1. 2. 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name:
Signature:
Month: Day: Year:

EPA Form 8700-22 (Rev. 12-17) Previous editions are obsolete.

DESIGNATED FACILITY TO GENERATOR

1) 9855811 /2654270

EPS SK SHIP# [illegible]14944

0088966105KS

Please print or type. Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	NMCESQG	1	1-800-468-1760	008896610 SKS

GENERATOR

5. Generator's Name and Mailing Address
Tetra Tech NASA
12600 NASA RD
LAS CRUCES NM 88012-0000
Generator's Phone: 407-808-1414

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name: SAFETY-KLEEN SYSTEMS INC — U.S. EPA ID Number: TXR000081205

7. Transporter 2 Company Name: CLEAN HARBORS ENV SERVICES INC — U.S. EPA ID Number: MAD039322250

8. Designated Facility Name and Site Address
CLEAN HARBORS LAPORTE
500 INDEPENDENCE PARKWAY SOUTH
LA PORTE, TX 77571
Facility's Phone: 281-884-5500
U.S. EPA ID Number: TXD982290140

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
	1. NONE, NON HAZARDOUS, NON D.O.T. REGULATED, (GROUND WATER), N/A	5	~~DM~~ TF BK	12,100 BK	P	OUTS 6091
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
TSD:LT 92998034 TE336169 CSG:

24H EMERGENCY#800-468-1760-CH/SK/TFI-Contract retained by generator confers agency authority on initial transporter to add or substitute additional transporters on generator's behalf.

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Robert Siegel — Signature: [signature] — Month: 10 Day: 10 Year: 23

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: David Pineda — Signature: [signature] — Month: 10 Day: 10 Year: 2023

Transporter 2 Printed/Typed Name: Brandon Kiamar — Signature: Brandon Kiamar — Month: 10 Day: 12 Year: 23

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name: Vanessa Arandaverde — Signature: [signature] — Month: 10 Day: 10 Year: 23

EPA Form 8700-22 (Rev. 12-17) Previous editions are obsolete. DESIGNATED FACILITY TO EPA's e-MANIFEST SYSTEM

1) 9855811/2654270

Clean Harbors LaPorte, LLC
500 Independence Parkway South
La Porte TX, 77571
TXD982290140
(281) 884-5500

CERTIFICATE OF DISPOSAL

Manifest Mailing Name :	Tetra Tech NASA		
Manifest Mailing Address:	12600 NASA RD Las Cruces, NM 88012	Job Address:	12600 NASA RD LAS CRUCES, NM 88012
Customer Contact Name:	Mrs Sarah Damphousse	Generator Contact Name:	
Sales Order #:	2305446137	Date Received:	10/16/2023
Generator EPA ID:	NMCESQG	Manifest #:	008896610SKS

Line #	Profile/Description	Disposal Date	Method of Disposal	Disposal Facility
1	2654270 Ground Water	10/29/2023	Incineration	Deer Park, TX Facility

Under Civil and Criminal Penalties of Law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.

Name: Nicole McClish

Title: Dir Environmental Application

Date: Saturday, January 06, 2024

Location WSTF New Mex Date 10 10 23

Project / Client NASA

212ig 06 01344

Cloudy Cold 65°

Robert Singer

5 45 TT

6 30 onsite meet with Robert Walker and Mike Flora gen review of testing and Maps

7 15 meet Trent Maz escort

7 30 drive for meet at Gate

7 45 at Gate with out Trent update from Sarah new ESD meet Time

7 55 TT update review with Sarah about meet

8 10 meet with Robert W and Mike P

8 25 at Gate with Trent

Rite in the Rain

Project / Client WSTF NASA

212.4 Pb 01344

Some Clouds Owind 75°

Robert Siegel / CH Hector B

RYR Adam R + Martin EF / SK Jamie P + Ryan C

8:45 crews onsite Pickup F150 Vac Truck Flat bed and Two Cabs 4 man crew 45 Box Truck and 5th person

9:30 All loaded Clean Harbor and Safety Clean

945 at First location Frac Tank # 265 890 Roll off # CHRT 24367

1015 First location completed

1030 at 2nd location gen Tank # 205 560 Roll off # CHRT 24310 Trent at Gate

1040 vac started Trent onsite

Project / Client WSTF NASA

212.4 Pb 01344

Some Clouds 70's Sunny

Robert Siegel 85° CH Hector B

RYR Adam R + Martin EF / SK Jaime M + Ryan C

1145 Tank empty start Transfer from vac Truck To Tote

1150 Tank # offsite TT

1220 Water in Totes completed

1240 Box Truck and Vac Truck offsite TT

1250 Transport at location load roll off

1310 Roll off offsite

1320 meet with Mike Flora gen review

1345 TT

Rite in the Rain

30

Location New Mex Date 10-10-23

Project / Client WSTF NASA

212.9 06 01344

Some Clouds 0 To Sky 90°

Robert Siegel ATC Admin V

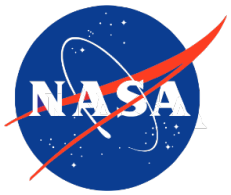
CH Hector B/RYR Adam R + Martin E F/SK Tyler H James M Ryan C

1350 2nd frac Tank pickup outside gate

1400 2nd Frac Tank loaded and Traveling

1430 Break

National Aeronautics and Space Administration



PFAS Site Investigation Well Completion Summary Report

for Wells 100-001-GW and 600C-005-GW

March 2024

Revised January 2025

NM8800019434

NASA Johnson Space Center White Sands Test Facility

PFAS Well Completion Summary Report

March 2024

Revised January 2025

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____ _____

Timothy J. Davis
Chief, NASA Environmental Office

Date

National Aeronautics and Space Administration

Johnson Space Center
White Sands Test Facility
12600 NASA Road
Las Cruces, NM 88012
www.nasa.gov/centers/wstf

www.nasa.gov

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List of Acronyms

AOPC(s)	Area(s) of Potential Concern
bgs	Below Ground Surface
Cascade	Cascade Environmental
CFR	Code of Federal Regulations
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
ft	Foot/feet
gal	Gallon(s)
GMP	Groundwater Monitoring Plan
gpm	Gallons Per Minute
HDPE	High-Density Polyethylene
IDW	Investigation Derived Waste
mi	Mile(s)
NAD83	North American Datum 1983
NASA	National Aeronautics and Space Administration
NAVD83	North American Vertical Datum 1983
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
PFAS	Per- and Polyfluoroalkyl Substances
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SI	Site Investigation
Tetra Tech	Tetra Tech, Inc
WSTF	White Sands Test Facility

1.0 Introduction and Purpose

As part of an agency-wide effort to identify areas of potential concern (AOPCs) at the National Aeronautics and Space Administration (NASA) centers/facilities, per- and polyfluoroalkyl substances (PFAS) a preliminary assessment was conducted at Johnson Space Center White Sands Test Facility (WSTF) in 2022 by Tetra Tech, Inc (Tetra Tech) for NASA. The ensuing WSTF Preliminary Assessment Report (NASA, 2023a) identified 12 AOPCs for further PFAS investigation at WSTF.

- AOPC 1 – Building 112 Former Fire Station
- AOPC 2 – Building 104 WSTF Fire Station
- AOPC 3 – Former 100 Area Burn Pit, Overflow Area, and Fire Department Training Area
- AOPC 4 – 100 and 600 Area Sewage Lagoons and Hazardous Waste Management Unit (HWMU)
- AOPC 5 – 200 Area Laboratories, Sewage Lagoons, and Former Burn Pits
- AOPC 6 – 700 Area Landfill
- AOPC 7 – Bureau of Land Management Area Soil Pile
- AOPC 8 – Groundwater Treatment Systems
- AOPC 9 – Various Current and Former Wastewater Impoundments in the 300/400 Areas and second Tracking and Data Relay Satellite System (TDRS) (Solid Waste Management Unit [SWMU] 33, SWMU 48, and Area of Concern 51)
- AOPC 10 – Building 114 Former Photo Shop
- AOPC 11 – Jet Propellant Remote Test Areas
- AOPC 12 – Building 634 Pesticide Storage

These areas were selected based on known historical and suspected use of aqueous film-forming foam, other sources of PFAS, and PFAS data previously collected at WSTF. From the preliminary assessment report, a WSTF PFAS Site Investigation Sampling and Analysis Plan (SAP) (Field Sampling Plan/Quality Assurance Project Plan) (NASA, 2023b) was developed. As part of the site investigation (SI), two conventional monitoring wells were installed. One monitoring well was installed at AOPC 3 and the other at AOPC 11. The well identification numbers proposed in the SAP (A03-MW-01 and A11-MW-01) were renamed as 100-001-GW and 600C-005-GW respectively to align with the WSTF well naming convention.

Well 100-001-GW was installed at AOPC 3 to evaluate groundwater underlying the former 100 Area Burn Pit, Overflow Area, and former 100 Area Fire Department Training Area. The well was installed within the footprint of the former 100 Area Burn Pit and downgradient of the former 100 Area Fire Department Training Area. Well 600C-005-GW was installed at AOPC 11, downgradient and to the west of the Jet Propellant (JP) Remote Test Areas to evaluate groundwater underlying the area.

Groundwater data from monitoring wells 100-001-GW and 600C-005-GW will be incorporated into the NASA WSTF Groundwater Monitoring Plan (GMP) as indicated in NASA's response to NMED's Approval with Modifications of the 2021 GMP Update (NASA, 2021). Additionally, data from wells 100-001-GW and 600C-005-GW will further characterize the hydro-stratigraphy in the area and monitor groundwater elevation data.

This report provides a summary of field activities associated with the drilling and installation of groundwater monitoring wells 100-001-GW and 600C-005-GW. Site field activities were conducted from July 17 through August 15, 2023, September 12-14, 2023, and October 10, 2023. A report documenting the entire PFAS site investigation conducted by Tetra Tech during these dates will be submitted as a courtesy under separate cover once the final report has been received by NASA.

1.1 Location and Description

1.2 Facility

WSTF is in Doña Ana County, New Mexico, 18 miles (mi) northeast of Las Cruces, New Mexico, and 65 mi north of El Paso, Texas (Figure 1.1). Construction at WSTF was initiated in 1964 at a location within the White Sands Missile Range adjacent to the San Andres Mountains. Through an inter-agency agreement between the Army and NASA (Department of Defense, 1982), the Department of the Army provided NASA use of the land currently occupied by WSTF. Access to the facility is provided by a paved road that intersects U.S. Highway 70 one mi west of Organ, New Mexico, and leads 6 mi north to WSTF.

1.3 Well Locations

1.3.1 100-001-GW

Well 100-001-GW is located in the SE1/4 of the NW1/4 of Section 2, Township 21 S, Range 3 E, within the WSTF 100 Area (Figure 1.2). The 100 Area, developed in 1964, is in the southern portion of the WSTF industrial area. Buildings and structures within the 100 Area include office facilities for administrative, management, and engineering activities, an emergency center (fire department and clinic), security facilities, heavy equipment maintenance and related facilities, vehicle maintenance facilities, construction facilities, warehouse facilities, trade/fabrication shops, storage buildings, waste accumulation areas, a fuel station, a cafeteria, a fitness center, and an auditorium (NASA, 2016b).

1.3.2 600C-005-GW

Well 600C-005-GW is located in the SE1/4 of the SW1/4 of Section 6, Township 21 S, Range 3 E, within the WSTF 600 Area (Figure 1.3). The 600 Area was developed in the mid-1960s. The industrial portion of the 600 Area is located adjacent to the west of the 100 Area; however, many of the buildings and support structures are in the portion of WSTF that extends approximately 3 mi toward the western boundary of the Facility, which encompasses the 600 Area (NASA, 2016a). The 600 Area is currently used for support of the WSTF water supply system, the groundwater monitoring well network, and the groundwater remediation systems (Plume Front Treatment System and Mid-plume Interception and Treatment System).

2.0 Regulatory Timeline

The wells were installed in accordance with Resource Conservation Recovery Act (RCRA) Permit (NMED, 2023a) and the Abbreviated Drilling Work Plan (NASA, 2023c) approved by NMED with adjustments to the proposed well depths based upon lithology and field observations. Permits to drill for non-consumptive purposes were submitted to the New Mexico Office of the State Engineer and approved prior to drilling activities (Appendix A).

The time to complete both wells was estimated at approximately five months from initiation of the first borehole through the receipt and validation of groundwater samples collected using the newly installed sampling systems. The original due date for the completion reports was February 28, 2024 (NMED, 2023b). Due to delays in subcontractor document delivery, NASA submitted a request for extension of time on January 18, 2024 (NASA, 2024) to extend the due date for the well completion reports to March 29, 2024. NMED approved the request for extension on February 6, 2024 (NMED, 2024b).

3.0 Drilling

Drilling at 100-001-GW (Figure 1.2) began on August 6, 2023, and the borehole was completed to the total depth of 345 feet (ft) below ground surface (bgs) on August 13, 2023. Drilling at 600C-005-GW (Figure 1.3) began on July 25, 2023, and the borehole was completed to the total depth of 419 ft bgs on July 31, 2023.

3.1 Drilling Method

Cascade Environmental (Cascade), a New Mexico licensed drilling contractor, was subcontracted to perform drilling services at WSTF to install the two monitoring wells. The boreholes were drilled using the air rotary casing advance drilling method. The system was equipped with a cyclone for the collection of drill cuttings. No water was used during drilling, well construction and development.

Grab samples of drill cuttings were collected as they came off the shaker table and compiled over 10-ft intervals. Lithologies were determined by washing and screening the recovered cuttings, and representative samples were placed in chip trays for later, detailed characterization using a binocular microscope. No groundwater samples were able to be collected during drilling due to the use of drilling mud.

3.2 Lithology

Soil lithology was recorded at each borehole during drilling and soil samples were collected at selected depths from each borehole for laboratory analysis of PFAS, in accordance with the SAP (NASA, 2023b). The lithology was recorded to supplement the conceptual site model and to guide the depth and placement of well screens. At 100-001-GW, the lithology generally consisted of unconsolidated sediments (sand and gravel) until andesite bedrock (Orejon Andesite) was encountered at approximately 100 ft bgs, consistent with previously recorded geologic information for this area. At well 600C-005-GW, the lithology was composed of unconsolidated sediments (sand, gravel, and silty clay) and is consistent with previously recorded geologic information for this area. Boring logs for 100-001-GW and 600C-005-GW are provided in Appendix A.

4.0 Well Construction

4.1 Well Design and Completion

Both wells were constructed with nominal 4-inch inner diameter Schedule 80 polyvinyl chloride casing and 0.020-inch slotted stainless-steel well screen and riser pipe. For well 100-001-GW, a 20-ft length of screen was used (installed from 230 to 250 ft bgs) and for well 600C-005-GW, a 15-ft length of screen was used (installed from 394 to 409 ft bgs). The difference in screen lengths was to allow greater recharge in 100-001-GW because of anticipated lower hydraulic conductivity in 100 Area.

For both wells, a 10/20 silica sand filter pack was installed from the bottom of the borehole to approximately 10~~7~~ ft above each monitoring well screen with an additional 3 ft of 30/65 fine silica sand. A 7~~5~~-ft bentonite seal composed of bentonite chips was placed above the filter pack and allowed to hydrate before grouting the annulus with bentonite-cement grout slurry to grade for well 600C-005-GW. A 5-ft bentonite seal composed of bentonite chips was placed above the filter pack and allowed to hydrate before grouting the annulus with bentonite-cement grout slurry to grade for well 100-001-GW. The surface completions for both wells consisted of stick-up risers inside stainless steel protective casings with locking caps and a Type II Portland Cement surface seal. As-built well construction diagrams are provided in Appendix A.

4.2 Screen Placement Justification

The locations of the screens were selected based upon lithology and field observations. For 100-001-GW, a clearly defined subsurface aquifer (water table) was not encountered at approximately 180 ft bgs as anticipated, and drilling continued to 345 ft bgs for lithologic logging purposes. The borehole was left open overnight and groundwater recharge occurred through fractures in the bedrock. The static water level was measured at 185 ft bgs after drilling. A review of the lithologic logs determined that a screen interval of 230 to 250 ft bgs would straddle the most productive water bearing fractures.

At 600C-005-GW, the water table was initially identified at approximately 398 ft bgs and 15 ft well screen was placed at 394 to 409 ft bgs, to straddle the top of the water table. After installation, the water table was measured at 382 ft bgs due to hydraulic pressure.

5.0 Well Development

Well development was conducted by Cascade using surging, bailing, and pumping procedures to remove sediments that accumulated in the well during the installation process. During well development, a minimum of three well volumes were removed from each well and groundwater parameters (pH, specific conductivity, temperature, and turbidity) were measured until the parameter readings did not vary by more than 10 percent.

Following completion of the well, a Grundfos®[1] electric pump was used to develop each well. The pump was decontaminated prior to deployment into each well. Well development operations at 600C-005-GW began on August 9, 2023 and were completed on August 10, 2023. A total of 300 gallons of groundwater were pumped from 600C-005-GW during development activities. Well development operations at 100-001-GW began on August 13, 2023 and were completed on August 15, 2023. A total of 217 gallons of groundwater was pumped from 100-001-GW during development activities. Well development data sheets are provided in Appendix A. Decontamination fluids and developed groundwater were containerized and disposed of as investigation-derived waste (IDW).

6.0 Groundwater Sampling

NASA selected a QED Environmental Systems, low-flow, purgeable bladder pump sampling system for installation in each well. Each newly installed well was fitted with a dedicated PFAS-free bladder pump (QED Well Wizard®[2] model P1101HM-Z) with air and discharge ports and dedicated high-density polyethylene (HDPE) tubing. The bladder pump sample inlets were set at the midpoint of each well screen. A pump specification sheet is included in Appendix A.

Groundwater samples were collected from well both wells on September 13, 2023 by Tetra Tech and analyzed by Pace Analytical Services. Groundwater sampling data sheets are provided for both wells in Appendix A. All analytical data were validated in accordance with the logic provided in the Department of Defense (DOD) *General Data Validation Guidelines, Revision 1* (DOD, 1982) and the *Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual Table B-15* (DOD, 2020). The laboratory analytical results and data validation reports are provided in Appendix B.

[1] Grundfos is a registered trademark of Grundfos Holding A/S.
[2] Well Wizard is a registered trademark of Q.E.D Environmental Systems, Inc.

7.0 Survey

Wells 100-001-GW and 600C-005-GW were surveyed for top-of-casing and ground surface elevations and spatial coordinates by Libbin Underwood Engineering & Surveying, a New Mexico-licensed surveyor on September 15, 2023. Coordinates for well locations are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983 (NAD83). Vertical data for well elevations are referenced the North American Vertical Datum 1988 (NAVD88). The well surveyor report is included in Appendix C.

8.0 Investigation-Derived Waste Management, Characterization, and Disposal

In accordance with the PFAS SI SAP (NASA, 2023b), soil and aqueous IDW consisting of drill cuttings, purge water, well development water, and decontamination water were containerized during the SI. Approximately 40 cubic yards (yd^3) of soil IDW (drill cuttings) were generated during drilling activities and containerized into two 25-yd^3 roll-off containers. Approximately 1,650 gallons of aqueous IDW were generated and containerized in two water storage frac tanks. Of that, approximately 525 gallons were generated during the drilling, development, and purging of the two newly installed monitoring wells. The remaining volume was generated during the SI sampling activities.

Soil and aqueous samples collected from the IDW storage containers were analyzed for PFAS, N-Nitrosodimethylamine, and waste characterization parameters required by the disposal facilities, including toxicity characteristic leaching procedure volatile organic compounds, semi-volatile organic compounds, metals, and diesel and gasoline range organics.

All soil and aqueous IDW were transported off-site for disposal by Clean Harbors Environmental Services. The soil IDW was found to be non-detect for PFAS and was transported via Clean Harbors Environmental Services to the Rhino Environmental Services facility in Otero County, New Mexico for disposal. The aqueous IDW showed detections of PFAS and was transferred from the water storage frac tanks into five 330-gallon HDPE totes (approximately 12,100 pounds of bulk weight) and transported via Clean Harbors Environmental Services to the Clean Harbors facility in LaPorte, Texas for incineration. IDW management documentation is included in Appendix D. Non-hazardous contact wastes and debris (e.g., disposable personal protective equipment) were managed in accordance with the 20.9 New Mexico Administrative Code (NMAC), Solid Waste Regulations. Petroleum-contaminated hazardous debris associated with equipment maintenance and spill prevention were managed in accordance 20.4.1.300 NMAC and 40 CFR 262.17, and properly treated and disposed of at a permitted Resource Conservation and Recovery Act Treatment, Storage, and Disposal Facility. All wastes were managed in accordance with NASA procedures and applicable federal and ~~,~~ state regulations.

9.0 References

Adoption of 40 CFR Part 262, Environmental Improvement Board, 20.4.1.300 NMAC (12-1-18).

Department of Defense (DOD). (1982, February 24). *Agreement Between the Department of Defense and The National Aeronautics and Space Administration for Operation of the NASA White Sands Test Facility at White Sands Missile Range, New Mexico Contract No. DACA47-9-75-145*. White Sands Missile Range, NM.

DOD. (2020, May). *Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15*. Environmental Data Quality Workgroup. Washington, DC.

Department of Defense/Department of Energy (DOE). (2021). Consolidated Quality Systems Manual (QSM) for Environmental Laboratories. DOD Quality Systems Manual Version 5.4. Washington, DC.

NASA Johnson Space Center White Sands Test Facility. (2016a, July 7). *Abbreviated Investigation Work Plan for the 600 Area Perched Groundwater.* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2016b, August 30). *Response to Approval with Modifications SWMUs 1, 3, and 15 Investigation Report (100 Area Burn Pit, 100 Container Storage Area, and 600 Area Burn Pit).* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2021, December 21). *Response to Approval with Modifications of NASA WSTF Groundwater Monitoring Plan Update for 2021*. Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2023a, July) *Final Per- and Polyfluoroalkyl Substances Preliminary Assessment Report for White Sands Test Facility.* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2023b, July) *Draft Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) Per- and Polyfluoroalkyl Substances Site Inspection for White Sands Test Facility.* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2023c, June*) NASA Johnson Space Center White Sands Test Facility Abbreviated Drilling Work Plan for the Installation of Monitoring Wells in the WSTF 100 and 600 Areas. Final.* Las Cruces, NM.

NASA Johnson Space Center White Sands Test Facility. (2024, January 18). *Request for Extension of Time for Submittal of the Report Documenting the Well Installation and Sampling of Well A03-MW-01 and A11-MW-01.* Las Cruces, NM.

NMED Hazardous Waste Bureau. (2023a, March 28). *RCRA Permit EPA ID # NM8800019434*. Santa Fe, NM.

NMED Hazardous Waste Bureau. (2023b, May 23*). Approval with Modifications Abbreviated Drilling Work Plan for the Installation of Monitoring Wells in the WSTF 100 and 600 Areas.* Santa Fe, NM.

NMED Hazardous Waste Bureau. (2024, February 6). *Request for Extension of Time for Submittal of the Report Documenting the Well Installation and Sampling of Well A03-MW-01 and A11-MW-01.* Santa Fe, NM.

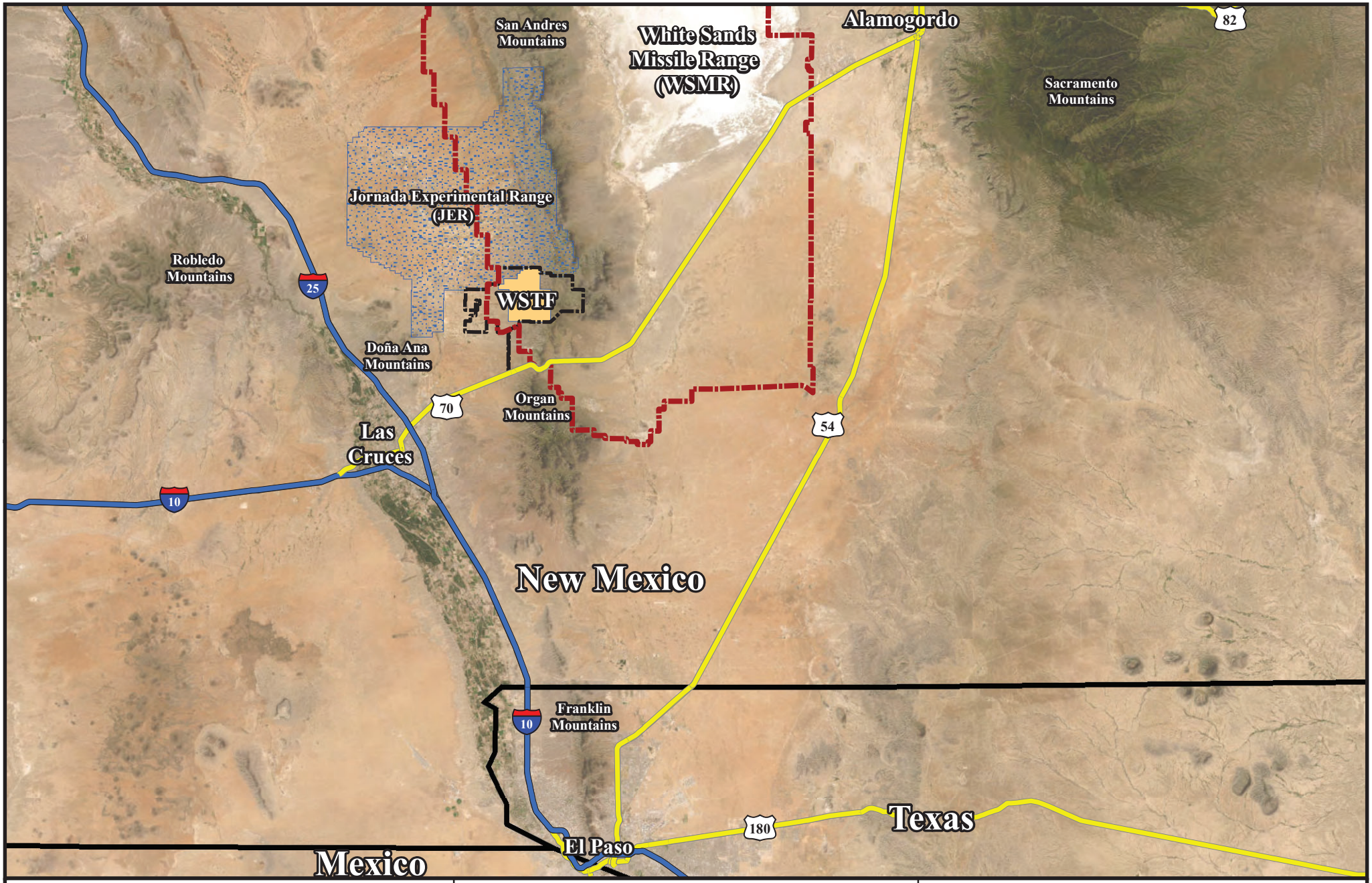
Solid Waste, New Mexico Environmental Improvement Board, 20.9 NMAC (8-2-07).

Tetra Tech. (2024, January – Internal Draft). *Per- and Polyfluoroalkyl Substances Site Inspection Report for White Sands Test Facility.* Pittsburgh, PA.

Figures

Figure 1.1 **WSTF Location Map**

(SEE NEXT PAGE)



WSTF Location Map

NASA Johnson Space Center
White Sands Test Facility
Las Cruces, New Mexico

Coordinate System:
NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet

G:\Projects\environmental\PMR\2023\1stQuarter

- WSMR Boundary
- WSTF Boundary
- WSTF Industrial Area
- Jornada Experimental Range (JER)

1 in = 12 miles

Miles
0 6 12 24

N
W E
S

March 2024

Figure 1.2 **100-001-GW Well Location Map**

(SEE NEXT PAGE)



N
W E
S

1 in = 233 ft

Ft
0 50 100 200

March 2024

Prepared by: srees

Monitoring Well Location

Well 100-001-GW Location

NASA Johnson Space Center
White Sands Test Facility Las Cruces, New Mexico

Coordinate System:
NAD 1983 HARN StatePlane New Mexico Central FIPS 3002 Feet

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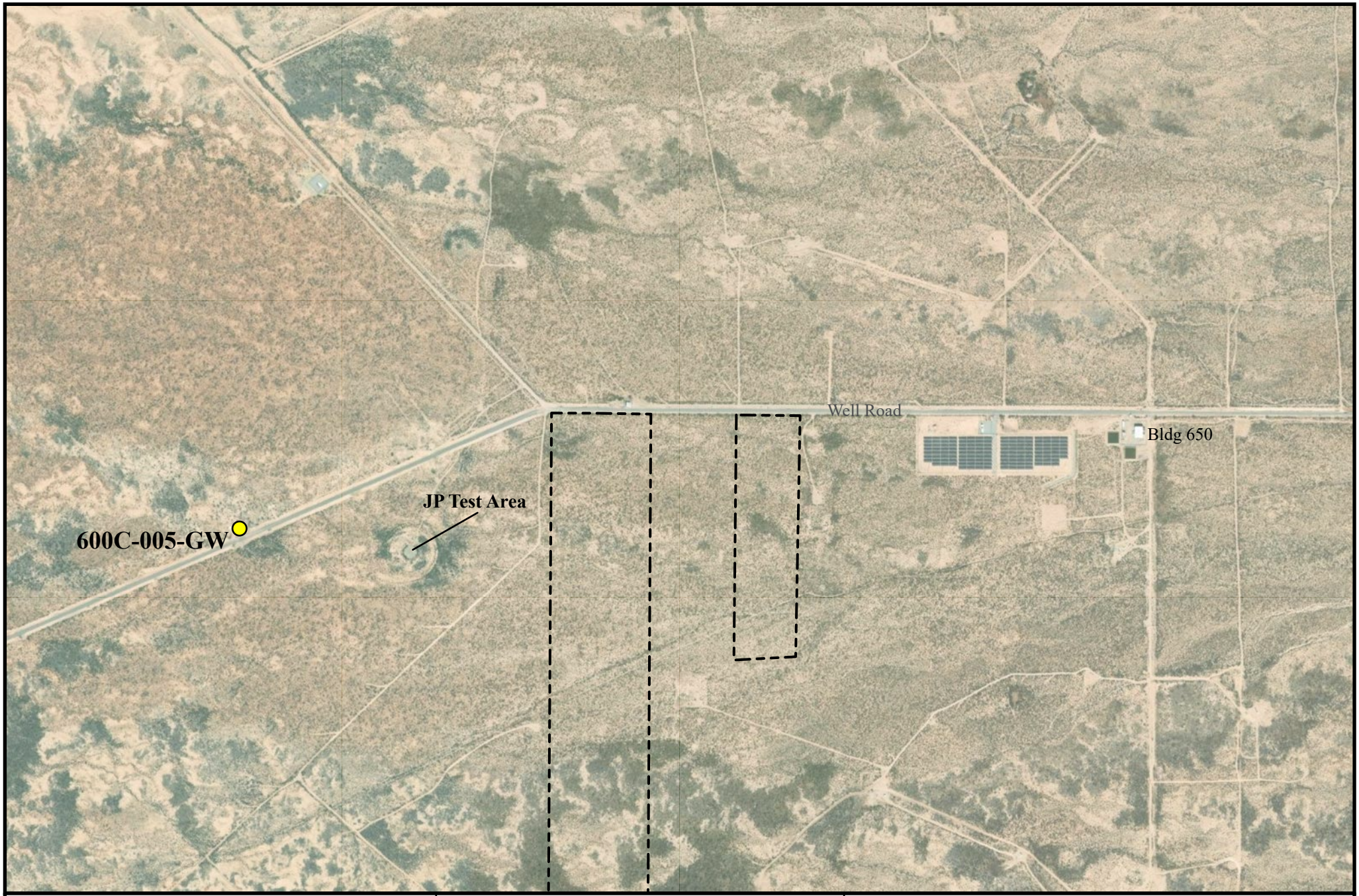
Figure 1.3 600C-005-GW Well Location Map

(SEE NEXT PAGE)



1 in = 1,000 ft

0 250 500 1,000 Ft

N
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March 2024

Prepared by: srees

Monitoring Well Location

WSTF Boundary

Well 600C-005-GW Location

NASA Johnson Space Center
White Sands Test Facility Las Cruces, New Mexico

Coordinate System:
NAD 1983 HARN StatePlane New Mexico Central FIPS 3002 Feet

G:\Projects\environmental\PFOA_PFOS\TetraTech_PFAS\TT_Well_Locations\

Appendix A
Monitoring Well Installation and Sampling Documentation

Mike A. Hamman, P.E.
STATE ENGINEER

District 4 Office
1680 Hickory Loop Suite J
Las Cruces, NM 88005-6598
Phone: (575) 524-6161
Fax: (575) 524-6160

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER

Trn Nbr: 747701
File Nbr: LRG 18480

Jun. 13, 2023

NASA JOHNSON SPACE CENTER WHITE SANDS TEST FACILITY
TIMOTHY DAVIS
P.O. BOX 20
LAS CRUCES, NM 88004

Greetings:

Your approved copy of the above numbered permit to drill a well for non-consumptive purposes is enclosed. You must obtain an additional permit if you intend to use the water. It is your responsibility to provide the contracted well driller with a copy of the permit that must be made available during well drilling activities.

Carefully review the attached conditions of approval for all specific permit requirements.

* If use of this well is temporary in nature and the well will be plugged at the end of the well usage, the OSE must initially approve of the plugging. If plugging approval is not conditioned in this permit, the applicant must submit a Plugging Plan of Operations for approval prior to the well being plugged. The Plugging Record must be properly completed and submitted to the OSE within 30 days of the well plugging.
* If the final intended purpose and condition requires a well ID tag and meter installation, the applicant must immediately send a completed meter report form to this office.
* The well record and log must be submitted within 30 days of the completion of the well or if the attempt was a dry hole.
* This permit expires and will be cancelled if no well is drilled and/or a well log is not received by the date set forth in the conditions of approval.

Appropriate forms can be downloaded from the OSE website www.ose.state.nm.us.

Sincerely,

Alice Amend
Water Resources Professional
(575)524-6161

Enclosure
explore

File No. LRG-18480

4-26038 SG

NEW MEXICO OFFICE OF THE STATE ENGINEER

WR-07 APPLICATION FOR PERMIT TO DRILL

A WELL WITH NO WATER RIGHT

(check applicable box):

For fees, see State Engineer website: http://www.ose.state.nm.us/

Purpose:	☐ Pollution Control And/Or Recovery	☐ Ground Source Heat Pump
☐ Exploratory Well*(Pump test)	☐ Construction Site/Public Works Dewatering	☐ Other(Describe):
☒ Monitoring Well	☐ Mine Dewatering	

A separate permit will be required to apply water to beneficial use regardless if use is consumptive or nonconsumptive.

*New Mexico Environment Department-Drinking Water Bureau (NMED-DWB) will be notified if a proposed exploratory well is used for public water supply.

☐ Temporary Request - Requested Start Date: 7-1-2023 Requested End Date: 8-1-2023

Plugging Plan of Operations Submitted? ☐ Yes ☒ No

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STATE ENGINEER OFFICE
LAS CRUCES, NEW MEXICO

1. APPLICANT(S)

Name: Cascadr Drilling L.P.	Name: NASA Johnson Space Center, White Sands Test Facility
Contact or Agent: check here if Agent ☑ Mark Green	Contact or Agent: check here if Agent ☐ Tomothy Davis
Mailing Address: 3621 HWY 47	Mailing Address: P.O. Box 20
City: Peralta	City: Las Cruces
State: NM Zip Code: 87042	State: NM Zip Code: 88004
Phone: ☐ Home ☒ Cell Phone (Work): 505.991.3511	Phone: 575.524.5024 ☒ Home ☐ Cell Phone (Work):
E-mail (optional): mgreen@cascade-env.com	E-mail (optional): Timothy.j.davis@nasa.gov

FOR OSE INTERNAL USE Application for Permit, Form WR-07, Rev 07/12/22

File No.: LRG-18480	Trn. No.: 747701	Receipt No.:
Trans Description (optional): LRG-18480-POD2&3		
Sub-Basin: LRO	PCW/LOG Due Date: 6-12-2024	

2. WELL(S) Describe the well(s) applicable to this application.

Location Required: Coordinate location must be reported in NM State Plane (NAD 83), UTM (NAD 83), or Latitude/Longitude (Lat/Long - WGS84).
District II (Roswell) and District VII (Cimarron) customers, provide a PLSS location in addition to above.

☒ NM State Plane (NAD83) (Feet) ☐ UTM (NAD83) (Meters) ☐ Lat/Long (WGS84) (to the nearest 1/10th of second)
☐ NM West Zone ☐ Zone 12N
☐ NM East Zone ☐ Zone 13N
☐ NM Central Zone

Well Number (if known):	X or Easting or Longitude:	Y or Northing or Latitude:	Provide if known: -Public Land Survey System (PLSS) (*Quarters or Halves , Section, Township, Range*) OR - Hydrographic Survey Map & Tract; OR - Lot, Block & Subdivision; OR - Land Grant Name
A03-MW-01 LRG-18480-POD2	~~548355~~ as AA	per email ~~1530396~~ AA	32°30'26.44"N, 106°36'26.85"W Sec. 2, Tw3.21S, R.03E
A11-MW02 LRG-18480-POD3	~~551331~~ AA	~~1539339~~ AA	32°30'54.35"N, 106°40'26.91"W Sec. 6, Tw3.21S, R.03E

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LAS CRUCES, NEW MEXICO

NOTE: If more well locations need to be described, complete form WR-08 (Attachment 1 – POD Descriptions)
Additional well descriptions are attached: ☒ Yes ☐ No **If yes, how many** 2

Other description relating well to common landmarks, streets, or other:

A03-MW01 is 210' 15' of 4" SS screen .020 A11-MW-02 is 475' 20' of 4" SS screen

Well is on land owned by: NASA Johnson Space Center, White Sands Test Facility

Well Information: NOTE: If more than one (1) well needs to be described, provide attachment. Attached? ☒ Yes ☐ No
If yes, how many 2

Approximate depth of well (feet): 205	Outside diameter of well casing (inches): 4.5
Driller Name: Cascade Drilling L.P.	Driller License Number: WD1664

3. ADDITIONAL STATEMENTS OR EXPLANATIONS

A03-MW01 is 210' 15' of 4" SS screen .020 A11-MW-02 is 475' 20' of 4" SS screen .020 slot. both sanded with 12/20 sand and sealed with 3/8" bentonite grout. then grouted in place with 20% High solids bentonite grout to 20' and topped off with 20' of cement bentonite grout 6 gal of water with 3 to 5% bentonite powder mixed onsite. both welled will have 304SS screen and sumps then SCH 80 flush thread PVC to 2.5' above ground serfsace.

4. SPECIFIC REQUIREMENTS: The applicant must include the following, as applicable to each well type. Please check the appropriate boxes, to indicate the information has been included and/or attached to this application:

Exploratory:	**Pollution Control and/or Recovery:**	**Construction De-Watering:**	**Mine De-Watering:**
Is proposed well a future public water supply well? ☐ Yes ☐ NO If Yes, an application must be filed with NMED-DWB, concurrently. ☐ Include a description of the requested pump test if applicable.	☐ Include a plan for pollution control/recovery, that includes the following: ☐ A description of the need for the pollution control or recovery operation. ☐ The estimated maximum period of time for completion of the operation. ☐ The annual diversion amount. ☐ The annual consumptive use amount. ☐ The maximum amount of water to be diverted and injected for the duration of the operation. ☐ The method and place of discharge. ☐ The method of measurement of water produced and discharged. ☐ The source of water to be injected. ☐ The method of measurement of water injected. ☐ The characteristics of the aquifer. ☐ The method of determining the resulting annual consumptive use of water and depletion from any related stream system. ☐ Proof of any permit required from the New Mexico Environment Department. ☐ An access agreement if the applicant is not the owner of the land on which the pollution plume control or recovery well is to be located.	☐ Include a description of the proposed dewatering operation, ☐ The estimated duration of the operation, ☐ The maximum amount of water to be diverted, ☐ A description of the need for the dewatering operation, and, ☐ A description of how the diverted water will be disposed of. **Ground Source Heat Pump:** ☐ Include a description of the geothermal heat exchange project, ☐ The number of boreholes for the completed project and required depths. ☐ The time frame for constructing the geothermal heat exchange project, and, ☐ The duration of the project. ☐ Preliminary surveys, design data, and additional information shall be included to provide all essential facts relating to the request.	☐ Include a plan for pollution control/recovery, that includes the following: ☐ A description of the need for mine dewatering. ☐ The estimated maximum period of time for completion of the operation. ☐ The source(s) of the water to be diverted. ☐ The geohydrologic characteristics of the aquifer(s). ☐ The maximum amount of water to be diverted per annum. ☐ The maximum amount of water to be diverted for the duration of the operation. ☐ The quality of the water. ☐ The method of measurement of water diverted. ☐ The recharge of water to the aquifer. ☐ Description of the estimated area of hydrologic effect of the project. ☐ The method and place of discharge. ☐ An estimation of the effects on surface water rights and underground water rights from the mine dewatering project. ☐ A description of the methods employed to estimate effects on surface water rights and underground water rights. ☐ Information on existing wells, rivers, springs, and wetlands within the area of hydrologic effect.
Monitoring ☒ The reason and duration of the monitoring is required.			

ACKNOWLEDGEMENT

I, We (name of applicant(s)), Shawn Cain
Print Name(s)

affirm that the foregoing statements are true to the best of (my, our) knowledge and belief.

Applicant Signature

Applicant Signature

RECEIVED
2023 JUN -8 AM 10:49
STATE ENGINEER OFFICE
LAS CRUCES, NEW MEXICO

ACTION OF THE STATE ENGINEER

This application is:

☑ approved ☐ partially approved ☐ denied

provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare and further subject to the attached conditions of approval.

Witness my hand and seal this 13th day of June 20 23, for the State Engineer,

Mike A. Hamman, P.E, STATE ENGINEER, State Engineer

By BY Alice Amend
Water Resources Professional

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STATE OF NEW MEXICO
STATE ENGINEER

FOR OSE INTERNAL USE

Application for Permit, Form WR-07 Version 07/12/22

File No.: LRG-18480 Trn No.: 747701

NEW MEXICO STATE ENGINEER OFFICE
PERMIT TO EXPLORE

SPECIFIC CONDITIONS OF APPROVAL (Continued)

17-Q The State Engineer retains jurisdiction over this permit.

17-R Pursuant to section 72-8-1 NMSA 1978, the permittee shall allow the State Engineer and OSE representatives entry upon private property for the performance of their respective duties, including access to the ditch or acequia to measure flow and also to the well for meter reading and water level measurement.

LOG The Point of Diversion LRG 18480 POD2 must be completed and the Well Log filed on or before 06/12/2024.

LOG The Point of Diversion LRG 18480 POD3 must be completed and the Well Log filed on or before 06/12/2024.

ACTION OF STATE ENGINEER

Notice of Intention Rcvd:	Date Rcvd. Corrected:
Formal Application Rcvd: 06/08/2023	Pub. of Notice Ordered:
Date Returned - Correction:	Affidavit of Pub. Filed:

This application is approved provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare of the state; and further subject to the specific conditions listed previously.

Witness my hand and seal this 13 day of Jun A.D., 2023

Mike A. Hamman, P.E., State Engineer

By: Alice Amend

STATE OF NEW MEXICO STATE ENGINEER

Trn Desc: LRG 18480 POD2-3

File Number: LRG 18480
Trn Number: 747701

OFFICE OF THE STATE ENGINEER/INTERSTATE STREAM COMMISSION – LAS CRUCES OFFICE

OFFICIAL RECEIPT NUMBER: 4 - 26038 DATE: 6-8-23 FILE NO.:

TOTAL: $10.00 RECEIVED: Ten DOLLARS ☐ CASH: ☑ CHECK NO: Money Order - 28397724254

PAYOR: Cascade Drilling L.P ADDRESS: 3621 Hwy 47 CITY: Peralta

STATE: NM ZIP: 87042 RECEIVED BY: S. Garay

INSTRUCTIONS: Indicate the number of actions to the left of the appropriate type of filing. Complete the receipt information. **Original** to payor; **pink** copy to Program Support/ASD; and **yellow** copy for Water Rights. If a mistake is made, void the original and all copies and submit to Program Support/ASD as part of your daily deposit.

A. Ground Water Filing Fees

___	1.	Change of Ownership of Water Right	$ 2.00
___	2.	Application to Appropriate or Supplement Domestic 72-12-1 Well	$ 125.00
___	3.	Application to Repair or Deepen 72-12-1 Well	$ 75.00
___	4.	Application for Replacement 72-12-1 Well	$ 75.00
___	5.	Application to Change Purpose of Use 72-12-1 Well	$ 75.00
___	6.	Application for Stock Well/Temp. Use	$ 5.00
___	7.	Application to Appropriate Irrigation, Municipal, or Commercial Use	$ 25.00
___	8.	Declaration of Water Right	$ 1.00
___	9.	Application for Supplemental Non 72-12-1 Well	$ 25.00
___	10.	Application to Change Place or Purpose of Use Non 72-12-1 Well	$ 25.00
___	11.	Application to Change Point of Diversion and Place and/or Purpose of Use from Surface Water to Ground Water	$ 50.00
___	12.	Application to Change Point of Diversion and Place and/or Purpose of Use from Ground Water to Ground Water	$ 50.00
___	13.	Application to Change Point of Diversion of Non 72-12-1 Well	$ 25.00
___	14.	Application to Repair or Deepen Non 72-12-1 Well	$ 5.00
2	15.	Application for Test, Expl. Observ. Well	$ 5.00
___	16.	Application for Extension of Time	$ 25.00
___	17.	Proof of Application to Beneficial Use	$ 25.00
___	18.	Notice of Intent to Appropriate	$ 25.00

B. Surface Water Filing Fees

___	1.	Change of Ownership of a Water Right	$ 5.00
___	2.	Declaration of Water Right	$ 10.00
___	3.	Amended Declaration	$ 25.00
___	4.	Application to Change Point of Diversion and Place and/or Purpose of Use from Surface Water to Surface Water	$ 200.00
___	5.	Application to Change Point of Diversion and Place and/or Purpose of Use from Ground Water to Surface Water	$ 200.00
___	6.	Application to Change Point of Diversion	$ 100.00
___	7.	Application to Change Place and/or Purpose of Use	$ 100.00
___	8.	Application to Appropriate	$ 25.00
___	9.	Notice of Intent to Appropriate	$ 25.00
___	10.	Application for Extension of Time	$ 50.00
___	11.	Supplemental Well to a Surface Right	$ 100.00
___	12.	Return Flow Credit	$ 100.00
___	13.	Proof of Completion of Works	$ 25.00
___	14.	Proof of Application of Water to Beneficial Use	$ 25.00
___	15.	Water Development Plan	$ 100.00
___	16.	Declaration of Livestock Water Impoundment	$ 10.00
___	17.	Application for Livestock Water Impoundment	$ 10.00

All fees are non-refundable.

C. Well Driller Fees

___	1.	Application for Well Driller's License	$ 50.00
___	2.	Application for Renewal of Well Driller's License	$ 50.00

D. Reproduction of Documents

___ @ 0.25¢ $_____

___ Map(s) $_____

E. Certification $_____

F. *Credit Card Convenience Fee $_____

G. Other _____ $_____

Comments:

_____

_____

_____

_____

_____

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OFFICE OF THE STATE ENGINEER
1680 HICKORY LOOP, STE. J
LAS CRUCES, NM 88005-6598

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6/20/23

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Tetra Tech
661 Andersen Drive
Pittsburgh, PA 15320
Telephone: (412)-921-7090

WELL NUMBER: 600C-005-GW

CLIENT NASA
PROJECT NAME NASA WSTF PFAS SI
PROJECT NUMBER 112G09033
PROJECT LOCATION White Sands Test Facility, Las Cruces, NM
DATE STARTED 7/25/23 **COMPLETED** 7/31/23
GROUND ELEVATION 4416.08 ft **HOLE SIZE** 11.75" inches
DRILLING CONTRACTOR Cascade
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary with Casing Hammer (ARCH)
AT TIME OF DRILLING 398.00 ft / Elev 4018.08 ft
LOGGED BY Liz Heness **CHECKED BY** Marvin Dunbar
AT END OF DRILLING 382.00 ft / Elev 4034.08 ft
NOTES Northing : 168059.66 meters Easting: 460152.37 meters
AFTER DRILLING 382.00 ft / Elev 4034.08 ft

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						Casing Top Elev: 4419.03 (ft) Casing Type: Steel
			SP		POORLY GRADED SAND, (SP) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, trace gravel, no odor, some caliche	Type II Portland Cement; Bentonite Grout
10					10.0 4406.1	
			SP		POORLY GRADED SAND WITH GRAVEL, (SP) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, trace gravel, no odor, gravel dark to medium gray limestone	
20					20.0 4396.1	
			SP-SM		POORLY GRADED SAND WITH SILT, (SP-SM) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, no odor, some silty clay	
35						

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 11/14/24 11:53 - C:\USERS\TESS.RAYCOZZENS\ONEDRIVE - TETRA TECH, INC\DESKTOP\NASA WSTF PFAS_TRC.GPJ

Notes: Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983 (NAD83). Vertical data for well elevations are referenced in North American Vertical Datum, 1988 (NAVD88)

(Continued Next Page)

Tetra Tech
661 Andersen Drive
Pittsburgh, PA 15320
Telephone: (412)-921-7090

WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
35			SP-SM		POORLY GRADED SAND WITH SILT, (SP-SM) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, no odor, some silty clay *(continued)*	
60.0					4356.1	
			SM		SILTY SAND, (SM) light tannish brown to gray, poorly graded, subangular, fine grained, dry, loose, non plastic, no odor	

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(Continued Next Page)

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PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
75			SM		SILTY SAND, (SM) light tannish brown to gray, poorly graded, subangular, fine grained, dry, loose, non plastic, no odor *(continued)*	
80					80.0 4336.1	
			SM		POORLY GRADED SAND WITH CLAY, (SM) light tannish brown to gray, poorly graded, fine grained, dry, loose, non plastic, trace gravel, no odor, some limestone pebbles with caliche	
85						
90					90.0 4326.1	
			GW-GM		WELL GRADED GRAVEL WITH SILT, (GW-GM) light tannish brown to gray, well graded, fine to coarse grained, dry, loose, non plastic, no odor	
95						
100						
105						
110						
115						

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(Continued Next Page)

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WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
115			GW-GM		WELL GRADED GRAVEL WITH SILT, (GW-GM) light tannish brown to gray, well graded, fine to coarse grained, dry, loose, non plastic, no odor *(continued)*	
130					130.0 4286.1	
			CL-ML		LEAN CLAY, SILTY CLAY, (CL-ML) light tannish brown to gray, poorly graded, fine to medium grained, dry, loose, some sand, no odor, some clay pebbles	

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Notes: Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983 (NAD83). Vertical data for well elevations are referenced in North American Vertical Datum, 1988 (NAVD88)

(Continued Next Page)

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WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
155					LEAN CLAY, SILTY CLAY, (CL-ML) light tannish brown to gray, poorly graded, fine to medium grained, dry, loose, some sand, no odor, some clay pebbles *(continued)*	
160						
165						
170						
175			CL-ML			
180						
185						
190						
195						

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(Continued Next Page)

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WELL NUMBER: 600C-005-GW

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PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
195					LEAN CLAY, SILTY CLAY, (CL-ML) light tannish brown to gray, poorly graded, fine to medium grained, dry, loose, some sand, no odor, some clay pebbles *(continued)*	
200						
205						
210						
215			CL-ML			
220						
225						
230						
235						

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(Continued Next Page)

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PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
235						
			CL-ML		LEAN CLAY, SILTY CLAY, (CL-ML) light tannish brown to gray, poorly graded, fine to medium grained, dry, loose, some sand, no odor, some clay pebbles *(continued)*	
240					240.0 4176.1	
			ML		SILT, CLAYEY SILT, (ML) light tannish brown to gray, poorly graded, fine to coarse grained, dry, loose, some gravel, no odor, limestone clasts	
245						
250						
255						
260					260.0 4156.1	
			CL-ML		SILT, CLAYEY SILT, (CL-ML) light tannish brown to gray, poorly graded, fine to coarse grained, dry, loose, trace gravel, no odor	
265						
270						
275						

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(Continued Next Page)

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CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
275			CL-ML		SILT, CLAYEY SILT, (CL-ML) light tannish brown to gray, poorly graded, fine to coarse grained, dry, loose, trace gravel, no odor *(continued)*	

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Notes: Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983 (NAD83). Vertical data for well elevations are referenced in North American Vertical Datum, 1988 (NAVD88)

(Continued Next Page)

Tetra Tech
661 Andersen Drive
Pittsburgh, PA 15320
Telephone: (412)-921-7090

WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
315			CL-ML		SILT, CLAYEY SILT, (CL-ML) light tannish brown to gray, poorly graded, fine to coarse grained, dry, loose, trace gravel, no odor *(continued)*	
320					320.0 4096.1	
			GP-GC		GRAVELLY SILT WITH SAND, (GP-GC) light tannish brown to gray, poorly graded, subangular, fine to coarse grained, dry, loose, no odor, limestone clasts	
325						
330						
335						
340					340.0 4076.1	
			CL-ML		SILTY CLAY, (CL-ML) brown, poorly graded, subrounded, fine to coarse grained, moist, loose, no odor	
345						
350						
355						

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(Continued Next Page)

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661 Andersen Drive
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Telephone: (412)-921-7090

WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
355					SILTY CLAY, (CL-ML) brown, poorly graded, subrounded, fine to coarse grained, moist, loose, no odor *(continued)*	
			CL-ML			
360					360.0 4056.1	
					WELL GRADED GRAVEL WITH SILT AND SAND, (GP-GC) brown, well graded, angular, fine to coarse grained, moist, loose, no odor, limestone gravels	
365						
370						
375						Bentonite Holeplug
			GP-GC			
380					▼	Silica Sand 30/65 (381' to 384)
385						Silica Sand 10/20 (384' to 419')
390						
395						

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(Continued Next Page)

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WELL NUMBER: 600C-005-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
395						
			GP-GC		WELL GRADED GRAVEL WITH SILT AND SAND, (GP-GC) brown, well graded, angular, fine to coarse grained, moist, loose, no odor, limestone gravels *(continued)*	Stainless Steel 4"x15' Screen, Slot Size 0.020
	GB	WSTF-A11-SB0009-398.0-20230729				
400					400.0 4016.1	
					WELL GRADED GRAVEL WITH SILT AND SAND, (GP-GC) brown, well graded, angular, fine to coarse grained, saturated, soft, no odor, limestone gravels	Dedicated bladder pump: QED Well Wizard PFAS Free Model P1101H(M)-Z Pump inlet depth 401.5
405						
410			GP-GC			
415						10' Sump
					419.0 3997.1	

Bottom of borehole at 419.0 feet.

Notes: Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983 (NAD83). Vertical data for well elevations are referenced in North American Vertical Datum, 1988 (NAVD88)

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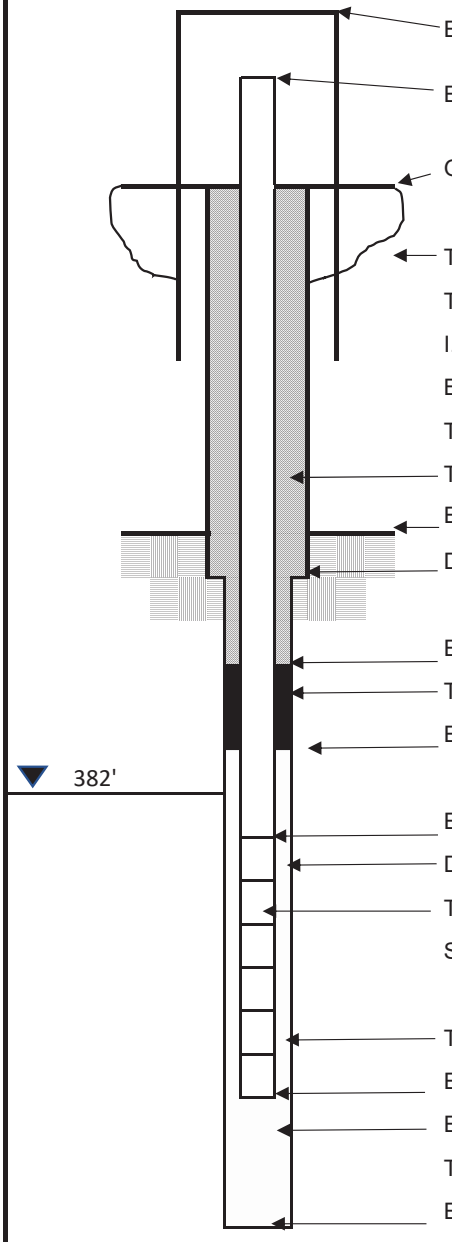
TETRA TECH

Well No. 600C-005-GW

MONITORING WELL CONSTRUCTION SHEET
OVERBURDEN / BEDROCK - STICK-UP

Project Name NASA WSTF SI	Drilling Co.: Cascade	Boring No.: 600C-005-GW
Project No: 112G09033	Driller: Gerry Woods	Date Completed:7/25-31/2023
Site Name: NASA PFAS SI	Drilling Method: Air Rotary with Casing Hammer	Northing:168059.66 meters
Geologist: Liz Heness	Dev. Method: Surge and Purge	Easting:460152.37 meters



Elevation / Height Top of Protective Casing:	--	+3'
Elevation / Height Top of Riser:	4419.03'	+2.95'
Ground Elevation:	4416.08'	
Type of Surface Seal:	Portland Cement Type II	
Type of Protective Casing:	304 Stainless Steel	
I.D. of Protective Casing:	4.5"	
Borehole Diameter:	11 3/4" (0-240')	
Type of Riser and I.D.:	SCH 80 PVC 4"	
Type of Backfill:	Bentonite grout	
Elevation / Depth Top of Rock:	--	--
Depth and Diameter of Surface Casing:	9 5/8" (240-420')	
Elevation / Depth of Seal:	404235.308'	37481'
Type of Seal:	Bentonite Holeplug	
Elevation / Depth Top of Filter Pack:	40352.08'	3814'
Elevation / Depth Top of Screen:	4022.08'	394'
Diameter of Hole in Bedrock:	N/A	
Type of Screen and I.D.:	Stainless Steel 4"	
Slot Size and Length:	0.020 15'	
Type of Filter Pack:	Silica Sand 10/20 and then 30/65 3' below seal	
Elevation / Depth Bottom of Screen:	4007.08'	409'
Elevation / Depth Bottom of Filter Pack:	3997.08'	419'
Type of Backfill Below Filter Pack:	10' sump below filter	
Elevation / Depth Bottom of Hole:	3997.08'	419'

Not To Scale

Note:
Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983
Vertical data for well elevations are referenced to the North American Datum 1988
QED Well Wizard PFAS Free bladder pump (Model P1101H(M)-Z) installed with pump inlet at a depth of 401.5 feet

Tetra Tech
661 Andersen Drive
Pittsburgh, PA 15320
Telephone: (412)-921-7090

WELL NUMBER: 100-001-GW

CLIENT NASA
PROJECT NAME NASA WSTF PFAS SI
PROJECT NUMBER 112G09033
PROJECT LOCATION White Sands Test Facility, Las Cruces, NM
DATE STARTED 8/6/23 **COMPLETED** 8/13/23
GROUND ELEVATION 4810.49 ft **HOLE SIZE** 9.625" inches
DRILLING CONTRACTOR Cascade
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary with Casing Hammer (ARCH)
AT TIME OF DRILLING ---
LOGGED BY Liz Heness **CHECKED BY** Marvin Dunbar
AT END OF DRILLING ---
NOTES Northing : 167180.70 meters Easting: 466407.77 meters
AFTER DRILLING 185.00 ft / Elev 4625.49 ft

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						Casing Top Elev: 4813.86 (ft) Casing Type: Steel
	GB	WSTF-A03-SB0001-000.5-20230802			POORLY GRADED GRAVEL WITH SAND, (GP) light tannish gray, poorly graded, fine to coarse grained, dry, loose, non plastic, no odor	Type II Portland Cement Bentonite Grout
5	GB	WSTF-A03-SB0001-0305-20230810	GP			
10	GB	WSTF-A03-SB0001-099.5-20230806			10.0 4800.5	
					POORLY GRADED GRAVEL WITH SAND, (GP) light tannish brown and gray, poorly graded, subrounded, fine to coarse grained, dry, loose, non plastic, no odor, clasts are a mix of limestone and quartz	
15			GP			
20					20.0 4790.5	
					POORLY GRADED GRAVEL WITH SAND, (GP) light tannish brown and gray, poorly graded, subrounded, fine to coarse grained, dry, loose, non plastic, no odor	
25			GP			
30					30.0 4780.5	
					POORLY GRADED GRAVEL WITH SAND, (GP) light tannish brown and gray, poorly graded, subrounded, fine to coarse grained, dry, non plastic, no odor	
35			GP			

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Notes: Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983 (NAD83). Vertical data for well elevations are referenced in North American Vertical Datum, 1988 (NAVD88)

(Continued Next Page)

Tetra Tech
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WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
35					POORLY GRADED GRAVEL WITH SAND, (GP) light tannish brown and gray, poorly graded, subrounded, fine to coarse grained, dry, non plastic, no odor *(continued)*	
40			GP			
45						
50					50.0 4760.5	
	GB	WSTF-A03-SB0001-5050.5-20230806			POORLY GRADED GRAVEL WITH SILT AND SAND, (GP) gray, poorly graded, subangular, fine grained, dry, loose, non plastic, no odor, clasts are light gray limestone, some caliche	
55						
60			GP			
65						
70						
75						

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Tetra Tech
661 Andersen Drive
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Telephone: (412)-921-7090

WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
75			GP		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP) gray, poorly graded, subangular, fine grained, dry, loose, non plastic, no odor, clasts are light gray limestone, some caliche *(continued)*	
80						
85						
90						
95	GB	SB0001-095.5-20230806				
100					100.0 4710.5 Gray, Bedrock, andesite	
105						
110						
115						

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(Continued Next Page)

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WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
115					Gray, Bedrock, andesite *(continued)*	
120					120.0 4690.5	
					Gray, Bedrock, chatter	
125						
130						
135						
140						
145						
150						
155						

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WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
155					Gray, Bedrock, chatter *(continued)*	
160					160.0 4650.5 Gray, Bedrock, red oxidation on chips	
165						
170					170.0 4640.5 Gray, Bedrock, white veins, reactive to HCL	
175						
180					180.0 4630.5 Gray, Bedrock, hard veining in chips	
185						
190					190.0 4620.5 Reddish gray, Bedrock, thin layers of red clay on andesite chips	
195						

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WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
195					Reddish gray, Bedrock, thin layers of red clay on andesite chips *(continued)*	
200					200.0 4610.5 Reddish gray, Bedrock, fine grained andesite, calcite rhoms	
205						
210						
215						Bentonite Holeplug
220					220.0 4590.5 Reddish gray, Bedrock, small amounts of calcite	Silica Sand 30/65 (217' to 220') Silica Sand 10/20 (220' to 260')
225						
230					230.0 4580.5 Reddish gray, Bedrock, reddish brown clay	Stainless Steel 4"x15' Screen, Slot Size 0.020
235						

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WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
235					Reddish gray, Bedrock, reddish brown clay *(continued)*	
240						Dedicated bladder pump: QED Well Wizard PFAS Free Model P1101H(M)-Z pump inlet depth 240'
245						
250					250.0 4560.5 Reddish gray, Bedrock, andesite chips and reddish brown clay	5' Sump
255						
260						Bentonite Holeplug
265						
270						
275						

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(Continued Next Page)

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WELL NUMBER: 100-001-GW

CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
275					Reddish gray, Bedrock, andesite chips and reddish brown clay *(continued)*	
280					280.0 4530.5	
					Reddish gray, Bedrock, andesite chips and reddish brown clay, small amount of water	
285						
290						
295						
300					300.0 4510.5	
					Reddish gray, Bedrock, andesite chips and reddish brown clay	
305						
310						
315						

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CLIENT NASA **PROJECT NAME** NASA WSTF PFAS SI

PROJECT NUMBER 112G09033 **PROJECT LOCATION** White Sands Test Facility, Las Cruces, NM

DEPTH (ft)	SAMPLE TYPE	SAMPLE ID	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
315					Reddish gray, Bedrock, andesite chips and reddish brown clay *(continued)*	
320						
325						
330						
335						
340						
345	GB	WSTF-A03-SB0001-345.5-20230807		345.0	Bottom of borehole at 345.0 feet. 4465.5	

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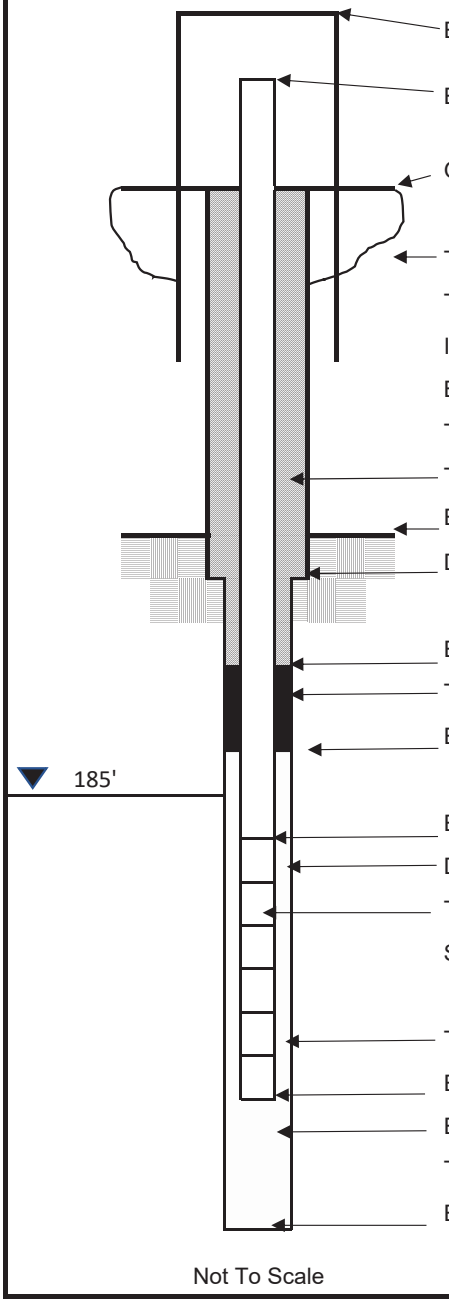
TETRA TECH

Well No. 100-001-GW

MONITORING WELL CONSTRUCTION SHEET
OVERBURDEN / BEDROCK - STICK-UP

Project Name NASA WSTF SI	Drilling Co.: Cascade	Boring No.: 100-001-GW
Project No: 112G09033	Driller: Gerry Woods	Date Completed: 8/6-13/2023
Site Name: NASA PFAS SI	Drilling Method: Air Rotary with Casing Hammer	Northing: 167180.70 meters
Geologist: Liz Heness	Dev. Method: Surge and Purge	Easting: 466407.77 meters



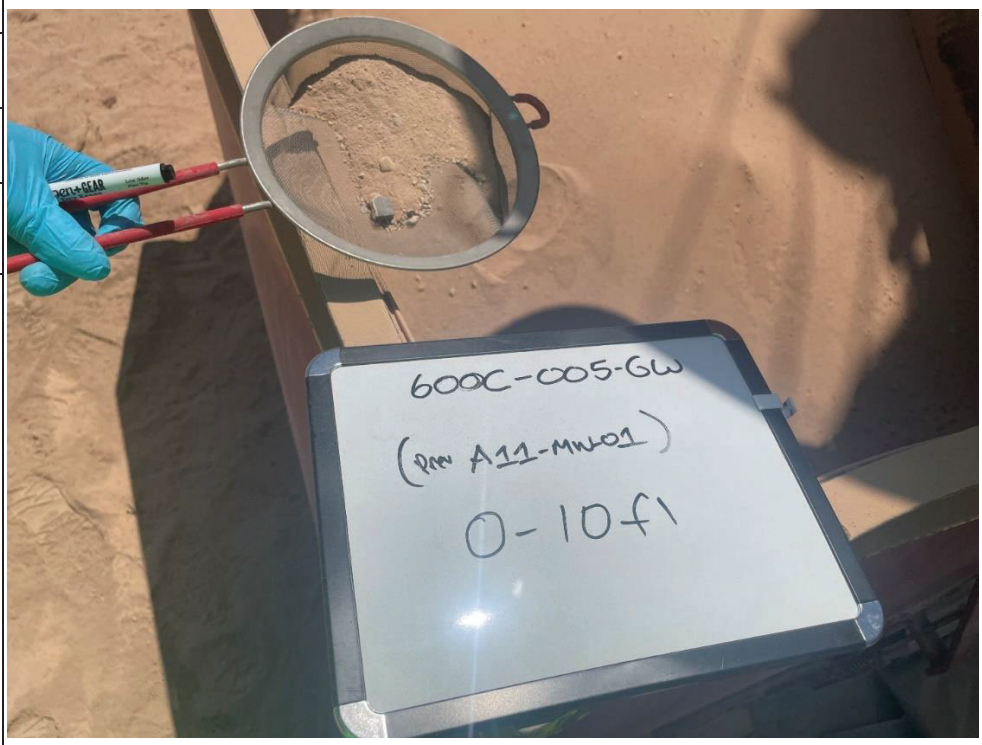
Elevation / Height Top of Protective Casing:	--	--
Elevation / Height Top of Riser:	4813.86'	+3.37'
Ground Elevation:	4810.49'	
Type of Surface Seal:	Portland Cement Type II	
Type of Protective Casing:	Steel	
I.D. of Protective Casing:	4.5"	
Borehole Diameter:	9 5/8" 0-100'	
Type of Riser and I.D.:	SCH 80 PVC 4"	
Type of Backfill:	Bentonite grout	
Elevation / Depth Top of Rock:	4710.49'	100'
Depth and Diameter of Surface Casing:	N/A	
Elevation / Depth of Seal:	45985.49'	2125'
Type of Seal:	Bentonite Holeplug	
Elevation / Depth Top of Filter Pack:	45930.49'	21720'
Elevation / Depth Top of Screen:	4580.49'	230'
Diameter of Hole in Bedrock:	8.5" depth of 100-345'	
Type of Screen and I.D.:	Stainless Steel 4"	
Slot Size and Length:	0.020 20'	
Type of Filter Pack:	Silica Sand 10/20 and then 30/65 3' below seal	
Elevation / Depth Bottom of Screen:	4560.49'	250'
Elevation / Depth Bottom of Filter Pack:	4550.49'	260'
Type of Backfill Below Filter Pack:	Holeplug to below 5' sump	
Elevation / Depth Bottom of Hole:	4465.49'	345'

Not To Scale

Note:
Coordinates are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum, 1983
Vertical data for well elevations are referenced to the North American Datum 1988
QED Well Wizard PFAS Free bladder pump (Model P1101H(M)-Z) installed with pump inlet at a depth of 240 feet

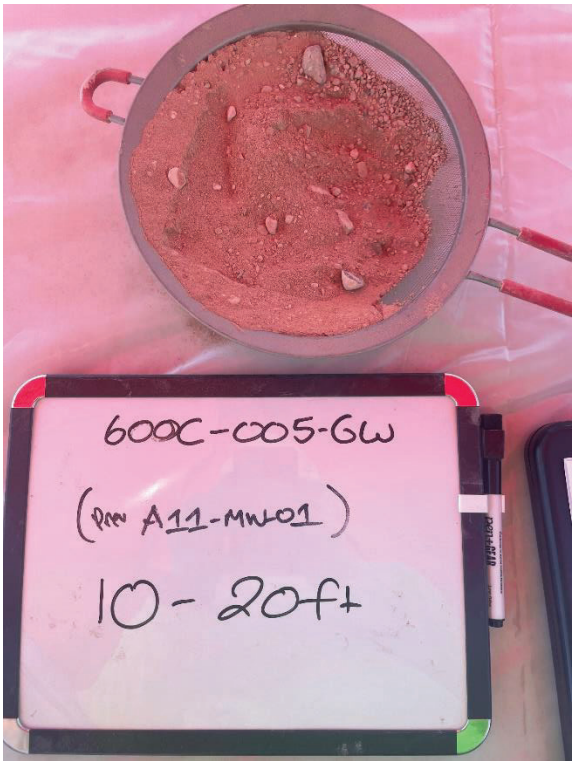
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 1 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** Overview of Air Rotary Drill Rig and logging workstation at 600C-005-GW	
PHOTO 2 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 0-10 ft – Fine Sand, some silt and clay, trace gravels	

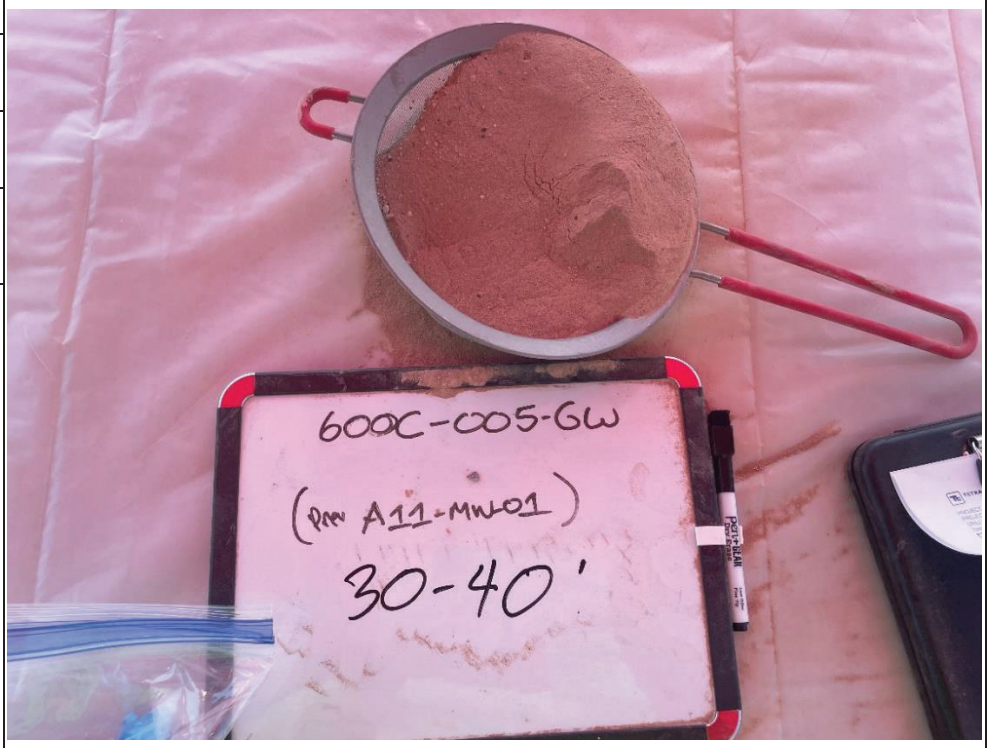
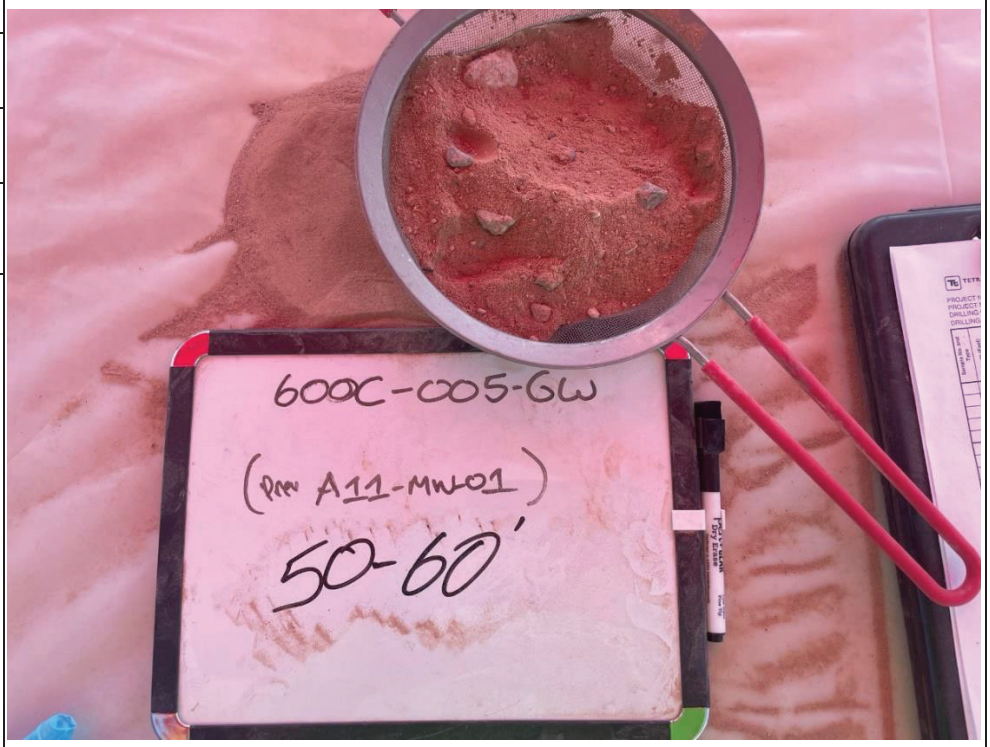
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 3 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 10-20 ft - Fine Sand, some silt and clay, increase in gravels	
PHOTO 4 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 20-30 ft – Silty clay, some coarse sand and small pebbles	

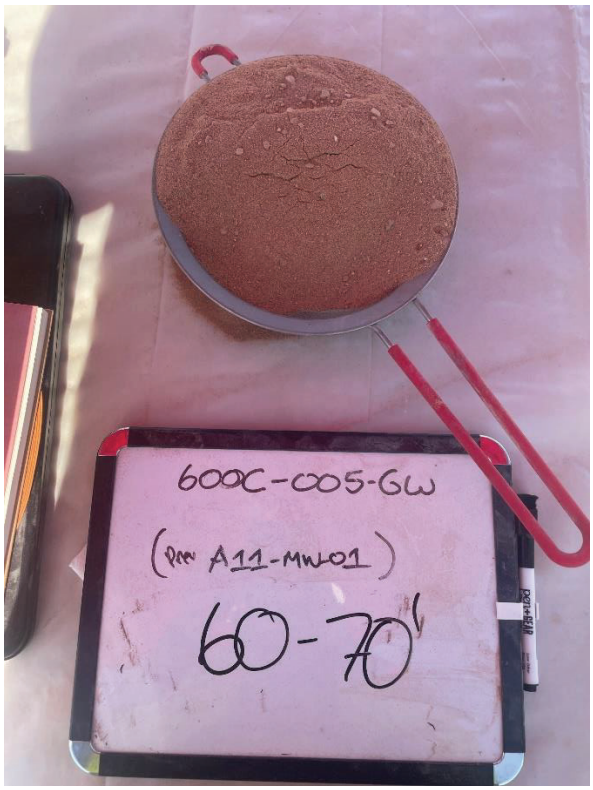
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 5 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 30-40 ft – Silty Clay	
PHOTO 6 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 50-60 ft – Silty clay, some gravels	

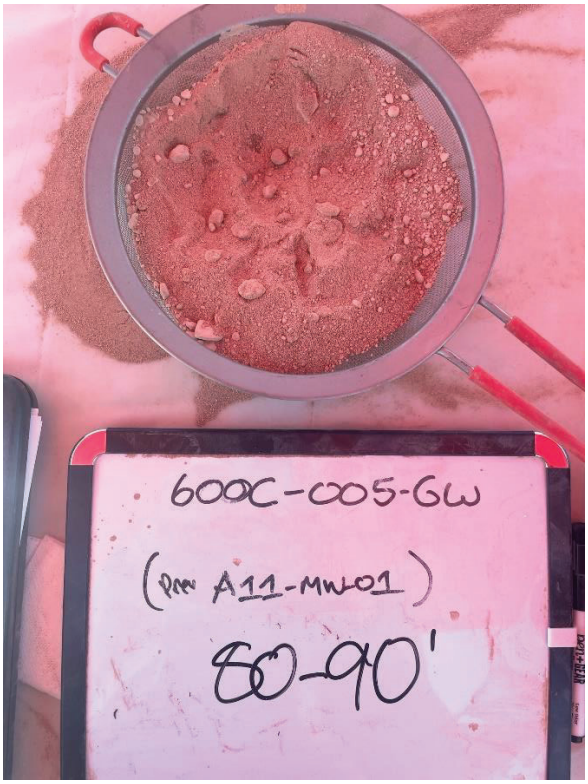
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 7 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 60-70 ft – Silty sand, some gravels	
PHOTO 8 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 70-80 ft – Silty sand, some gravels	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 9 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 80-90 ft – Sandy silt, few gravels	
PHOTO 10 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 90 - 100 ft – Gravelly silty clay, transition into 'clay pebbles'	

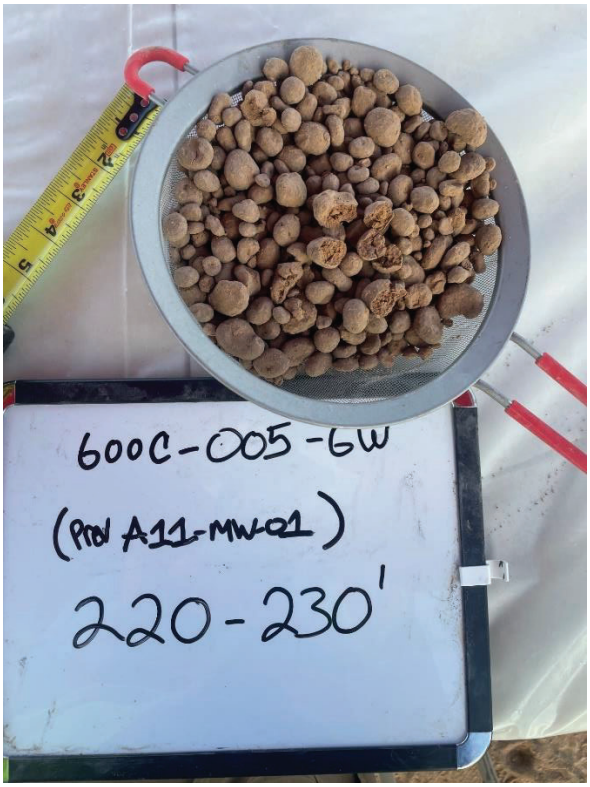
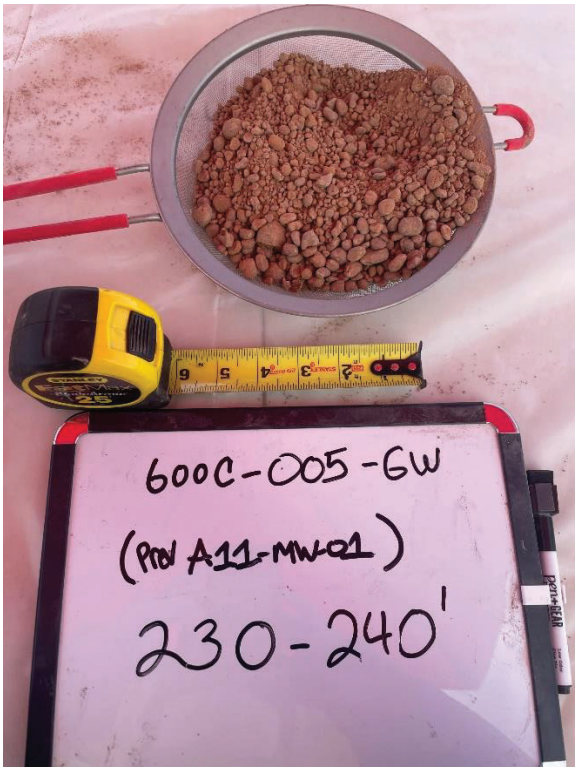
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 11 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 120 - 130 ft – Gravelly Silty clay, smallest trace of moisture and beginning of 'clay pebble' formation	
PHOTO 12 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 210-220 ft – SAA, Clay pebbles, some moisture, increase in pebble size	

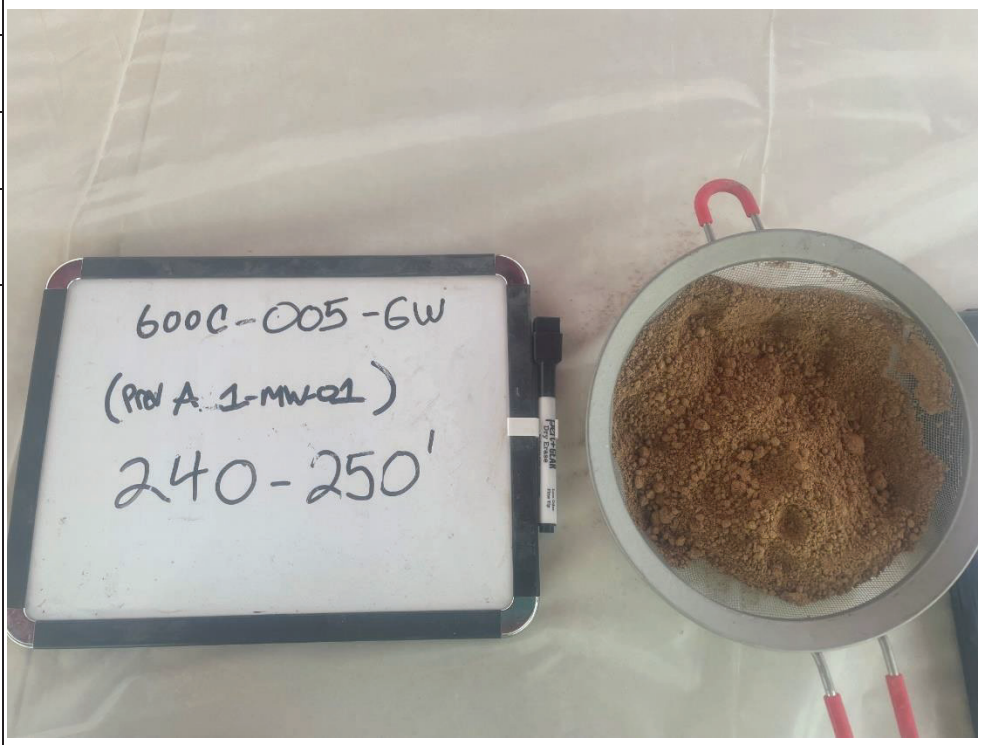
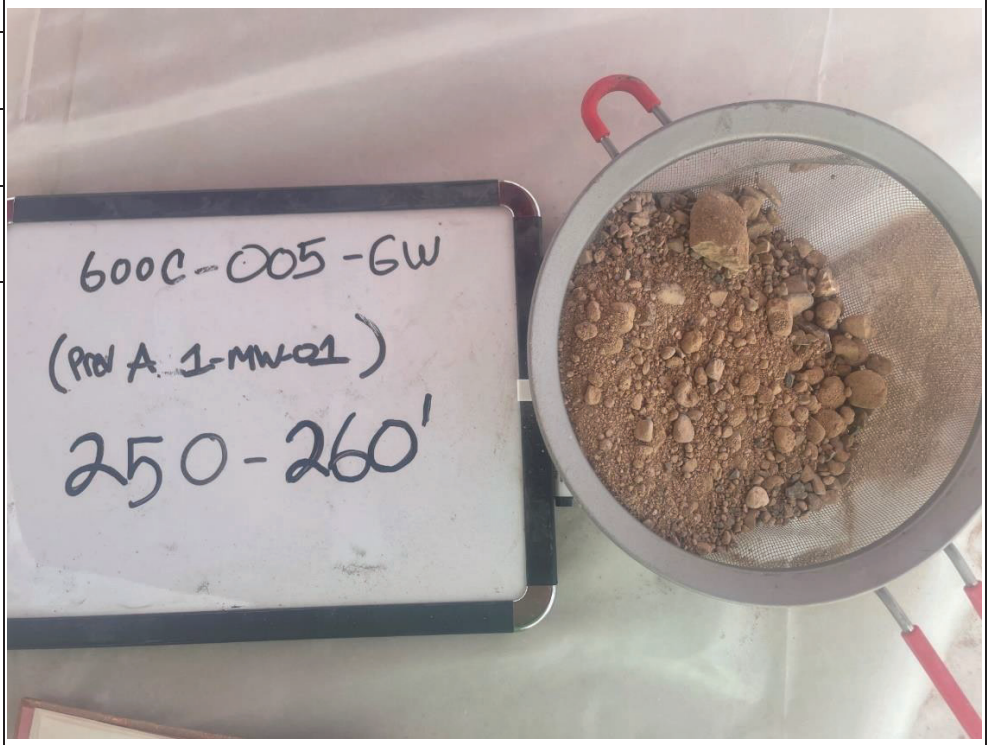
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 13 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 0600C-005-GW 220-230 ft – SAA, Clay pebbles, some moisture, increase in pebble size, broke pebbles in half to show inside texture.	
PHOTO 14 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 230-240 ft – SAA, Clay pebbles, some moisture, decrease in pebble size and silt transition increase.	

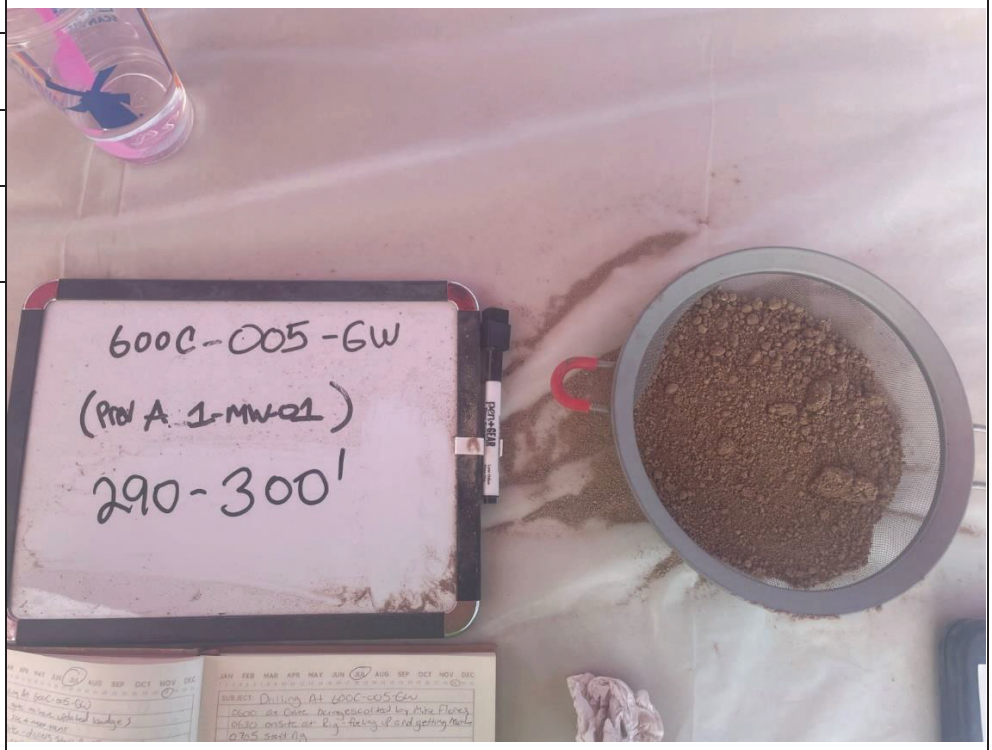
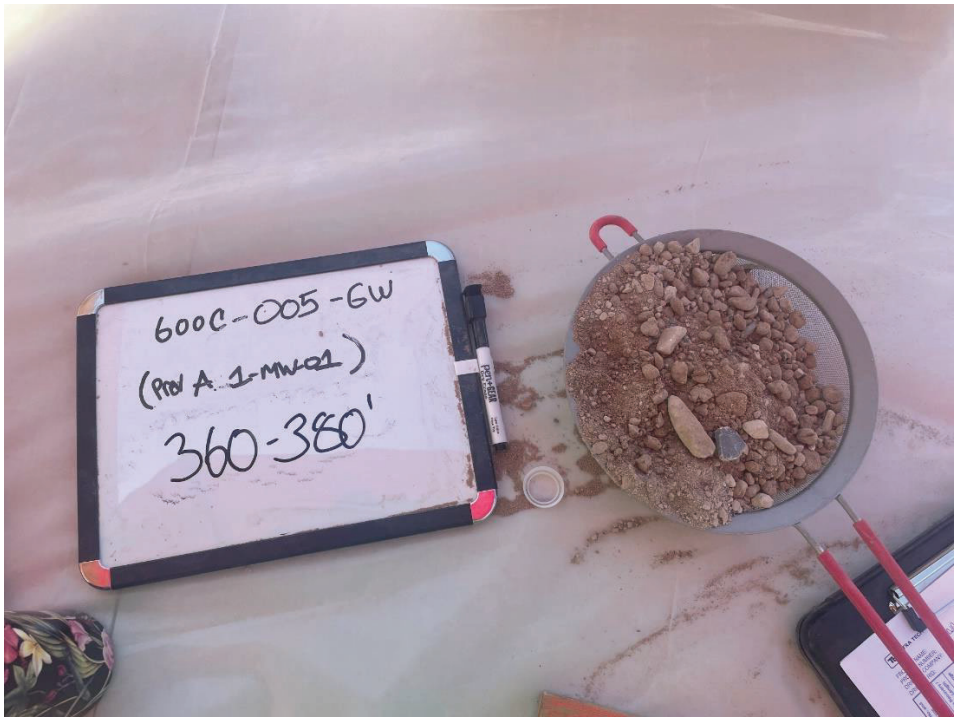
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 15 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 240-250 ft – Transition to a Clayey silt with some pebbles, trace moisture.	
PHOTO 16 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 250-260 ft – Transition to a poorly sorted, gravelly clayey silt, dry.	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 17 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 290-300 ft – Transition to a poorly sorted, gravelly sandy silt, with some clay, dry	
PHOTO 18 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 360-380 ft –Silty sandy gravels. Poorly sorted, dry	

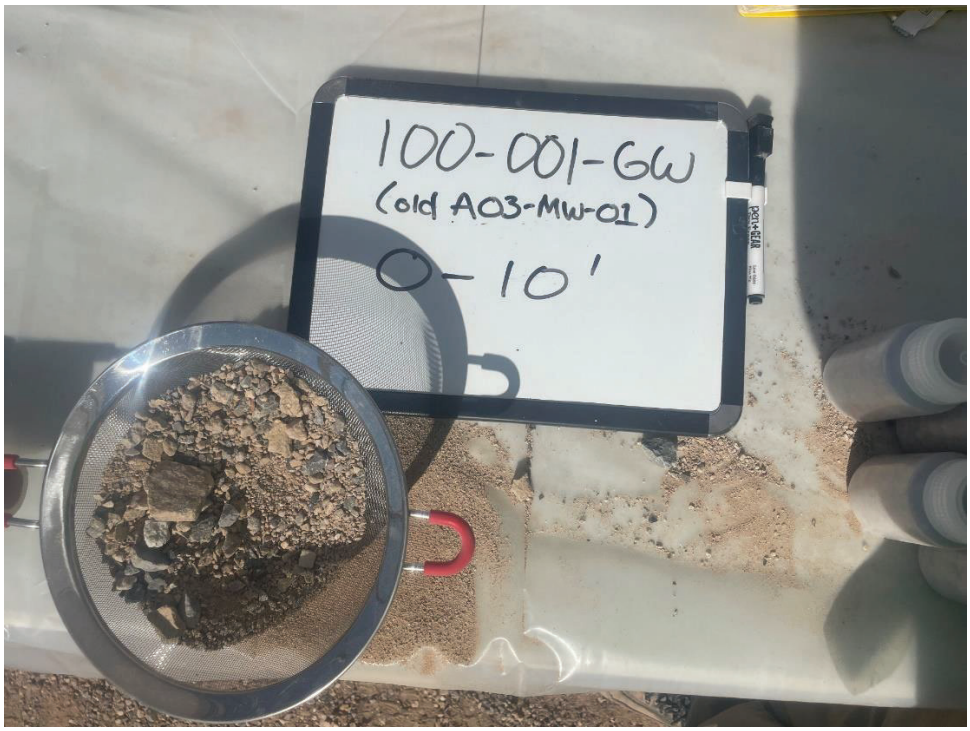
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 19 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW 380-400 ft –Silty sandy gravels. Poorly sorted, dry	
PHOTO 20 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** 600C-005-GW completed	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 21 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** Soil borings for MW100-001-GW Sandy Gravels, dry	
PHOTO 22 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 10 – 20 ft, Sandy Gravels, dry	

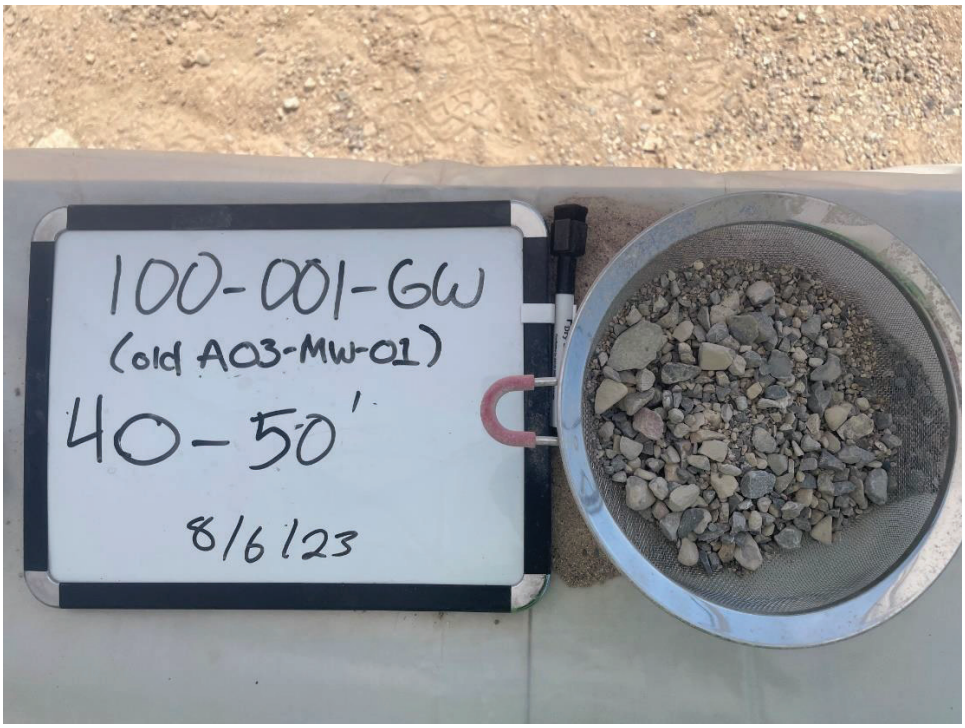
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 23 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 20 – 30 ft, Sandy Gravels, dry	
PHOTO 24 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 30 – 40 ft, Sandy Gravels, dry	

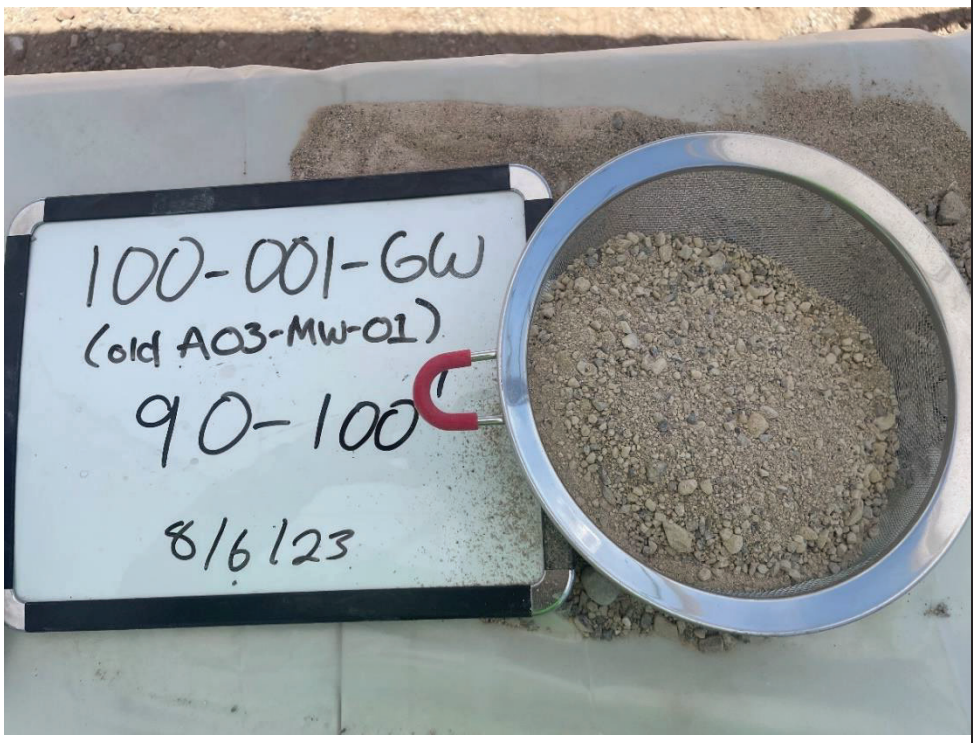
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 25 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 40 – 50 ft, Sandy Gravels, dry	
PHOTO 26 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 60 – 70 ft, Sandy Gravels with silts, dry	

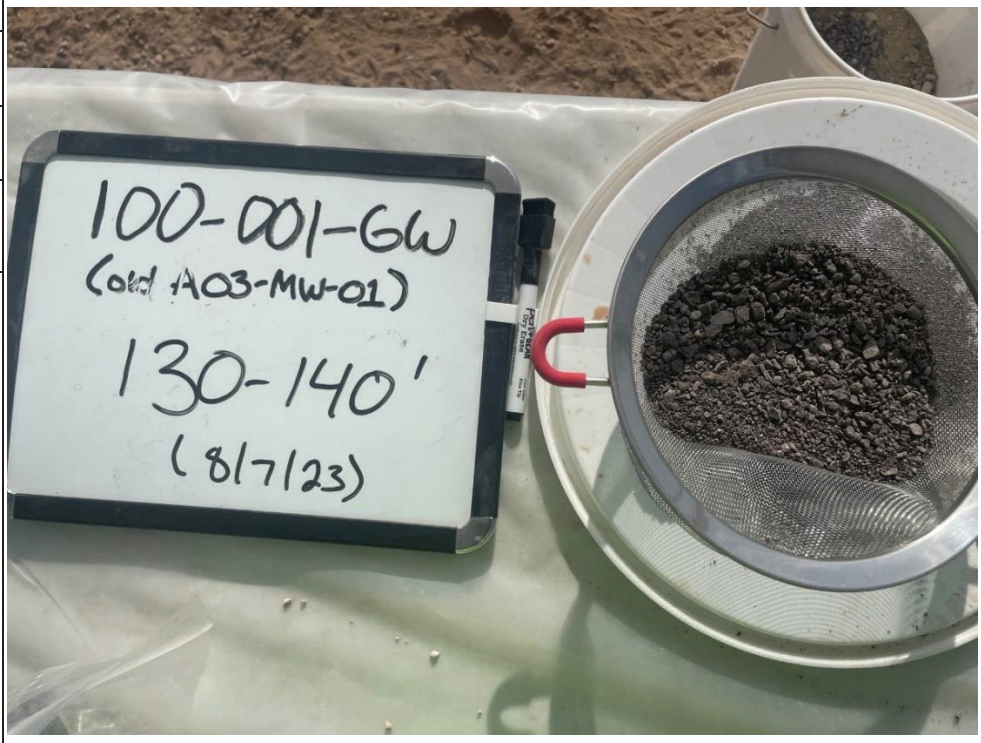
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 27 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 80 – 90 ft, Sandy Gravels with silts, dry	
PHOTO 28 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 90 – 100 ft, Sandy Gravels with silts, dry, bedrock at 100 ft.	

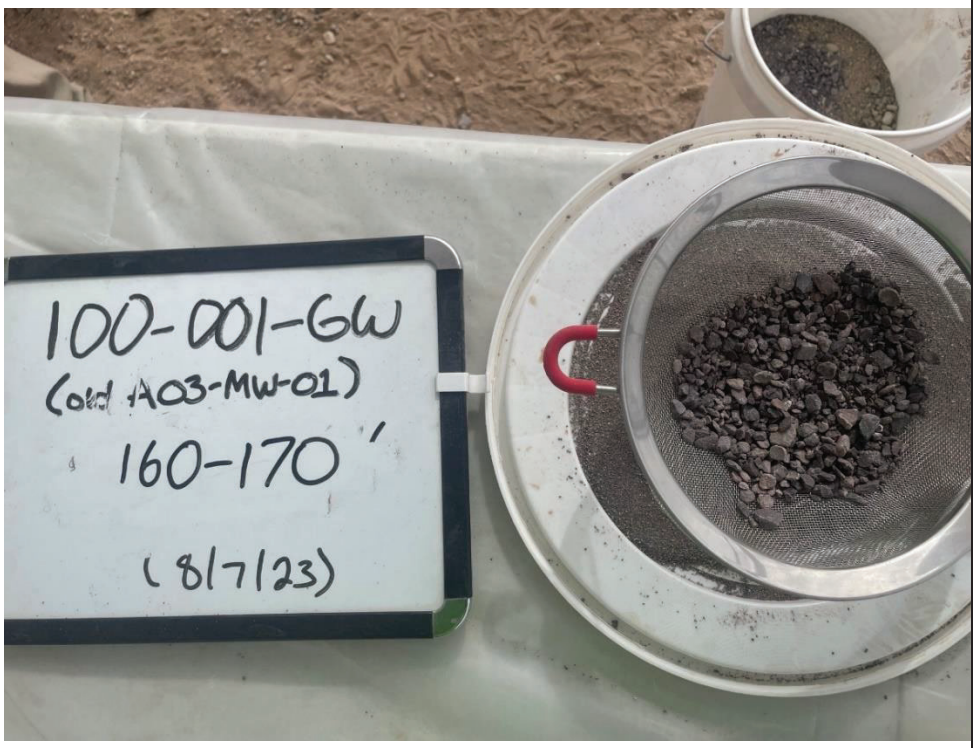
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 29 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 120 – 130 ft, In Bedrock, Andesite, small chips	
PHOTO 30 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 130 – 140 ft, In Bedrock, Andesite, small chips	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 31 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 150 – 160 ft, In Bedrock, Andesite, small chips, hint of red oxidation on chips	
PHOTO 32 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 160 – 170 ft, In Bedrock, Andesite, small chips	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 33 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 170 – 180 ft, In Bedrock, Andesite, small chips, possible fracture zone, calcite veining	
PHOTO 34 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 180 – 190 ft, In Bedrock, Andesite, small chips, veining in chips	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 35 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 200 – 210 ft, In Bedrock, Andesite, small pebbles of clay, calcite rhomb crystals, moist	
PHOTO 36 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 210 – 220 ft, In Bedrock, Andesite, small pebbles of clay, calcite rhomb crystals, moist	

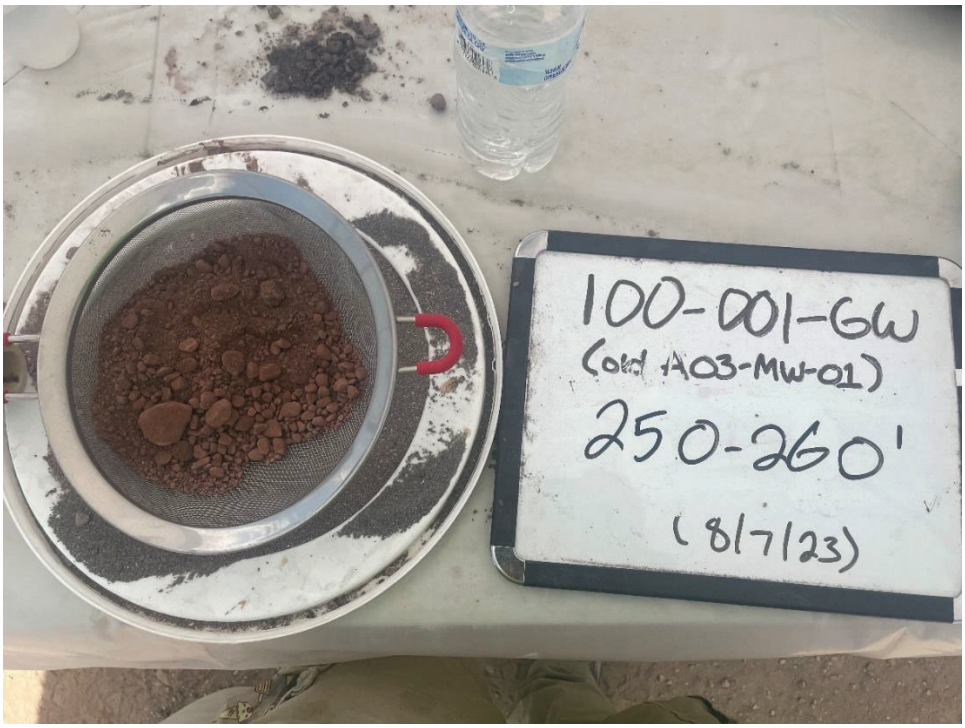
Photographic Log

White Sands Test Facility, New Mexico

PHOTO 37 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 210 – 220 ft, In Bedrock, Andesite, small pebbles of clay, calcite rhomb crystals, moist	
PHOTO 38 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 230 – 240 ft, In Bedrock, Andesite, clay coating chips, moist	

Photographic Log

White Sands Test Facility, New Mexico

PHOTO 39 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW100-001-GW 250 – 260 ft, In Bedrock, Andesite, clay coating chips, moist	
PHOTO 40 **DATE:** 7/24/2023-08/15/2023 **DIRECTION:** **TAKEN BY:** Tetra Tech **DESCRIPTION:** MW 100-001-GW after installation	

SOIL & SEDIMENT SAMPLE LOG SHEET

TETRA TECH

Event:	PFAS SI
Project Site Name:	WSTF PFAS SI
Project No.:	112G09033

Sample ID No.:	WSTF-A03-SB0001	**Sampled By:**	Liz Heness
Sample Location:	100-001	**Sample Date:**	8/2/2023 - 8/7/2023
QA/QC Duplicate ID:	WSTF-FD-20230806-09	**MS/MSD Collected:**	NO

MATRIX / CONCENTRATION:

[X] Surface Soil

[X] Subsurface Soil — **[ ] Low Concentration**

[ ] Sediment — **[ ] High Concentration**

GRAB SAMPLE DATA:

Time:	multiple	**Depth Interval**	**Color**	**Description (Sand, Silt, Clay, Moisture, etc.)**
Method:	Grab			
Monitor Reading (ppm):	0			

MULTIPLE / COMPOSITE SAMPLE DATA:

Method: — **PID Readings (Range in ppm):**

Sample ID	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
WSTF-A03-SB0001-000.5-20230802	915	0-0.5'	lt tan grey	Sand with large SA gravels
WSTF-A03-SB0001-009.5-20230806	930	9-9.5'	lt tan brwn grey	Sand with large SA gravels
WSTF-FD-20230806-09	0000	'	'	Sand with large SA gravels
WSTF-A03-SB0001-050.5-20230806	1120	50-50.5'	lt tan brwn grey	Sand with large SA gravels
WSTF-A03-SB0001-095.5-20230806	1300	95-95.5'	lt tan brwn grey	Sand with large SA gravels
WSTF-A03-SB0001-345.5-20230807	1630	345-345.5	Reddish brwn	Clay
WSTF-A03-SB0001-005.0-20230810	800	3-5	lt tan grey	Sand with large SA gravels

SAMPLE COLLECTION INFORMATION:

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
PFAS	QSM Table B-15	None	1 per sample	125	HDPE	Yes

OBSERVATIONS / NOTES:

MAP:



Coordinates:	N	E	
NAD83 Harn State Plane NM Central meters	167180.7	466407.77	

Signature(s): Elizabeth Heness

SOIL & SEDIMENT SAMPLE LOG SHEET

TETRA TECH

Event:	PFAS SI
Project Site Name:	WSTF PFAS SI
Project No.:	112G09033

Sample ID No.:	WSTF-A11-SB0009-398.0-20230729	**Sampled By:**	EH
Sample Location:	600C-005	**Sample Date:**	7/29/2023
QA/QC Duplicate ID:		**MS/MSD Collected:**	YES

MATRIX / CONCENTRATION:

- [ ] Surface Soil
- [x] Subsurface Soil
- [ ] Sediment
- [ ] Low Concentration
- [ ] High Concentration

GRAB SAMPLE DATA:

		Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:	13:45			
Method:	Grab			
Monitor Reading (ppm):	0	398'	Md brwn	Sandy silty clay, wet

MULTIPLE / COMPOSITE SAMPLE DATA:

Method: **PID Readings (Range in ppm):**

Sample ID	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)

SAMPLE COLLECTION INFORMATION:

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
PFAS	QSM Table B-15	None	3	125	HDPE	Yes

OBSERVATIONS / NOTES:

Sample collected from borehole during installation of monitoirng well A11-MW01

MAP:



Coordinates:	N	E	
NAD83 Harn State Plane N meters	**168059.66**	460152.37	

Signature(s): Elizabeth Heness

TETRA TECH

MONITORING WELL DEVELOPMENT RECORD

Event: NASA WSTF SI
Project Site Name: White Sands Test Facility
Project Number: 112G09033

WELL INFORMATION:

Well No.:	600C-500-GW	**Casing ID (in.):**	4
Drilling Co.:	Cascade	**Depth to Bottom (ft.):**	421.55 BTOC
Date Installed:	7/30-31/23	**Static Water Level Before (ft.):**	388.4
Date Developed:	8/9-10/23	**Static Water Level After (ft.):**	385.1
Dev. Method:	Bailing, surge-purge	**Screen Length (ft.):**	15'
Pump Type:	Grunfos	**Specific Capacity:**	--
Developed By:	Dan Hawkins-Wood		

DEVELOPMENT DATA:

Time	Estimated Sediment Thickness (ft.)	Cumulative Water Volume (Gal.)	Water Level (ft. below TOC)	Temp. (C°)	pH (S.U.)	SC (µS/cm)	Turbidity (NTU)	Remarks: (odor, color, etc.)
Date: 08/09/2023								
1330	--	--	--	--	--	--	--	Bailer used to remove coarse sediment
1422	--	10	--	--	--	--	--	Bailed 10 gallons, DTW 388.55
1432	--	--	--	--	--	--	--	Surging
1610	--	20	--	--	--	--	--	Bailed 10 gallons, DTW 388.55
Date: 08/10/2023								
1325	--	--	--	--	--	--	--	Turbid
1430	0	1 gal/min	385.9	28.5	6.1	822	18.7	
1440	0	1 gal/min	385.9	27.5	6.55	803	5.31	
1500	0	3 gal/min	385.92	28	6.51	803	4.77	
1510	0	3 gal/min	385.95	28.2	6.57	808	3.46	
1520	0	3 gal/min	385.92	27.2	6.55	794	3.25	
1527	0	300	--	--	--	--	--	Off WL after 385 ft

TETRA TECH

MONITORING WELL DEVELOPMENT RECORD

Event: NASA WSTF SI
Project Site Name: White Sands Test Facility
Project Number: 112G09033

WELL INFORMATION:

Well No.:	100-001-GW	**Casing ID (in.):**	4
Drilling Co.:	Cascade	**Depth to Bottom (ft.):**	258.6
Date Installed:	8/9-10/23	**Static Water Level Before (ft.):**	175.56
Date Developed:	8/13-15/23	**Static Water Level After (ft.):**	222.8
Dev. Method:	Bailing, surge-purge	**Screen Length (ft.):**	20'
Pump Type:	Grunfos	**Specific Capacity:**	--
Developed By:	Dan Hawkins-Wood		

DEVELOPMENT DATA:

Time	Estimated Sediment Thickness (ft.)	Cumulative Water Volume (Gal.)	Water Level (ft. below TOC)	Temp. (C°)	pH (S.U.)	SC (mS/cm)	Turbidity (NTU)	Remarks: (odor, color, etc.)
Date: 08/13/2023								
1215	--	0	182.2	--	--	--	--	Bailed 5 Gallons - low recharge well
1246	--	5	180.05	--	--	--	--	Surged
1250	--	10	--	--	--	--	--	Bailed ~5 Gallons
1313	--	--	186.7	--	--	--	--	Set up pump after surge
1500	--	1 gal/min	--	--	--	--	--	Start Purge, turbid
1510	--	--	205	--	--	--	--	
1520	--	--	215	--	--	--	--	
1533	--	--	230.4	--	--	--	--	Cloudy water/ lt grey
1543	--	--	235	--	--	--	--	
1604	--	--	254	--	--	--	--	Turned off pump to recharge - removed 1 well volume
Date: 08/14/2023								
645	--	--	181	--	--	--	--	
652	--	--	205	--	--	--	--	Cloudy water/ lt grey
658	--	--	214	--	--	--	--	
716	--	--	235	--	--	--	--	
739	--	~130	--	--	--	--	--	Turned off pump to recharge - removed 2 well volume
1458	--	--	191	25.8	7.97	651	110	

TETRA TECH

MONITORING WELL DEVELOPMENT RECORD

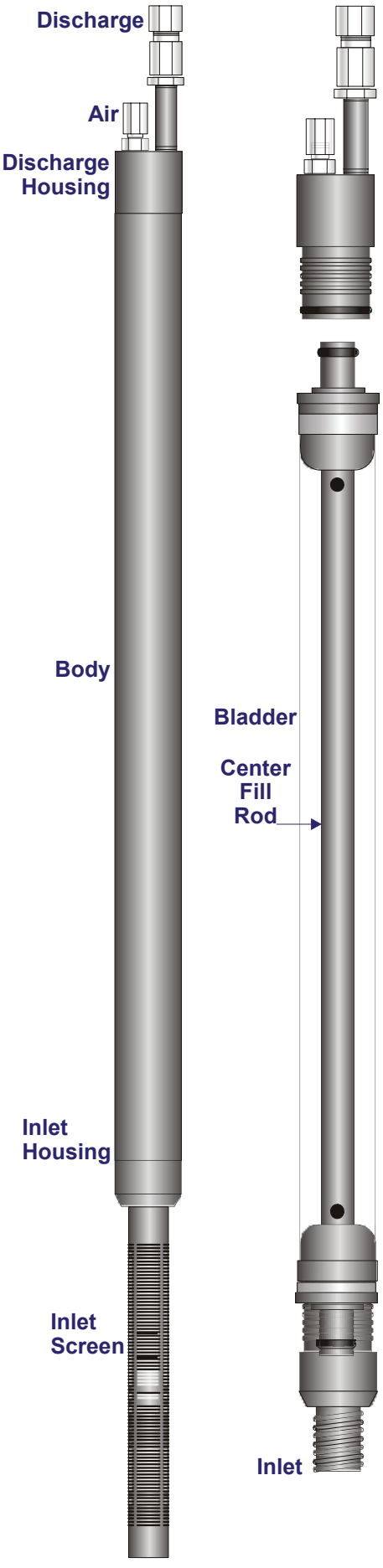
Event: NASA WSTF SI
Project Site Name: White Sands Test Facility
Project Number: 112G09033

WELL INFORMATION:

Well No.:	100-001-GW	**Casing ID (in.):**	4
Drilling Co.:	Cascade	**Depth to Bottom (ft.):**	258.6
Date Installed:	8/9-10/23	**Static Water Level Before (ft.):**	175.56
Date Developed:	8/13-15/23	**Static Water Level After (ft.):**	222.8
Dev. Method:	Bailing, surge-purge	**Screen Length (ft.):**	20'
Pump Type:	Grunfos	**Specific Capacity:**	--
Developed By:	Dan Hawkins-Wood		

DEVELOPMENT DATA:

Time	Estimated Sediment Thickness (ft.)	Cumulative Water Volume (Gal.)	Water Level (ft. below TOC)	Temp. (C°)	pH (S.U.)	SC (mS/cm)	Turbidity (NTU)	Remarks: (odor, color, etc.)
1505	--	--	213	24.8	7.54	687	37.4	
1510	--	--	222	24.1	7.81	671	32	
1520	--	--	234	25.9	7.98	688	29.1	
1525	--	--	242	25.7	8	688	22.4	
1530	--	--	244	25.9	8	695	23	
1535	--	--	246	26	8.01	696	43.1	
1540	--	--	252	26.1	7.98	727	86.8	Turned off pump to recharge - removed 3 well volume
Date: 08/15/2023								
700	--	--	183.9	21.4	8.68	601	59.3	
705	--	--	204.5	21.1	7.63	660	22.1	
710	--	--	210.5	21.4	7.6	666	14.9	
715	--	--	220	21.6	7.75	662	17.7	
720	--	3 gal/min	--	--	--	--	--	Increased flow and pumped 4th well volume
730	--	217	--	--	--	--	--	Pumped dry



PUMP TYPE:
Positive Air Displacement

DIMENSIONS:

Pump O.D.:	1.66" (42 mm)
Length:	42.25" (107.3 cm)
Length w/Screen:	48.25" (122.5 cm)
Screen Slot Size:	.010
Weight:	4.05 lbs. (1.8 kg)

MATERIALS:
PVC, SS EPDM Flouropolymer-free

FITTINGS:
Stainless Steel Compression

Discharge Size:	1/2" O.D., 3/8" I.D. (12.7 mm / 9.5 mm)
Air Supply Size:	1/4" O.D., 3/16" I.D. (6.3 mm / 4.7 mm)
(M) Discharge Size:	3/8" O.D., 1/4" I.D. (9.5 mm / 6.3 mm)

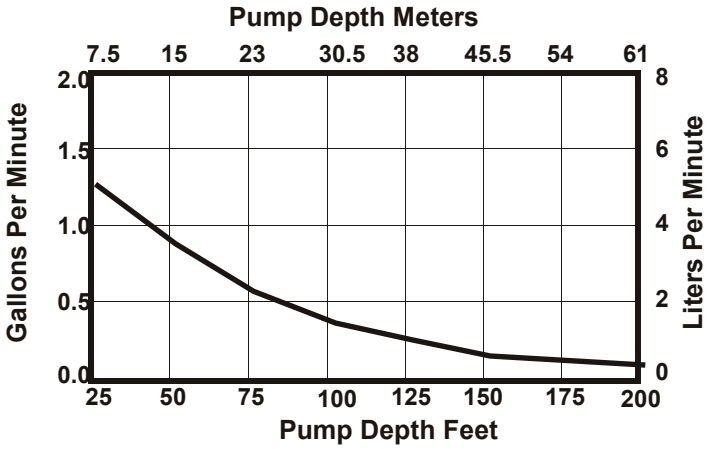
PUMP PERFORMANCE:

MAXIMUM LIFT:
600 Feet (182.8 m)

PUMP STROKE VOLUME:

Liters	Milliliters	Gallons	Ounces
.395	395	.10	12.8

PUMP FLOW RATES:



NOTE: Flow rates are based on a pump submergence of 25' (7.5 m), 1/2" (12.7 mm) discharge tubing and an operating gas pressure of 100 P.S.I. (7 bar) from an 3111HR air source/controller.

ACCESSORIES:

P/N 37789	Inlet Screen 6" (15.2 cm) PVC
P/N 41933	Bladder Cartridge
P/N 35052	Clamp Hand Tool

P/N 2163 REV 11-7-02

Installed 9-12-23

2 new wells

QED PUMP CERTIFICATION

Tim Wheeler — Quality Certification Manager

8/23/2023 — Date

P1101HM-Z — Pump Model

All Pump 052302 — Batch Serial Number

Wells: GOC-005-GW-402

If you need further information on QED's Pump Certification Program please contact QED Environmental Systems at 1-800-624-2026

QED PUMP CERTIFICATION

Tim Wheeler — Quality Certification Manager

8/23/2023 — Date

P1101HM-Z — Pump Model

052302 — Batch Serial Number

Wells: 100-OOOI-GW-240

If you need further information on QED's Pump Certification Program please contact QED Environmental Systems at 1-800-624-2026

Tetra Tech, Inc. Groundwater Sampling Sheet

SITE NAME: **NASA WSTF**		SITE LOCATION: **White Sands Test Facility, Dona Ana County, NM**
LOCATION ID: **A03-100-001-GW**	SAMPLE ID: **WSTF-A03-100-001-GW-240-20230913** Sample depth (ddd)=Top of Screen (feet bls)	DATE: **09/13/2023**

PURGING DATA

Static Depth to Water (feet): 169.41	CASING HEIGHT (feet als): NA	STATIC DEPTH TO WATER (feet bls) = DTW (btoc) - Casing Height (feet als): NA	WELL SCREEN INTERVAL DEPTH (feet bls): 230-250

WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/8	PURGE PUMP TYPE OR BAILER: Bladder Pump	TOP DEPTH = top of screen or depth to water which ever is greatest (feet bls): NA	BOTTOM DEPTH (feet bls): NA

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)

NA Liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)

NA Liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 240	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 240	PURGING INITIATED AT: 1040	PURGING ENDED AT: 1105	TOTAL VOLUME PURGED (Liters):

TIME	VOLUME PURGED (Liters)	CUMUL. VOLUME PURGED (Liters)	PURGE RATE (mlpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	ORP (mV)	COLOR (describe)
1045	0.5	1.5	100	170.26	6.93	20.7	9	6.93	1.98	243.0	Clear
1050	0.5	2.0	100	170.42	7.70	20.9	717	7.70	1.98	215.4	-
1055	0.5	2.5	100	170.47	7.68	20.8	744	7.68	2.74	220.6	-
1100	0.5	3.0	100	170.54	7.68	20.9	730	7.68	2.54	220.3	-
1105	0.5	2.5	100	170.55	7.68	20.8	725	7.68	2.83	219.7	-
Stable											
1110	Sample	Collected									

WELL CAPACITY (Liters Per Foot): **0.75"** = 0.076; **1"** = 0.15; **1.25"** = 0.23; **2"** = 0.61; **3"** = 1.40; **4"** = 2.46; **5"** = 3.86; **6"** = 5.57; **12"** = 22.26
TUBING INSIDE DIA. CAPACITY (Liters/Ft.): **1/8"** = 0.002; **3/16"** = 0.005; **1/4"** = 0.0098; **5/16"** = 0.015; **3/8"** = 0.023; **1/2"** = 0.038; **5/8"** = 0.09

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Aaron Kupper /Tetra Tech	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT: 1110	SAMPLING ENDED AT: 1120

PUMP OR TUBING DEPTH IN WELL (feet): 240	SAMPLE PUMP FLOW RATE (mL per minute): 100	TUBING MATERIAL CODE: HDPE

FIELD DECONTAMINATION: **(Y)** N	FIELD-FILTERED: Y **(N)** FILTER SIZE: ____ µm Filtration Equipment Type: _____	DUPLICATE: Y **(N)**

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
1	2	HDPE	250 mL	4°C	NONE	See Above	PFAS – QSM Table B-15	APP

REMARKS: erroneous Cond reading first reading. Checked meter with cal solution, good. Purged 1L dialing in settings. Pump pressure 200psi. Discharged 500ml each cycle. Set to 1 cycle every 5 min for a flow rate of 100ml/min. Controller settings: refill 275 seconds, discharge 25 seconds.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O** = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **PP =** Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

Tetra Tech, Inc. Groundwater Sampling Sheet

SITE NAME: **NASA WSTF**		SITE LOCATION: **White Sands Test Facility, Dona Ana County, NM**
LOCATION ID: **A11-600C-005-GW**	SAMPLE ID: **WSTF-A11-600C-005-GW-402-20230913** Sample depth (ddd)=Top of Screen (feet bls)	DATE: **09/13/2023**

PURGING DATA

Static Depth to Water (feet): 386.65	CASING HEIGHT (feet als): NA	STATIC DEPTH TO WATER (feet bls) = DTW (btoc) - Casing Height (feet als): NA	WELL SCREEN INTERVAL DEPTH (feet bls): 394 to 409	
WELL DIAMETER (inches): 4	TUBING DIAMETER (inches): 3/8	PURGE PUMP TYPE OR BAILER: Bladder Pump	TOP DEPTH = top of screen or depth to water which ever is greatest (feet bls): NA	BOTTOM DEPTH (feet bls): NA

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)

NA Liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)

NA Liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 402	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 402	PURGING INITIATED AT: 1310	PURGING ENDED AT: 1430	TOTAL VOLUME PURGED (Liters): 12.6

TIME	VOLUME PURGED (Liters)	CUMUL. VOLUME PURGED (Liters)	PURGE RATE (mlpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	ORP (mV)	COLOR (describe)
1330	0.8	3.8	160	385.64	7.46	20.6	889	6.07	9.09	221.4	Clear
1335	0.8	4.6	160	385.64	7.42	20.7	971	4.71	7.65	223.2	-
1340	0.8	5.4	160	385.64	7.41	20.7	970	4.83	5.25	224.2	-
1345	0.8	6.2	160	385.64	7.40	20.7	969	4,81	13.9	224.4	-
1350	0.8	7.0	160	385.64	7.40	20.7	967	4.76	24.3	224.6	-
1355	0.8	7.8	160	385.64	7.40	20.7	965	4.75	15.0	223.9	-
1400	0.8	8.6	160	385.64	7.40	20.7	963	4.75	14.6	223.8	-
1405	0.8	9.4	160	385.64	7.40	20.7	962	4.77	12.2	223.5	-
1410	0.8	10.2	160	385.64	7.40	20.7	960	4.78	10.3	222.9	-
1415	0.8	11	160	385.64	7.40	20.7	958	4,76	9.55	222.8	-
1420	0.8	11.8	160	385.64	7.41	20.7	956	4.76	7.80	222.8	-
1425	0.8	12.6	160	385.64	7.40	20.7	953	4.75	7.91	222.8	-
Stable											
1430	Sample	Collected									

WELL CAPACITY (Liters Per Foot): **0.75"** = 0.076; **1"** = 0.15; **1.25"** = 0.23; **2"** = 0.61; **3"** = 1.40; **4"** = 2.46; **5"** = 3.86; **6"** = 5.57; **12"** = 22.26
TUBING INSIDE DIA. CAPACITY (Liters/Ft.): **1/8"** = 0.002; **3/16"** = 0.005; **1/4"** = 0.0098; **5/16"** = 0.015; **3/8"** = 0.023; **1/2"** = 0.038; **5/8"** = 0.09

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Aaron Kupper /Tetra Tech	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT: 1430	SAMPLING ENDED AT: 1440
PUMP OR TUBING DEPTH IN WELL (feet): 402	SAMPLE PUMP FLOW RATE (mL per minute): 160	TUBING MATERIAL CODE: HDPE, S	
FIELD DECONTAMINATION: **(Y)** N	FIELD-FILTERED: Y **(N)** FILTER SIZE: ____ µm Filtration Equipment Type:	DUPLICATE: Y **(N)**	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
1	2	HDPE	250 mL	4°C	NONE	See Above	PFAS – QSM Table B-15	ABP

REMARKS: Unsure why Initial depth to water reading was deeper then purge readings. Took a while to dial in controller settings to get water to surface. Purged about 3 Liters tuning settings. 400ml water discharged each cycle. Set controller to run 2 times every 5 minutes for a flow rate of 160ml/min. Pressure set at 270psi. Controller set to 120 second refill, 30 second discharge.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O** = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **ABP** = After Bladder Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **PP =** Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

Hot! H: 102°F sunny

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Mob to WSTF - NASA

0600 onsite at Gate with Corey, AAron, Marvin, Garry (Drillers), Alex & Jake (cascade). Escorted By Trent
mob to building 101
0700 - safety meeting with Kyle & Navarro.
0848 - Call Potty time about setting up Porta john
Set up Porta john to come tommorow
0900 - mob to site, machinist moves brush out of way. Forklift getting dropped off
0930 - Frack tank & Rolloff are delivered, corey needs to escort Frack Tank drive back on in an hour or so.
1200 - lunch time
1245 - mob back, drillers unload Pipe/casing
Jake goes to get fuel.
1330 - Drillers set up rig/site
1430 - Drillers contine set up
1530 - Cascade brings more supplies/casing
1630 - cascade contines set up, Jake is back
1700 - leave site for day.

EAM

H: 104°F Su

JAN FEB MAR A
1 2 3 4 5 6 7 8 9 10

SUBJECT: Drillers

Hot
0600 meet
before gate
0700 grab ic
0748 Shanno
0820 core
(more sup
0855 - Dal
drop off
0910 Corey
Shannon n
kyle text
other locatio
0930 Drillers
- need to
Gw, nterfa
1130 - lunch
1200 - Drillers
1300 - Drillers
1330 - about
1345-1425-
& hose w/
1450 - ~30
1540 ~ 40
1630 - ~
Off Si

P OCT NOV DEC
24 25 26 27 28 29 30 31

AAron, Marvin,
). Escorted

+ Navarro:
Porta John
omow
rush out of

eel, corey
back on in

pe/casing

es/casing
ke is back

Hi 104°F Sunny

JAN FEB MAR APR MAY JUN (JUL) AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 (25) 26 27 28 29 30 31

SUBJECT: Drillers continue set up at WSTF-NASA

Hot
0600 meet Corey + drillers at turn off before gate and head to building
0700 grab ice + head to site
0748 Shannon is with us this morning
0820 corey has to go escort Drillers deliveries (more supplies)
0855 - Dale from Pottytime is on way to drop off Porta John.
0910 Corey is bringing both over but Shannon needs to unlock gate
Kyle texts me well ID - 600C-005-GW
other location (headquarters) will be (100-001-GW).
0930 Drillers unloading supplies
- need to take samples[EH] from VADOSE GW. nterface zone
1130 - lunch
1200 - Drillers start at 600C-005-GW
1300 - Drilled about 20ft
1330 - about half an hour to add casing/rods
1345-1425 - lost time due to needing to fix compressor + hose w/ leak
1450 - ~30 ft
1540 ~ 40 ft
1630 - ~60 ft
Off Site

EAM

SEP OCT NOV DEC
24 25 26 27 28 29 30 31

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT:

Remaining Items for WSTF

✓ ○ Source water blank – collected 8/1/23 @ 1200

✓ ○ Equipment blank collected 8/2/23 @ 0950

○ 2 GW samples → 600C-005-GW "WSTF-600C-005-YYMMDD
100-001-GW

✓ ○ Soil samples → ○ WSTF-A11-SB0009-398.0-20230729 ☑ ms/msd

✓ ○ WSTF-A03-SB0001-000.5-20230802 ☑

✓ <1 oft ○ WSTF-A03-SB0001- ☑

✓ mid point ○ WSTF-A03- ☑

○ IDW samples → 2 soil, 2 water — Bedrock interface → " ☑

WSTF-IDW-YYYYMMDD-01 (ect)

○ WSTF-IDW-20230802-01 -01 (soil)

○ -02

○ -03

○ -04

◎ Ship back equipment to field

Hot! Hi: 108°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drilling At 600C-005-GW

0600 meet onsite at turnoff to go to gate together
0620 Get ice and head to site
0720 Drillers start up rig
0745 Issues with hose
0855 need new hydraulic hose
1000 - Drillers heading offsite for hose
1100 - Help out with work for Aaron & Corey
1320 - Gary calls - has hose + going to get crew from hotel
1418 - Gary calls back - need to get Mark Green pass for tomorrow. They are not coming back today.
1500 offsite for day.

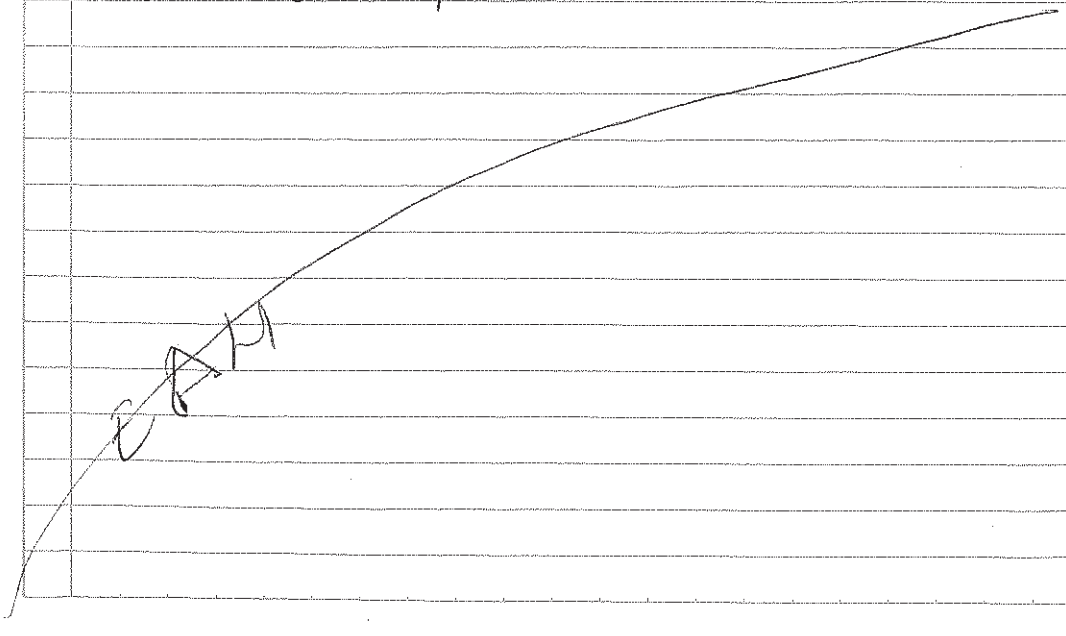
TDH

Hot! Hi: 104°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drilling At 600C-005-GW

0600 at gate to have updated badges
0620 get IA & meet trent
0640 at site - drillers start Prepping for day
0720 add another 20' of drill string & start drilling
0749 at 225 ft
0800 Mark leaving site for the day, corey escorting him off
0830 - Clay lense is slow going
0915 - changing out drill bit
1040 - still removing casing to change out drill bit
1200-1230 - lunch
1230 - inserting smaller casing (telescoping)
1446 - still installing smaller casing
1506 - installing Bit & rods
1630 - installing Bits & rods - Powering down for day
1645 - offsite for day

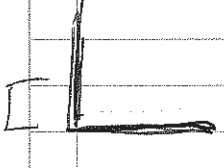


Hot Hi:

JAN FEB MAR A
1 2 3 4 5 6 7 8 9 10

SUBJECT: Drill

0600 at
0630 ons
0705 start
0715 beg
0723 ~ 24
0830 ~ 28
0930 - ~ 3
32
1050 · Jake
1130 ~ 3
Call with S
closer to 4
1145 - Screw
1216 - addin
1308 - back a
water at
1345 - T
WSTF-A
did MS/MSD
Pulled Rod
d. drit sta
38



1645 - offsite f

04°F

P OCT NOV DEC
24 25 26 27 28 29 30 31

es

for day
& start drilling

corey escorting

t drill bit

ng)

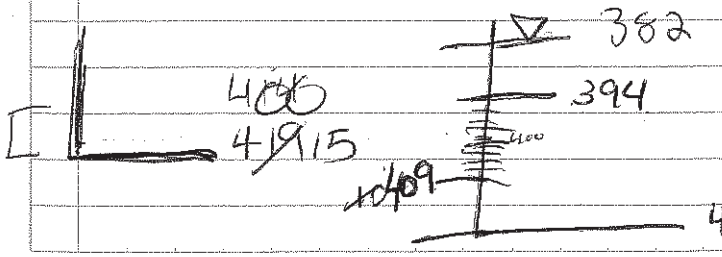
rig down for day

Hot H, 102°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drilling At 600C-coS-GW

0600 at Gate being escorted by Mike Flores
0630 onsite at Rig - fueling up and getting ready
0705 start Rig
0715 begin drilling
0723 ~ 247ft
0830 ~ 280ft
0930 - ~~300ft~~ 320ft Jake leaves to get fuel
1050 Jake back ~ at 340ft
1130 ~ 360ft - moist!
Call with Sarah - depth to water might be shallower closer to 420, set screen 10ft below wt.
1145 - screwing in casing for 380'
1216 - adding casing for 400, took lunch
1308 - back at drilling
water at roughly 398'
1345 - take soil sample from cuttings
WSTF-All-SB0009-398.0-20230729
did MS/MSD (2 additional bottles)
Pulled Rods TD 422.5 - 3.7 = 419 - Bottom
d.drit stay open at bottom
~~395~~ - 3.7 ≈ 382



1645 - offsite for day

Hot, Windy H: 99°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Well installation At 600C-005-6Gw

0605 - onsite at Gate - mob to get ice

0635 - arrive at site, Drillers fuel up

WL At ~~3862'~~ 386ft - 3.7ft = 382.3ft bgs

805 set well at 419 ft

858 move rig away from casing to set up for annulus/ casing Pulling

1006 Pulling up casing & dumping sand for annulus

1040 - added ~40 bags of sand, Void space at depth Pulling off 20ft of casing (40 total to see where they are at,

1103 - 47 Bags of sand total to get to 380.8ft

1130 - ~~Bentonite~~ 3ft of fine sand (60) 377

Then Bentonite for 5ft.

Took lunch & started making grout

1427 - Gerry Says the one pump is acting up & might need to be replaced tomorrow. Taking Pump apart

1514 still taking Pump apart casing at 300ft.

1556 Testing Pump - need to get Part

1626 leave site & mob offsite

Hot! 100°F

JAN FEB MAR

1 2 3 4 5 6 7 8 9

SUBJECT: Well

0605 ons

0615 · grat

0635 ons

0713 ca

for dr. lle

0900 Dr

Grinding

0925 Gr

1018 stil

1030 got P

1120 Finish

Casing to

1130 chec

1200 lunch

1230 Dr

The helper

he's fly in

1525 le

Hot! 100°F

EP OCT NOV DEC
24 25 26 27 28 29 30 1

005-GW
Ice
up
= 382.3ft bgs
set up for
sand for annulus
id space at depth
see where they
380.8ft
377
ut
cting up
Taking Pump start
at 300-ft.
rt

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Well Construction/Installation At 600C-005-GW

0605 onsite at Gate to mob to site
0615 grab Ice & head to Site
0635 onsite drillers fueling up / Changing out Pump
0713 call with Sarah for update - Pump is working for drillers
0900 Drillers think grout tank is clogged
Grinding on out Put to see if clogged
0925 Grinding stops
1018 still trouble shooting
1030 got Pump to work & started removing casing
1120 Finished Pulling out larger casing, 225 ft of casing to go. (DTW) 2 (Casing Stage)
1130 checked WL - 389.2 - 6.5 = 382.7 ft bgs
1200 lunch
1230 Drillers having issues with Pump again
The helper Alex - his flight was cancelled, so now he's flying earlier, need to leave site by 3:30pm.
1525 leaving site

Hot! Hi of 95°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

SUBJECT: Drillers work on repair, hopefully fix rig

0603 At gate to be escorted in

0610 Grab ice mob to site

0625 at site, Drillers go through Paperwork

0700 Drillers work to remove parts/cleanup

0930- Sample Soil IDW

↳ WSTF-IDW-20230802-01

0915 - Sample 0-6in at A03MW01

↳ WSTF-A03-SB0001-000.5-20230802

0950 - Sample Equipment blank off Drill Bit (using on next hole/well)

0955 - Drillers need to take Part to ABQ for testing - Putting Drill string on trailer

1044 - Leaving site for day

1050 - Call Sarah to update her on issues

1120 - Back at hotel, to get samples ready to ship.

WSTF-EB-20230802-01

WSTF-TB-20230802-01

Shipped samples ~1400, Done for day

EAH

P OCT NOV DEC

24 25 26 27 28 29 30 31

e 11

rk on compressor

see other site

ty attendant

Clean Porta John

. Drillers grouting

ater blank

lic fluids

l. ng tech out

spill stuff +

lace because

s. Put down spill kit

told drillers to get

Hot Hi: 101°F

JAN FEB MAR APR MAY JUN JUL (AUG) SEP OCT NOV DEC

1 2 3 (4) 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Fixing Rig

0605 on site at gate for new badge
0611 Call from Robert Walker - sending escort to us
0625 Getting Ice
0645 at site drillers finish safety meeting, begin fueling & working on rig
0808 Still working on rig
0900 - Still working on rig, called in Hot work Permit just in case
0957 Talk to Sarah about drilling schedule
1053 Pumps are back in place, finishing up oil top off.
1200 Remove Casing
1230 Start mixing grout Casing finished.
1347 Still grouting
1545 Finish grouting, Drillers clean up site
1645 leave Site for the day

Hot Hi: 101°

JAN FEB MAR A

1 2 3 4 (5) 6 7 8 9 10

SUBJECT: Comp

0600 ons
0620 Grab
0640 ons
0800 Star
0855 Check
0907 Begin
0917 move r
1030 moved
things onto
1200 Putting
1300 move fr
1430 move ri
1520 move
1540 at
Staging the
1600 finish
to site
1640 Finish
in the morn
office

Hot Hi 101°F

EP OCT NOV DEC
24 25 26 27 28 29 30 31

scort to OS

, begin fueling

work Permit just

ing up oil to pat.

clean up site

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT, NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Completion of well

0600 On site at Gate for escort
0620 Grab Ice
0640 on site at rig/setup
0800 start mixing cement
0855 Checked TD 419 ft bgs
0907 Begin demobing rig - lowered tower
0917 move rig & start making forms
1030 moved generator, fork lift IS moving things onto trailer
1200 Putting together frame for monument
1300 Move trailer to other site
1430 move rig to next site, finish Pads
1520 MOB to decon Pad
1540 at 100-001-GW site, Drillers moving / Staging things
1600 finish decoming and bring rods/casing to site
1640 Finish set up at rig, some stuff to do in the morning before start drilling.
Off site

Hot Hi: 108°F

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Set up on 100-001-GW

0605 onsite at gate, mob to get rec

0620 onsite at 100-001-GW well location unloading hoppers/supplies. need to make another run to the other site

0700 at other site loading supplies

0800 mob back to 100-001-GW

0830 setting up on rig to start drilling

0914 start drilling

0930 sample 9-9.5ft

[Took Duplicate sample

→ WSTF-A03-SB0001-099.5-20230806

DUP→ WSTF-FD-20230806-09 @ 0000

0940 ~ 20ft

0950 adding casing/rod

1038 ~ 40ft - Having a hard time blowing gravels out of hole, add casing

1120 - sample 50ft

WSTF-A03-SB0001-5050.5-20230806

1200 ~ 70-75ft

1220 add another casing on

→ 1300 at ~ 100ft, lunch! took sample incase we were at ER

1350 changing out drill bit

1420 advancing rods

1435 Bedrock at ~ 100ft

sampled @ 95'

[1300 → WSTF-A03-SB0001-9595.5-20230806

1500-1530 Rod stuck, rock pinching rod in hole not advancing

1620 - Need to possibly switch to different bit. leaving for day.

Hot Hi: 100°F

JAN FEB MAR AP

1 2 3 4 5 6 7 8 9 10

SUBJECT: Drilling

0600 onsite

0615 onsite

meeting. Ge

the stabilizer

0650 start Pr

0750 ~ 110 ft

hole)

0823 ~ 1

0847 ~ 1

0942 ~ 19

0947 - shan

samples from

doesn't fizz

most closl

with calcit

1045 - called

more casing

1130 Talked

we might n

Have to re

don't hit w

1226 start d

1411 - call u

and have

1438 - Instr

of materials

Kyle says

find water

Hot Hi 100°F

SEP OCT NOV DEC
23 24 25 26 27 28 29 30 31

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drilling at 100-001-GW

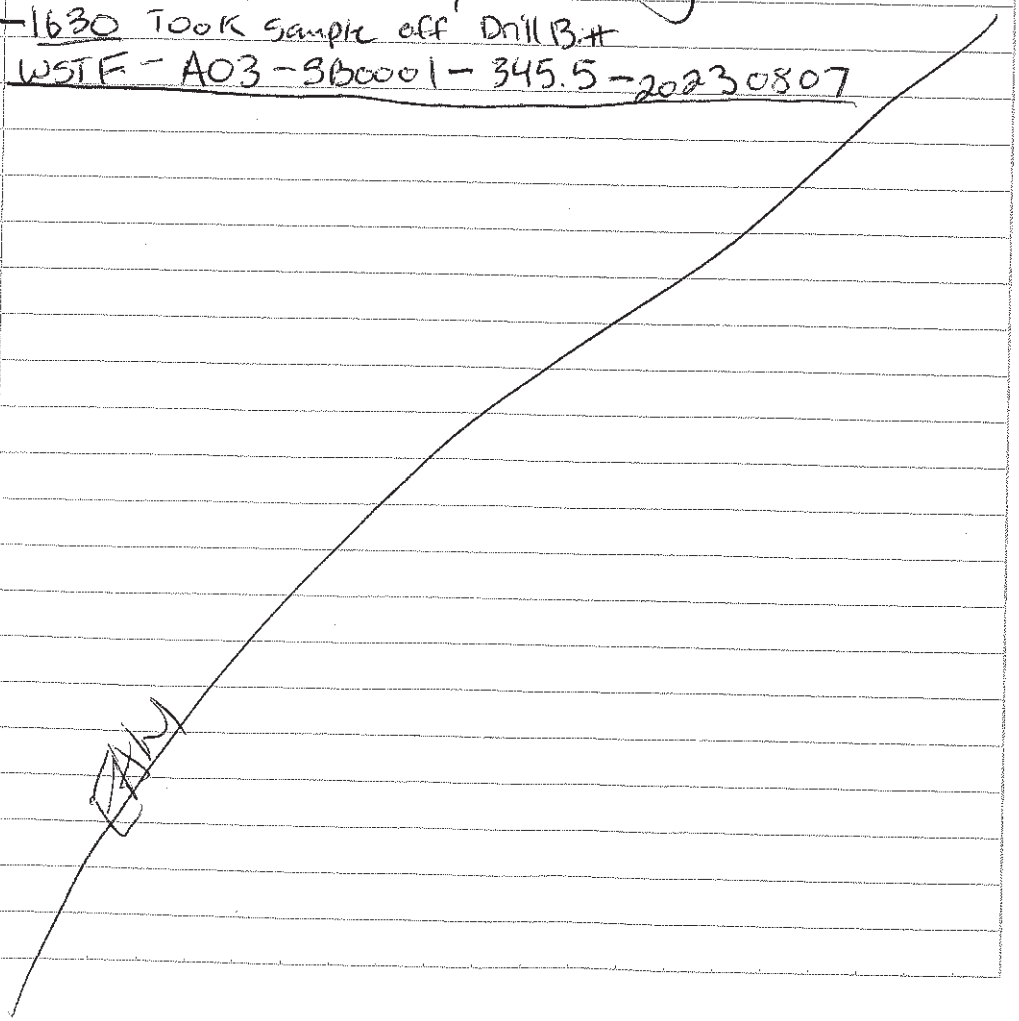
0600 onsite at ~~W~~ Gate, mob to get Ice
0615 onsite at well, drillers start up rig, H&S meeting, Gerry says the issue with the bit is the stabilizer and that mark said to remove it.
0650 Start Process of Pulling rods & removing stabilizer
0750 ~ 110 ft, debris (rocks from sidewall fell in hole)
0823 ~ 130 ft
0847 ~ 150 ft
0942 ~ 190 ft
0947 - Shannon came over with HCL & some samples from around the area the "Limestone" doesn't fizz at all even when scratch. It most closly resembles a sample of Andesite with calcite veins (veins do fizz)
1045 - called Sarah, Drillers needed to go get more casing from other site. (~ 240)
1130 Talked to Shannon, there is a possibility that we might not reach water, hit or miss in Andesite Have to re-evaluate if we reach 320' and don't hit water.
1226 Start drilling again.
1411 - call with Sarah Reached 280-300' and haven't hit water.
1438 - Instructed to go to 360' (the amount of materials we have)
Kyle says that its very difficult to find water in the Andesite. →

+ ice
location
make another
GW
rt drilling
20230806
0000
owing gravels out
5-20230806
sample incase we were at ~~BR~~
9595.5-20230806
ing rod in hole
bit. leaving for day

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT:

1441 at 300' - small amount of water!
need to add a small amount of water because it gummed up Hoses
1520 at 320' some water but mixed with a lot of clay. Will go to 340-345 & see what kind of water we get
1546 - TPPing ~~up to outer casing~~ EH out of hole
1635 - Done for day
1630 Took sample off Drill Bit
WSTF - A03 - 3B0001 - 345.5 - 20230807



Hi 96°F

JAN FEB MAR AP
1 2 3 4 5 6 7 8 9 10 11

SUBJECT: Settin

0600 at Ga te
0605 Get Ice
0615 on site
0637 WL
- Call w.
top of wt,
for, large Sa
Screen deep
0735 - WL
821 - Call w
- atleast 3f
- ands. is
~~but~~ WT in are
- where the
- not higher
Close ~ M
920 - WL

1546 063
Yesterday to tod
9.14
+ 6 37
15 51 x 16 hr

= 95ft x (0.
= 20.45 Ga

Bett p2 = 5.11 Ft

Hi 96°F

SEP OCT NOV DEC
23 24 25 26 27 28 29 30 31

- of water!
of water because

ixed with a
0-345ft see

out of hole

230807

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Setting

0600 at Gate
0605 Get Ice
0615 on site
0637 WL is at 242 Ft - Call Kyle/Sarah
- Call with Jeff Orient - Put screen near top of wt, would use gravel instead sand for, large sand pack to cover interval, set screen deep enough
0735 - WL is ~238 Ft
821 - Call w/ Geph Giles - Drillers go to clean up other site
- atleast 3ft of sand above - 35-40ft of sand
- ands. is unconfined, in some areas,
~~wt~~ wt in area ~170 Ft, wait to
- where the wt - equilibriates
- not higher then 238 because we're getting close ~ Maybe 260-280 for screen, ~~sand below~~ Ft
920 - WL 229

546 0637 = 340 — 242 ft bgs
Yesterday to today = 95 ft
9.14
+ 6 37
15 51 ± 16 hr
≈ 6.1 ft/hr r = 4.25

= 95ft × (0.35 Ft)² = 36.54 Ft³ × 7.48 gal/Ft³ = 273.3 Gal
= 20.45 Gal/hr. × ~~16 hr = 12 gal~~ 1 Ft³ / 960 min =

13 Ft × π r² = 5.11 Ft³ = 38.22 gal / 223 = 0.17 gal/min

343

SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

too well
05-ow

2 gallon/125min =
0.0176

and out
hole. One of
El Paso for Bentonite

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT:

1438 - Start blowing out hole, Dalton leaves to get supplies
1640 - Dalton heading back, Drillers tripping out after blowing hole
1717 looks like storms are coming in but not here just yet
1728 - raining, stop work lightning within 6mi. wait in vehicles til dalton arrives
1813 - Dalton back w/ supplies, lightning warning over need to unload + leave for day
1818 leaving site for the day

EAW

JAN FEB MAR APR MAY JUN JUL (AUG) SEP OCT NOV DEC

1 2 3 4 5 6 7 8 (9) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Well construction at 100-00[illegible]-Cav & Develop.

0600 - onsite at Gate
0605 - mob for Ice
0620 - onsite Prepping for day
0749 - blowing dam hole
0806 - begin tripping
0900 - Chipping bottom w/ bentonite
1011 - finishe Placing bento, Set sump at 255
1020 - Start to put well in before setting sand
1124 - Developer at Gate, to be escorted to our site,
Drillers adding Sand, drillers need to move
some materials, over at other site
1200 meh to other site, drillers move some things
~~to~~ around So developer can pull up to well.
1241 Call w.th Sarah, developer starts to set up.
1330 Dan (Developer) Sends down bailer
Initail WL is 388.4 TOC DTB 421.55 TOC
1422 Bailed 10 Gallons, DTW 388.55 Same DTB
1432 Set up Surge Block
1537 - Remove surgeblock DTW 38905-ft TOC
1610 Bailed 10 gallons, Pack up at 600-005-GW
DTW 388.75 Same DTB.
Leave to meet w/ drillers
1640 - Grout to 85ft. Casing removed.
Leave site for day

JAN FEB MAR A

1 2 3 4 5 6 7 8 9 (10)

SUBJECT: Finish

0600 - at
0620 - Lead
0630 - on si
hand auge
enough to
0700 - Dal
0720 - Take
WSTF - ID

0740 - Tri.b
WSTF - IB

0800 - Too
WSTF - AO3

0842 - Drille
Clean up
0934 - Ca
In Still has
0950 - Jake
1010 moving
1057 mobi
1145 - leave
1300 - com
1226 - Dan
- needed
1330 - Da
working
1335 - Ba

G SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

-00ф-Gw & Develop

ite
t sump at 255
re setting sand
corted to our site,
rs need to move
er site
, move some things
up to well.
s to set up.
uler
421.55 TOC
.55 Some DTB

38905-ft TOC
t 600-005-GW

ing removed.

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Finish well construction & Develop 600-005-GW

0600 - at Gate, Dalton needs new Pass
0620 - Leading to get Ice
0630 - on site at 100-001-GW, need to get hand auger from other site, Dan is nice enough to drop it off
0700 - Dalton back on site
0720 - Take Soil IDW Sample 02
WSTF-IDW-20230810-02

0740 - Trip blank labeled
WSTF-TB-20230810-02

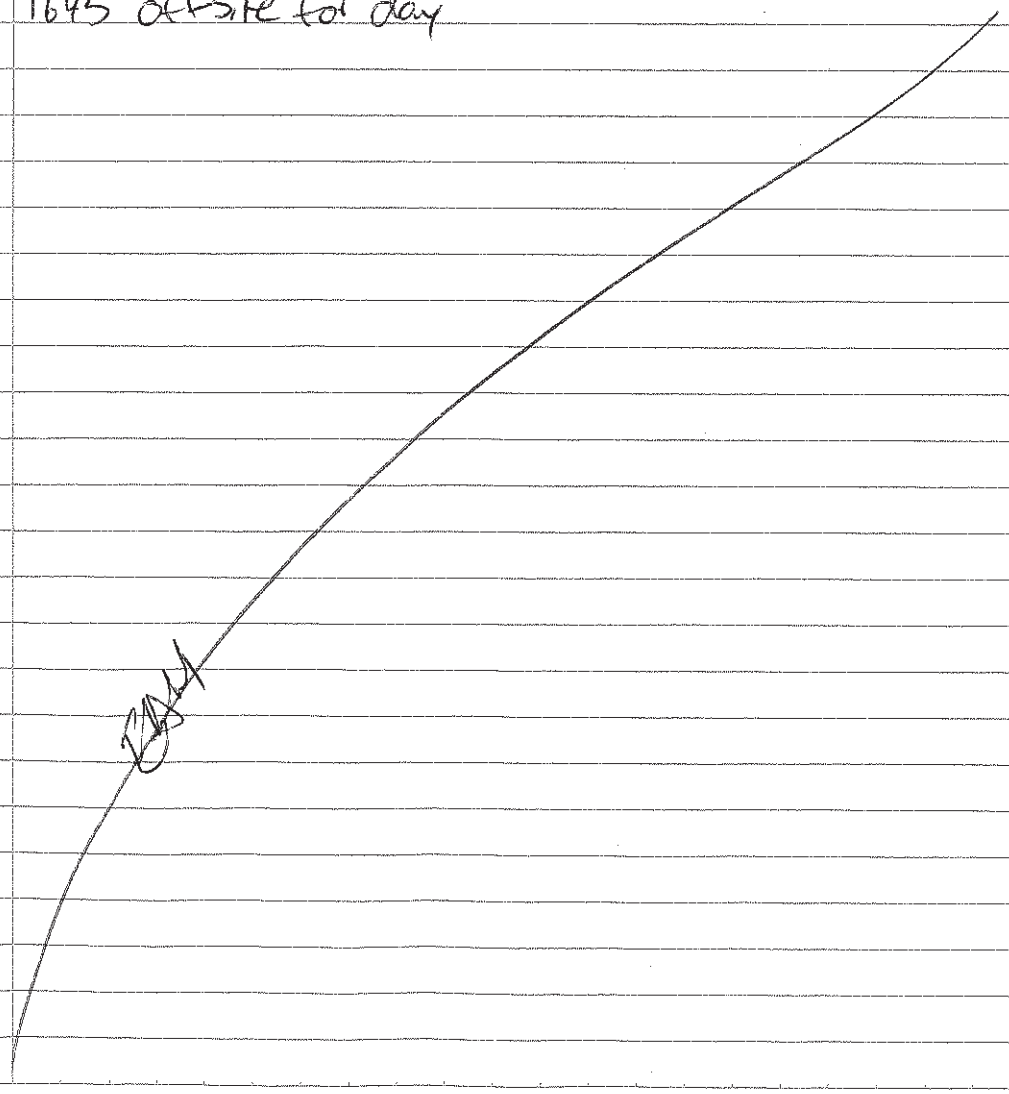
0800 - Took 03-05 Soil Sample
WSTF-A03-SB0001-0305-20230810

0842 - Drillers finish Grouting & get ready to clean up site
0934 - Call w/ Dan - Still working on tripping in Still has >9 rods to go.
0950 - Jake needs to leave to get more concrete.
1010 moving rig off hole
1057 mobilizing rig to laydown area
1145 - leave base to ship Samples
1300 - Coming back to site
1226 - Dan had Pump set up but not Pulling water - needed to call Larry
1330 - Dan called back, was able to get Pump working
1335 - Back on site

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT:

1345 – Head to get water with drillers
1420 on site at Development
1527 WL after stop development @ 385.0
400 Gallons total
1600 Dan packs up & we mob back to other site
1645 offsite for day



JAN FEB MAR AP
1 2 3 4 5 6 7 8 9 10 11

SUBJECT: Clean.n

0600 on s.
0605 mob
0635 on s.
is 182.
0654 trailer
area.
0718 leave for
0800 Decon
0850 leav.
0920 Decon
1030 Still
1100 Develop
1142 Still
1215 Developer
decon
1300 Driller
1430 load
1500 Decon
1600 Flat b
1654 Still
1720 Still
1741 finish
1750 leav

SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

drillers

t @ 385.0

k to other Site

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Cleaning up site

0600 on site at Gate, Dan half hour late
0605 mob to get ice, Mike brought donuts
0635 on site at 100-001-GW - WL is 182.6 ft btoc!
0654 trailering up trucks to take to laydown area.
0718 leave for site 600-005-GW
0800 cleaning up at Site 600-005 GW
0850 leaving 600-005-GW
0920 Deconing casing/Gear
1030 Still deconing casing/Gear
1100 Developer comes over to decon area
1142 Still deconing casing larger diameter
1215 Developer done for day leaving Site, drillers still deconning Developer offsite 1230
1300 Drillers loading up flatbed w/casing
1430 load up Generator
1500 Deconning rig
1600 Flat beds leave with Generator
1654 Still deconing rig
1720 Still deconning rig
1741 finishing up decon for the day
1750 leaving site for day

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: 3 ft stick up

Well name/#	600C-005-Gw	100-001-Gw
date/time of well construction	7/31/23 0900	8/9-8/10/23
borehole diam/well casing diam	9 5/8 (240-420) 11 3/4 (0-240)	PVC 5 (0-100) S.S. 3 5
well depth	421.55 btoc	255+3ft = ~258 ft btoc
Casing length	396.55 ft toc	255 bgs
Casing material	Sch 80 PVC	"
casing & screen joint type	screw on	"
Screened interval	396.55 - 411.55 btoc	~~245-225~~ ~~233-263~~
Screen material	stainless steel	"
Screen slot size & design	0.020	"
filterpack material & size	Silica sand 10/20 ~~30/65 #60~~	260-220
filterPack volume (calculated-tactual)	47 (50lb bags)	23 (4bags sieved)
filter Pack Placement method	Gravity	"
Filter Pack intervals	419-382 (bgs)	→ bgs
annular seal composition	~~Silica Sand~~ Bentonite	no lie Plug
Placement Gravity	379-373.5	"
Volume	3 (50lb bags)	3 bags
interval	379-373.5	212-217
Grout Sealant composition	Quik Grout	bentonite at bottom
Placement Gravity		52 on bottom
Volume	~~28~~ (50lb bags) 84 total	12 bags Grout
interval	373.5-10ft	
Surface Completion & well apron design	10 bag (50lb) Portland Cement	
well CapV	10-0	10-0ft
Construction of Protective casing	Steel	
well development volume	400 Gallons	

JAN FEB MAR APR

1 2 3 4 5 6 7 8 9 10 11 12

SUBJECT: Drillers

0600 on site
0610 Grab Ic
0630 at Deco
- Drillers contu
0708 still waiting
0720 M.Ke Flor
0800 - Drillers
0840 - mob to
0900 - Dump D
loading up
0939 - Dan clean
1000 - Dan dump
on 100-00
1215 - Surging
1246 - finish
1250 Bailing
1313 DTW -
1332 setting
1440 Drillers
1450 - setting
1500 Sample
WSTF - ID
1510 - label TB
↳ WSTF - TB
Start development
1511 205 ft bto
1604 254 ft bt
1630 offsite

SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

5. Gw	100-001-Gw
900	8/9/-8/10/23
0) 11¾(0-3½)	95/5(0-100) 8.5 flow 35
toc	255+3ft = ~258ft DTOC
ft toc	255 bgs
	"
	"
	245-225
otoc	233-253
	"
	"
	260-220
bags)	23 (4bags Sieved)
	"
	→ bgs
ntonite	no Ice Plug
5	ft
	3 bags
	212-217
ut	bentonite at bottom
	52 on bottom
5¼ total	12 bags Grout
+	↓
	10 bags (5/16) Portland Cement
0	10-ft
allons	

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Drillers Demob, Development of 100-001-Gw

0600 on site at Gate
0610 Grab Ice and mob to Decon Pad
0630 at Decon Pad, waiting on second escort
- Drillers continue decon
0708 still waiting on second escort
0720 Mike Flora on site - Take Dan over to frack tank
0800 - Drillers decon'ing, Dan Pumping IDW into tank
0840 - mob to dump decon water
0900 - Dump Decon, head back to Pad, Drillers loading up, Dan Pumping
0939 - Dan cleans off Pad a bit, drillers still loading
1000 - Dan dumps 250 decon water, and start set up on 100-001-Gw
1215 - Surging well initial DTW 175.56 DTB 258.60
1246 - finish surging well DTW 180.05ft DTOC
1250 Bailing well ~5 Gallons
1313 DTW - 186.7 DTB - same
1337 setting up Pump
1440 Drillers Demob/head off site
1450 - Setting up Pump (complete)
1500 Sample Liquid IDW for 600C-005-GW
WSTF-IDW-20230813-03
1510 - label TB
↳ WSTF-TB-20230813-03
start development
1511 205 ft btoc (Dropping steady) 1 gal/min
1604 254 ft btoc - end development for day (1 well vol)
1630 offsite

TBH

Cloudy!

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Development

0605 onsite at Gate, waiting on Dan
0615 go through Gate, Get Ice
0625 set up at 100-001-GW
0645 - Start Pumping well WL 181 ft btoc
6:52 WL 205 ft btoc @ 1 gal/min
6:58 WL 214 ft btoc @ 1 gal/min
7:16 WL 235 ft btoc @ 1 gal/min call w/ Sarah
7:39 Turned off Pump to let recharge
removed ~130 Gallons
0817 at Decon pad for cleanup
0930 still at Decon pad for cleanup, moving to 600 well
1059 Back at 100 site, WL ~201 need to wait a bit longer for recharge before we can Pump again.
1130 calibrate YSI & Hanna Turb meter
1200 WL ~201
1237 WL ~200
1245 Mike escorts me to Decon Pad, I grab last of Garbage left by drillers, mob offsite to dispose of trash at hotel
1450 - Back onsite at well, Start Purge
WL 191 ft btoc
1540 finish Purge / call Sarah, take a couple readings in morning to check turb.
1614 Leaving Site for day

7th is water callow
80% 59.2

JAN FEB MAR APR
1 2 3 4 5 6 7 8 9 10 11 12

SUBJECT: Finish De

0600 onsite
0627 at 100-
0700 start
0715 Turbidity
is still Jump
0720 increase
0730 Pumpe
0740 take
↳ WSTF-I
0750 Driller
0840 finish
0900 WLT
Pump
0940 Dem
0956 mo
of well &
roll off
1013 Porta Potty
10 min, I'm he

SEP OCT NOV DEC
22 23 24 25 26 27 28 29 30 31

on Day

1 ftbtoc

gal/min

al/min

al/min call ursarah

t recharge

nothing to 600 well

200 need to

before we can

h meter

ed, I grab last

nob offsite to

rt Purge

take a couple

turb.

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

SUBJECT: Finish Development + mob offsite

0600 onsite at Gate
0627 at 100-001-GW / calibrate
0700 start taking readings. 1GPM
0715 Turbidity is lower than yesterday but is still Jumping, everything else is stable
0720 increase flow to 3GPM to Pump dry
0730 Pumped dry
0740 take IDW sample
↳ WSTF-IDW-20230815-04
0750 Dailer starts tripping out
0840 finish tripping out
0900 WLT 222.8 ftbtoc
Pump off water
0940 Developer offsite
0956 mob to 600C to take Photo of well + label IDW sample on roll off
1013 Porta Potty man (Dale) will be here in 10 min, I'm heading offsite to Ship.

Appendix B
Laboratory Data

TETRA TECH

INTERNAL CORRESPONDENCE

TO: **S. DAMPHOUSSE** **DATE:** **OCTOBER 16, 2023**

FROM: **CALVIN J. LODGE** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – POLY- AND PERFLUOROALKYL SUBSTANCES**
NASA-WHITE SANDS
SAMPLE DELIVERY GROUP (SDG) YI15029

SAMPLES: 9/Aqueous/PFAS

WSTF-A03-100-001-GW-240-20230913
WSTF-A08-EFF0001-20230914
WSTF-A08-EFF0002-20230914
WSTF-A08-INF0001-20230914
WSTF-A08-INF0002-20230914
WSTF-A11-600C-005-GW-402-20230913
WSTF-EB-20230913-07
WSTF-FB-20230913-08
WSTF-FB-20230914-09

Overview

The sample set for NASA-White Sands, SDG YI15029, consisted of six (6) aqueous samples, one (1) equipment blank, and two (2) field blanks. All nine (9) samples were analyzed for poly-and perfluoroalkyl substances (PFAS). No field duplicate pairs were associated with this SDG.

The samples were collected by Tetra Tech, Inc. on September 13 and 14, 2023, and analyzed by Pace Analytical Services. All analyses were conducted in accordance with Department of Defense ((DOD)/Department of Energy (DOE) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.4, PFAS using LC/MS/MS Appendix B Table B-15 (2021). The data contained in this SDG was validated via EPA Stage 4 with regard to the following parameters:

* • Data completeness
* • Hold times/Sample Preservation
* • Mass Calibration
* • LC/MS/MS System Tuning and Performance
* • Mass Spectral Acquisition Rate
* • Instrument Sensitivity Check
* • Ion Transition Check
* • Ion Ratios
* • Initial/Continuing Calibrations
* • Laboratory Instrument/Method and Field Blank Results
* • Extraction Internal Standard Recoveries
* • Laboratory Control Sample/Laboratory Control Sample Duplicate Results
* • Compound Identification
* • Compound Quantitation
* • Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Qualified analytical results are presented in Appendix A, results as reported by the laboratory are presented in Appendix B, and documentation supporting these findings is presented in Appendix C.

Notes

Detected results reported below the Limit of Quantitation (LOQ) but above the Detection Limit (DL) were qualified as estimated, (J).

Non-detected results were reported to the Limit of Detection (LOD).

PFAS

None.

Additional Comments

The percent recovery (%R) for the extracted internal standard 13C2-6:2 fluorotelomer sulfonate (13C2-6:2FTS) was above the 150% quality control limit in samples WSTF-EB-20230913-07, WSTF-FB-20230913-08, and WSTF-FB-20230914-09. No action was necessary since 6:2 FTS was not detected in any sample.

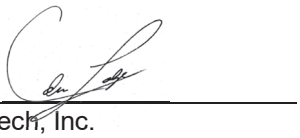
Instances of manual integrations were present in this data package. All manual integrations were documented by the laboratory and are noted in the raw data of the original data package.

Executive Summary

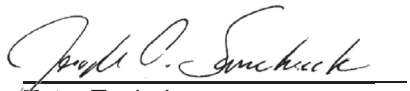
Laboratory Performance Issues: None

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the Department of Defense (DOD) document entitled “Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis be QSM Table B15” (May 1, 2020). The text of this report has been formulated to address only those areas affecting data quality.



Tetra Tech, Inc.
Calvin J. Lodge
Chemist/Data Validator



Tetra Tech, Inc.
Joseph A. Samchuck
Data Validation Manager

Attachments:
Appendix A - Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Data Qualifier Definitions

The following definitions provide brief explanations of the validation qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted detection limit.
J	The result is an estimated value with an unknown bias. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The reported detection limit is approximate and may be inaccurate or imprecise.
NJ	The analyte has been “tentatively identified” or “presumptively” as present and the associated numerical value is the estimated concentration in the sample.
R	The sample result (detected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
UR	The sample result (nondetected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team, but exclusion of the data is recommended.

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's r < 0.995
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient r < 0.995
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 standard deviations is greater than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed
Z3 = Tentatively Identified Compound aldol condensate
Z4 = Sample activity is less than the at uncertainty at 3 standard deviations and greater than the MDC
Z5 = Sample activity is less than the at uncertainty at 3 standard deviations and less than the MDC

PROJ_NO: 09033W	NSAMPLE	WSTF-A03-100-001-GW-240-202309			WSTF-A08-EFF0001-20230914			WSTF-A08-EFF0002-20230914			WSTF-A08-INF0001-20230914		
SDG: YI15029	LAB_ID	YI15029-001			YI15029-004			YI15029-006			YI15029-003		
FRACTION: PFAS	SAMP_DATE	9/13/2023			9/14/2023			9/14/2023			9/14/2023		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	NG/L			NG/L			NG/L			NG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
10:2 FLUOROTELOMER SULFONATE (10:2FTS)		3.6	U		3.6	U		3.5	U		3.6	U	
11CL-PF3OUDS		3.6	U		3.6	U		3.5	U		3.6	U	
2-(N-ETHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-ETFOSE)		3.6	U		3.6	U		3.5	U		3.6	U	
2-(N-METHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-MEFOSE)		3.6	U		3.6	U		3.5	U		3.6	U	
4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)		3.6	U		3.6	U		3.5	U		3.6	U	
4:2 FLUOROTELOMER SULFONATE		3.6	U		3.6	U		3.5	U		3.6	U	
6:2 FLUOROTELOMER SULFONATE (6:2FTS)		3.6	U		3.6	U		3.5	U		3.6	U	
8:2 FLUOROTELOMER SULFONATE (8:2FTS)		3.6	U		3.6	U		3.5	U		3.6	U	
9CL-PF3ONS		3.6	U		3.6	U		3.5	U		3.6	U	
HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)		3.6	U		3.6	U		3.5	U		3.6	U	
N-ETHYLPERFLUORO-1-OCTANESULFONAMIDE (N-ETFOSA)		3.6	U		3.6	U		3.5	U		3.6	U	
N-ETHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NEFOSA)		3.6	U		3.6	U		3.5	U		3.6	U	
N-METHYLPERFLUORO-1-OCTANESULFONAMIDE (N-MEFOSA)		7	U		7	U		7	U		7	U	
N-METHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NMFOSA)		3.6	U		3.6	U		3.5	U		3.6	U	
PENTADECAFLUOROOCTANOIC ACID (PFOA)		1.8	U		2.7	J	P	1.8	U		2.8	J	P
PERFLUOROBUTANESULFONIC ACID (PFBS)		1.8	U		0.92	J	P	1.8	U		0.89	J	P
PERFLUOROBUTANOIC ACID (PFBA)		1.8	U		53			1.8	U		52		
PERFLUORODECANESULFONIC ACID (PFDS)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUORODECANOIC ACID (PFDA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUORODODECANESULFONIC ACID (PFDOS)		3.6	U		3.6	U		3.5	U		3.6	U	
PERFLUORODODECANOIC ACID (PFDOA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROHEPTANESULFONIC ACID (PFHPS)		1.8	U		1.8	U		1.8	U		1.8	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-A08-INF0002-20230914			WSTF-A11-600C-005-GW-402-20230			WSTF-EB-20230913-07			WSTF-FB-20230913-08		
SDG: YI15029	LAB_ID	YI15029-005			YI15029-002			YI15029-007			YI15029-008		
FRACTION: PFAS	SAMP_DATE	9/14/2023			9/13/2023			9/13/2023			9/13/2023		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	NG/L			NG/L			NG/L			NG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
10:2 FLUOROTELOMER SULFONATE (10:2FTS)		3.7	U		3.5	U		3.6	U		3.7	U	
11CL-PF3OUDS		3.7	U		3.5	U		3.6	U		3.7	U	
2-(N-ETHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-ETFOSE)		3.7	U		3.5	U		3.6	U		3.7	U	
2-(N-METHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-MEFOSE)		3.7	U		3.5	U		3.6	U		3.7	U	
4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)		3.7	U		3.5	U		3.6	U		3.7	U	
4:2 FLUOROTELOMER SULFONATE		3.7	U		3.5	U		3.6	U		3.7	U	
6:2 FLUOROTELOMER SULFONATE (6:2FTS)		3.7	U		3.5	U		3.6	U		3.7	U	
8:2 FLUOROTELOMER SULFONATE (8:2FTS)		3.7	U		3.5	U		3.6	U		3.7	U	
9CL-PF3ONS		3.7	U		3.5	U		3.6	U		3.7	U	
HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)		3.7	U		3.5	U		3.6	U		3.7	U	
N-ETHYLPERFLUORO-1-OCTANESULFONAMIDE (N-ETFOSA)		3.7	U		3.5	U		3.6	U		3.7	U	
N-ETHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NEFOSA)		3.7	U		3.5	U		3.6	U		3.7	U	
N-METHYLPERFLUORO-1-OCTANESULFONAMIDE (N-MEFOSA)		7.5	U		7	U		7	U		7.5	U	
N-METHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NMFOSA)		3.7	U		3.5	U		3.6	U		3.7	U	
PENTADECAFLUOROOCTANOIC ACID (PFOA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROBUTANESULFONIC ACID (PFBS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROBUTANOIC ACID (PFBA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORODECANESULFONIC ACID (PFDS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORODECANOIC ACID (PFDA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORODODECANESULFONIC ACID (PFDOS)		3.7	U		3.5	U		3.6	U		3.7	U	
PERFLUORODODECANOIC ACID (PFDOA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROHEPTANESULFONIC ACID (PFHPS)		1.9	U		1.8	U		1.8	U		1.9	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-FB-20230914-09		
SDG: YI15029	LAB_ID	YI15029-009		
FRACTION: PFAS	SAMP_DATE	9/14/2023		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	NG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
10:2 FLUOROTELOMER SULFONATE (10:2FTS)		3.7	U	
11CL-PF3OUDS		3.7	U	
2-(N-ETHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-ETFOSE)		3.7	U	
2-(N-METHYL PERFLUOROOCTANESULFONAMIDO-ETHANOL) (N-MEFOSE)		3.7	U	
4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)		3.7	U	
4:2 FLUOROTELOMER SULFONATE		3.7	U	
6:2 FLUOROTELOMER SULFONATE (6:2FTS)		3.7	U	
8:2 FLUOROTELOMER SULFONATE (8:2FTS)		3.7	U	
9CL-PF3ONS		3.7	U	
HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)		3.7	U	
N-ETHYLPERFLUORO-1-OCTANESULFONAMIDE (N-ETFOSA)		3.7	U	
N-ETHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NEFOSA)		3.7	U	
N-METHYLPERFLUORO-1-OCTANESULFONAMIDE (N-MEFOSA)		7.5	U	
N-METHYLPERFLUOROOCTANE SULFONAMIDOACETATE(NMFOSA)		3.7	U	
PENTADECAFLUOROOCTANOIC ACID (PFOA)		1.9	U	
PERFLUOROBUTANESULFONIC ACID (PFBS)		1.9	U	
PERFLUOROBUTANOIC ACID (PFBA)		1.9	U	
PERFLUORODECANESULFONIC ACID (PFDS)		1.9	U	
PERFLUORODECANOIC ACID (PFDA)		1.9	U	
PERFLUORODODECANESULFONIC ACID (PFDOS)		3.7	U	
PERFLUORODODECANOIC ACID (PFDOA)		1.9	U	
PERFLUOROHEPTANESULFONIC ACID (PFHPS)		1.9	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-A03-100-001-GW-240-202309			WSTF-A08-EFF0001-20230914			WSTF-A08-EFF0002-20230914			WSTF-A08-INF0001-20230914		
SDG: YI15029	LAB_ID	YI15029-001			YI15029-004			YI15029-006			YI15029-003		
FRACTION: PFAS	SAMP_DATE	9/13/2023			9/14/2023			9/14/2023			9/14/2023		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	NG/L			NG/L			NG/L			NG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
PERFLUOROHEPTANOIC ACID (PFHPA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROHEXADECANOIC ACID (PFHXDA)		3.6	U		3.6	U		3.5	U		3.6	U	
PERFLUOROHEXANESULFONIC ACID (PFHXS)		1.8	U		3.5	J	P	1.8	U		3.6		
PERFLUOROHEXANOIC ACID (PFHXA)		1.8	U		1.9	J	P	1.8	U		1.8	J	P
PERFLUORONONANESULFONIC ACID (PFNS)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUORONONANOIC ACID (PFNA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROOCTADECANOIC ACID (PFODA)		3.6	U		3.6	U		3.5	U		3.6	U	
PERFLUOROOCTANE SULFONAMIDE (FOSA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROOCTANESULFONIC ACID (PFOS)		1.8	U		4.9			1.8	U		7.3		
PERFLUOROPENTANESULFONIC ACID (PFPES)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROPENTANOIC ACID (PFPEA)		1.8	U		1.3	J	P	1.8	U		1.1	J	P
PERFLUOROTETRADECANOIC ACID (PFTEA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROTRIDECANOIC ACID (PFTRIA)		1.8	U		1.8	U		1.8	U		1.8	U	
PERFLUOROUNDECANOIC ACID (PFUNA)		1.8	U		1.8	U		1.8	U		1.8	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-A08-INF0002-20230914			WSTF-A11-600C-005-GW-402-20230			WSTF-EB-20230913-07			WSTF-FB-20230913-08		
SDG: YI15029	LAB_ID	YI15029-005			YI15029-002			YI15029-007			YI15029-008		
FRACTION: PFAS	SAMP_DATE	9/14/2023			9/13/2023			9/13/2023			9/13/2023		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	NG/L			NG/L			NG/L			NG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
PERFLUOROHEPTANOIC ACID (PFHPA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROHEXADECANOIC ACID (PFHXDA)		3.7	U		3.5	U		3.6	U		3.7	U	
PERFLUOROHEXANESULFONIC ACID (PFHXS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROHEXANOIC ACID (PFHXA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORONONANESULFONIC ACID (PFNS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUORONONANOIC ACID (PFNA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROOCTADECANOIC ACID (PFODA)		3.7	U		3.5	U		3.6	U		3.7	U	
PERFLUOROOCTANE SULFONAMIDE (FOSA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROOCTANESULFONIC ACID (PFOS)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROPENTANESULFONIC ACID (PFPES)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROPENTANOIC ACID (PFPEA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROTETRADECANOIC ACID (PFTEA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROTRIDECANOIC ACID (PFTRIA)		1.9	U		1.8	U		1.8	U		1.9	U	
PERFLUOROUNDECANOIC ACID (PFUNA)		1.9	U		1.8	U		1.8	U		1.9	U	

PROJ_NO: 09033W	NSAMPLE	WSTF-FB-20230914-09		
SDG: YI15029	LAB_ID	YI15029-009		
FRACTION: PFAS	SAMP_DATE	9/14/2023		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	NG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
PERFLUOROHEPTANOIC ACID (PFHPA)		1.9	U	
PERFLUOROHEXADECANOIC ACID (PFHXDA)		3.7	U	
PERFLUOROHEXANESULFONIC ACID (PFHXS)		1.9	U	
PERFLUOROHEXANOIC ACID (PFHXA)		1.9	U	
PERFLUORONONANESULFONIC ACID (PFNS)		1.9	U	
PERFLUORONONANOIC ACID (PFNA)		1.9	U	
PERFLUOROOCTADECANOIC ACID (PFODA)		3.7	U	
PERFLUOROOCTANE SULFONAMIDE (FOSA)		1.9	U	
PERFLUOROOCTANESULFONIC ACID (PFOS)		1.9	U	
PERFLUOROPENTANESULFONIC ACID (PFPES)		1.9	U	
PERFLUOROPENTANOIC ACID (PFPEA)		1.9	U	
PERFLUOROTETRADECANOIC ACID (PFTEA)		1.9	U	
PERFLUOROTRIDECANOIC ACID (PFTRIA)		1.9	U	
PERFLUOROUNDECANOIC ACID (PFUNA)		1.9	U	

Appendix B

Results as Reported by the Laboratory

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-001
Description: WSTF-A03-100-001-GW-240-20230913
Matrix: Aqueous
Date Sampled: 09/13/2023 1110
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0506	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.5	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		96	50-150
13C2_6:2FTS		113	50-150
13C2_8:2FTS		87	50-150
13C2_PFDoA		79	50-150
13C2_PFHxDA		84	50-150
13C2_PFTeDA		85	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-001
Description: WSTF-A03-100-001-GW-240-20230913
Matrix: Aqueous
Date Sampled: 09/13/2023 1110
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		86	50-150
13C3_PFHxS		91	50-150
13C3-HFPO-DA		91	50-150
13C4_PFBA		96	50-150
13C4_PFHpA		90	50-150
13C5_PFHxA		88	50-150
13C5_PFPeA		94	50-150
13C6_PFDA		83	50-150
13C7_PFUdA		85	50-150
13C8_PFOA		89	50-150
13C8_PFOS		85	50-150
13C8_PFOSA		91	50-150
13C9_PFNA		89	50-150
d-EtFOSA		64	50-150
d5-EtFOSAA		82	50-150
d9-EtFOSE		78	50-150
d-MeFOSA		73	50-150
d3-MeFOSAA		82	50-150
d7-MeFOSE		86	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-002
Description: WSTF-A11-600C-005-GW-402-20230913
Matrix: Aqueous
Date Sampled: 09/13/2023 1430
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0517	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.5	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.88	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		102	50-150
13C2_6:2FTS		117	50-150
13C2_8:2FTS		98	50-150
13C2_PFDoA		87	50-150
13C2_PFHxDA		86	50-150
13C2_PFTeDA		92	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-002
Description: WSTF-A11-600C-005-GW-402-20230913
Matrix: Aqueous
Date Sampled: 09/13/2023 1430
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		94	50-150
13C3_PFHxS		95	50-150
13C3-HFPO-DA		98	50-150
13C4_PFBA		94	50-150
13C4_PFHpA		84	50-150
13C5_PFHxA		89	50-150
13C5_PFPeA		95	50-150
13C6_PFDA		88	50-150
13C7_PFUdA		90	50-150
13C8_PFOA		98	50-150
13C8_PFOS		87	50-150
13C8_PFOSA		90	50-150
13C9_PFNA		90	50-150
d-EtFOSA		70	50-150
d5-EtFOSAA		87	50-150
d9-EtFOSE		97	50-150
d-MeFOSA		74	50-150
d3-MeFOSAA		87	50-150
d7-MeFOSE		88	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-003
Description: WSTF-A08-INF0001-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1145
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0528	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.6	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	0.89	J	3.6	1.8	0.89	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	3.6		3.6	1.8	0.89	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	52		3.6	1.8	0.89	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	UM-01	3.6	1.8	0.89	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	JM-03	3.6	1.8	0.89	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.6	U	7.1	3.6	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	2.8	JM-03	3.6	1.8	0.89	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.1	J	3.6	1.8	0.89	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.89	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	7.3	M-06	3.6	1.8	0.89	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		103	50-150
13C2_6:2FTS		129	50-150
13C2_8:2FTS		115	50-150
13C2_PFDoA		104	50-150
13C2_PFHxDA		83	50-150
13C2_PFTeDA		103	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-003
Description: WSTF-A08-INF0001-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1145
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		103	50-150
13C3_PFHxS		101	50-150
13C3-HFPO-DA		109	50-150
13C4_PFBA		100	50-150
13C4_PFHpA		104	50-150
13C5_PFHxA		108	50-150
13C5_PFPeA		101	50-150
13C6_PFDA		103	50-150
13C7_PFUdA		105	50-150
13C8_PFOA		111	50-150
13C8_PFOS		99	50-150
13C8_PFOSA		100	50-150
13C9_PFNA		103	50-150
d-EtFOSA		81	50-150
d5-EtFOSAA		104	50-150
d9-EtFOSE		93	50-150
d-MeFOSA		69	50-150
d3-MeFOSAA		89	50-150
d7-MeFOSE		101	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-004
Description: WSTF-A08-EFF0001-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 0800
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0600	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.6	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	0.92	J	3.6	1.8	0.90	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	3.5	J	3.6	1.8	0.90	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	53		3.6	1.8	0.90	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.9	JM-01	3.6	1.8	0.90	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	2.7	J	3.6	1.8	0.90	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.3	J	3.6	1.8	0.90	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	4.9	M-06	3.6	1.8	0.90	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		104	50-150
13C2_6:2FTS		102	50-150
13C2_8:2FTS		97	50-150
13C2_PFDoA		89	50-150
13C2_PFHxDA		87	50-150
13C2_PFTeDA		97	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-004
Description: WSTF-A08-EFF0001-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 0800
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		95	50-150
13C3_PFHxS		97	50-150
13C3-HFPO-DA		98	50-150
13C4_PFBA		85	50-150
13C4_PFHpA		91	50-150
13C5_PFHxA		94	50-150
13C5_PFPeA		92	50-150
13C6_PFDA		97	50-150
13C7_PFUdA		87	50-150
13C8_PFOA		96	50-150
13C8_PFOS		86	50-150
13C8_PFOSA		92	50-150
13C9_PFNA		90	50-150
d-EtFOSA		73	50-150
d5-EtFOSAA		89	50-150
d9-EtFOSE		84	50-150
d-MeFOSA		83	50-150
d3-MeFOSAA		94	50-150
d7-MeFOSE		91	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-005
Description: WSTF-A08-INF0002-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1340
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0610	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.5	U	15	7.5	3.7	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.7	U	7.3	3.7	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.92	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		95	50-150
13C2_6:2FTS		114	50-150
13C2_8:2FTS		103	50-150
13C2_PFDoA		95	50-150
13C2_PFHxDA		92	50-150
13C2_PFTeDA		102	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-005
Description: WSTF-A08-INF0002-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1340
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		99	50-150
13C3_PFHxS		104	50-150
13C3-HFPO-DA		104	50-150
13C4_PFBA		97	50-150
13C4_PFHpA		93	50-150
13C5_PFHxA		100	50-150
13C5_PFPeA		97	50-150
13C6_PFDA		103	50-150
13C7_PFUdA		97	50-150
13C8_PFOA		103	50-150
13C8_PFOS		103	50-150
13C8_PFOSA		98	50-150
13C9_PFNA		101	50-150
d-EtFOSA		67	50-150
d5-EtFOSAA		97	50-150
d9-EtFOSE		93	50-150
d-MeFOSA		70	50-150
d3-MeFOSAA		94	50-150
d7-MeFOSE		86	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-006
Description: WSTF-A08-EFF0002-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1350
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0621	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.5	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.5	U	7.0	3.5	1.7	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.8	U	3.5	1.8	0.87	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		112	50-150
13C2_6:2FTS		130	50-150
13C2_8:2FTS		114	50-150
13C2_PFDoA		103	50-150
13C2_PFHxDA		105	50-150
13C2_PFTeDA		112	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-006
Description: WSTF-A08-EFF0002-20230914
Matrix: Aqueous
Date Sampled: 09/14/2023 1350
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		112	50-150
13C3_PFHxS		114	50-150
13C3-HFPO-DA		113	50-150
13C4_PFBA		110	50-150
13C4_PFHpA		103	50-150
13C5_PFHxA		112	50-150
13C5_PFPeA		110	50-150
13C6_PFDA		117	50-150
13C7_PFUdA		112	50-150
13C8_PFOA		113	50-150
13C8_PFOS		110	50-150
13C8_PFOSA		115	50-150
13C9_PFNA		105	50-150
d-EtFOSA		85	50-150
d5-EtFOSAA		107	50-150
d9-EtFOSE		102	50-150
d-MeFOSA		86	50-150
d3-MeFOSAA		104	50-150
d7-MeFOSE		99	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-007
Description: WSTF-EB-20230913-07
Matrix: Aqueous
Date Sampled: 09/13/2023 1550
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0631	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.6	UQ	7.2	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.0	U	14	7.0	3.6	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.6	U	7.2	3.6	1.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.8	U	3.6	1.8	0.90	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		134	50-150
13C2_6:2FTS	N	161	50-150
13C2_8:2FTS		125	50-150
13C2_PFDoA		112	50-150
13C2_PFHxDA		101	50-150
13C2_PFTeDA		121	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-007
Description: WSTF-EB-20230913-07
Matrix: Aqueous
Date Sampled: 09/13/2023 1550
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		123	50-150
13C3_PFHxS		128	50-150
13C3-HFPO-DA		129	50-150
13C4_PFBA		123	50-150
13C4_PFHpA		121	50-150
13C5_PFHxA		123	50-150
13C5_PFPeA		119	50-150
13C6_PFDA		120	50-150
13C7_PFUdA		114	50-150
13C8_PFOA		130	50-150
13C8_PFOS		112	50-150
13C8_PFOSA		113	50-150
13C9_PFNA		124	50-150
d-EtFOSA		83	50-150
d5-EtFOSAA		111	50-150
d9-EtFOSE		114	50-150
d-MeFOSA		82	50-150
d3-MeFOSAA		122	50-150
d7-MeFOSE		105	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech
Laboratory ID: YI15029-008
Description: WSTF-FB-20230913-08
Matrix: Aqueous
Date Sampled: 09/13/2023 1600
Project Name: NASA White Sands
Date Received: 09/15/2023
Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0642	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.7	UQ	7.4	3.7	1.9	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.5	U	15	7.5	3.7	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		114	50-150
13C2_6:2FTS	N	165	50-150
13C2_8:2FTS		119	50-150
13C2_PFDoA		111	50-150
13C2_PFHxDA		94	50-150
13C2_PFTeDA		107	50-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
U = Not detected at or above the LOD
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
LOD = Limit of Detection
S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech			Laboratory ID: YI15029-008
Description: WSTF-FB-20230913-08			Matrix: Aqueous
Date Sampled: 09/13/2023 1600		Project Name: NASA White Sands	
Date Received: 09/15/2023		Project Number: 112G09033	

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		115	50-150
13C3_PFHxS		113	50-150
13C3-HFPO-DA		123	50-150
13C4_PFBA		116	50-150
13C4_PFHpA		111	50-150
13C5_PFHxA		111	50-150
13C5_PFPeA		119	50-150
13C6_PFDA		119	50-150
13C7_PFUdA		101	50-150
13C8_PFOA		122	50-150
13C8_PFOS		102	50-150
13C8_PFOSA		116	50-150
13C9_PFNA		113	50-150
d-EtFOSA		73	50-150
d5-EtFOSAA		109	50-150
d9-EtFOSE		105	50-150
d-MeFOSA		79	50-150
d3-MeFOSAA		107	50-150
d7-MeFOSE		112	50-150

LOQ = Limit of Quantitation	B = Detected in the method blank	E = Quantitation of compound exceeded the calibration range	DL = Detection Limit	Q = Surrogate failure
U = Not detected at or above the LOD	N = Recovery is out of criteria	P = The RPD between two GC columns exceeds 40%	J = Estimated result < LOQ and ≥ DL	L = LCS/LCSD failure
H = Out of holding time	W = Reported on wet weight basis	LOD = Limit of Detection		S = MS/MSD failure

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PFAS by LC/MS/MS

Client: Tetra Tech | Laboratory ID: YI15029-009
Description: WSTF-FB-20230914-09 | Matrix: Aqueous
Date Sampled: 09/14/2023 0925 | Project Name: NASA White Sands
Date Received: 09/15/2023 | Project Number: 112G09033

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP QSM B-15	1	09/29/2023 0652	OMNS	09/27/2023 2024	85972

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	LOD	DL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	3.7	UQ	7.4	3.7	1.9	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	7.5	U	15	7.5	3.7	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	3.7	U	7.4	3.7	1.9	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	1.9	U	3.7	1.9	0.93	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		119	50-150
13C2_6:2FTS	N	153	50-150
13C2_8:2FTS		120	50-150
13C2_PFDoA		104	50-150
13C2_PFHxDA		63	50-150
13C2_PFTeDA		82	50-150

LOQ = Limit of Quantitation
U = Not detected at or above the LOD
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%
LOD = Limit of Detection
DL = Detection Limit
J = Estimated result < LOQ and ≥ DL
Q = Surrogate failure
L = LCS/LCSD failure
S = MS/MSD failure

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106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: Tetra Tech			Laboratory ID: YI15029-009
Description: WSTF-FB-20230914-09			Matrix: Aqueous
Date Sampled: 09/14/2023 0925		Project Name: NASA White Sands	
Date Received: 09/15/2023		Project Number: 112G09033	

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		117	50-150
13C3_PFHxS		116	50-150
13C3-HFPO-DA		119	50-150
13C4_PFBA		114	50-150
13C4_PFHpA		106	50-150
13C5_PFHxA		108	50-150
13C5_PFPeA		109	50-150
13C6_PFDA		112	50-150
13C7_PFUdA		114	50-150
13C8_PFOA		119	50-150
13C8_PFOS		107	50-150
13C8_PFOSA		104	50-150
13C9_PFNA		113	50-150
d-EtFOSA		76	50-150
d5-EtFOSAA		107	50-150
d9-EtFOSE		94	50-150
d-MeFOSA		72	50-150
d3-MeFOSAA		106	50-150
d7-MeFOSE		97	50-150

LOQ = Limit of Quantitation	B = Detected in the method blank	E = Quantitation of compound exceeded the calibration range	DL = Detection Limit	Q = Surrogate failure
U = Not detected at or above the LOD	N = Recovery is out of criteria	P = The RPD between two GC columns exceeds 40%	J = Estimated result < LOQ and ≥ DL	L = LCS/LCSD failure
H = Out of holding time	W = Reported on wet weight basis	LOD = Limit of Detection		S = MS/MSD failure

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Appendix C

Support Documentation

NASA-WHITE SANDS
SDG YI15029

Initial Calibration 9/20/2023
LCMSMS01.i

PFOS

Analyte Concentration	Analyte Response	Internal Standard Response	Internal Standard Amount	RRF	Reported RRF/RSD
92.8	29619	597564	2000	1.068238	1.068238
185.6	54082	514885	2000	1.131865	1.131865
464	145917	553769	2000	1.135767	1.135767
928	268890	530037	2000	1.093328	1.093328
1856	492223	552943	2000	0.959254	0.959254
4640	1428877	534495	2000	1.152294	1.152294
9280	2652123	499127	2000	1.145156	1.145156
13920	3857093	488047	2000	1.135505	1.135505
18560	5304578	504185	2000	1.133739	1.133739
			Average	1.106127	1.106127
			Standard Deviation	0.061229	
			RSD	0.055355	
			%RSD	5.535464	5.5

Continuing Calibration 09/29/2023 @ 02:27
LCMSMS01.i

PFOS	Analyte Concentration	Target Concentration	Calculation	Calculated %R	Reported %R	QC Limits
	199.39	185.6	199.39/185.60*100	107.4299569	107.0000	70-130

Sample Identification WSTF-A08-INF0001-20230914
Compound PFOS

Compound Area	124429	Average RRF	1.106127
Internal Standard Amount (ng)	2000	Sample Volume(ml)	279.8
Dilution Factor	1	Volume Extract (ml)	5
Internal Standard Area	552131		

Concentration	7.2816	ng/L
Reported Result	7.3	ng/L

Extracted Internal Standard (EIS) 13C8-PFOS
%Recovery = ((Area * DF)/Opening CCV Area) * 100

Calculation	((552131*1)/557998)*100		
Calculated EIS %R	98.94856254		
Reported EIS %R	99	QC Limits	50-150

LCS %R YQ85972-002

	PFOS	Spike amount	LCS concentration
Calculation	14/15*100		
Calculated LCS %R	93.33	15	14
Reported LCS %R	97		

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Injection Vol:	10.0 uL
Sample Type:	Client	Auto Sampler:	77
Lab Sample ID:	YI15029-003	Lab Prep. Batch:	85972
Client ID:	WSTF-A08-INF0001-20230914	Sample Group:	YI15029
Sample Info:	YI15029-003	Misc. Info:	
Inst. ID:	LCMSMS01.i	Operator:	eqi.svoa
Method:	LCMSMS01_PFAS-ID2	Version: V16	30-Jun-2022 10:54:24
Calib Method:	PFAS-ID2	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker

Matrix: Aqueous
Final Conc.: Amt * DF * CF
Concentration Formula: CF = (VF/1000) * 1/VI = 0.0178699

Name	Value	Units	Description
DF	1		Dilution Factor
VF	5000	ul	Final Volume
VI	279.8	ml	Initial Sample Volume

IsoDil Stds %Recovery = ((Area * DF)/Opening CCV Area) * 100

Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1000 ml

Signal	Quant Std	RT (Min)	Exp RT (Min)	Δ RT (Min)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.660	1.660	0.000	1867244	18	>100:1			2000.00	2082.32	100	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													
212.9 > 168.9	46	1.668	1.660	0.000	2174068	17	>100:1			2884.82	51.551		
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		1.989	1.989	0.000	1499479	18	>100:1			2000.00	2038.19	101	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													J
262.9 > 218.9	50	1.989	1.989	0.000	53429	15	63:1			63.432	1.1335		
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.038	2.030	0.000	683621	16	>100:1			2000.00	2232.49	103	
7 Perfluoro-1-butanesulfonate (PFBS) CAS: 375-73-5													U
298.9 > 80	44		2.030		ND								
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													U
349 > 80	44		2.355		ND								
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.290	2.290	0.000	359816	17	>100:1			10000	10563	103	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonate] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.290		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.327	2.327	0.000	1756490	16	>100:1			2000.00	2330.98	108	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													J
313 > 269	49	2.327	2.327	0.000	79100	12	85:1	Target = 15.95		101.28	1.8099		M
313 > 119	49	2.327	2.327		4442	16	23:1	17.80 (7.97-23.93)					
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.449	2.440	0.000	1538028	16	>100:1			10000	10352	109	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.440		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.711	2.711	0.000	2484120	18	>100:1			2000.00	2410.51	104	
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													U
363 > 319	47		2.711		ND								

Signal	Quant Std	RT (Min)	Exp RT (Min)	Δ RT (Min)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.727	2.728	0.000	628751	19	>100:1			2000.00	2059.58	101	
14 Perfluorohexanesulfonate (PFHxS) CAS: 355-46-4													
399 > 80	45	2.727	2.728	0.000	72325	27	>100:1	Target = 3.56	5.31	200.58	3.5844		
399 > 99	45	2.736	2.728		21808	26	>100:1	3.31 (1.78-5.35)	5.23				
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.753		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													U
449 > 80	45		3.162		ND								
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.135	3.127	0.000	431009	23	>100:1			10000	13407	129	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonate] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.109		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.162	3.162	0.000	1951160	20	>100:1			2000.00	2415.79	111	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													J
413 > 369	53	3.170	3.162	0.000	137753	29	73:1	Target = 2.61	5.50	155.64	2.7814		M
413 > 169	53	3.170	3.162		53345	31	89:1	2.58 (1.30-3.93)	3.55				
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.651	3.644	0.000	552131	23	>100:1			2000.00	2081.31	99	
18 Perfluorooctanesulfonate (PFOS) CAS: 1763-23-1													
499 > 80	54	3.658	3.651	0.000	124429	49	>100:1	Target = 4.00	1.24	407.48	7.2816		M
499 > 99	54	3.651	3.651		23897	47	>100:1	5.20 (2.00-6.00)	2.79				
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.929		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		4.127		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.574		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.809		ND								
34 Perfluorododecanesulfonic acid (PFDOS) CAS: 79780-39-5													U
699 > 80	54		5.341		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.658	3.651	0.000	1633762	21	>100:1			2000.00	2105.88	103	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.651		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		4.090	4.082	0.000	902365	24	>100:1			2000.00	2006.61	100	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		4.075		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		4.127	4.112	0.000	327724	23	>100:1			10000	11004	115	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonate] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		4.120		ND								
4 1H,1H,2H,2H-perfluorododecane sulfonate (10:2FTS) CAS: 120226-60-0													U
627 > 607	65		4.998		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		4.142	4.135	0.000	1455982	23	>100:1			2000.00	2019.36	103	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		4.135		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.358	4.358	0.000	1443414	23	>100:1			10000	9263.35	89	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.367		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.588	4.589	0.000	1441774	23	>100:1			10000	11319	104	

Signal	Quant Std	RT (Min)	Exp RT (Min)	Δ RT (Min)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.589		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.596	4.589	0.000	1393151	22	>100:1			2000.00	2116.14	105	
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.589		ND								
D 61 d7-MeFOSE CAS: SESI-0129													
623 > 59		4.723	4.724	0.000	221045	18	>100:1			2000.00	1900.47	101	
32 2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE) CAS: 24448-09-7													U
616 > 59	61		4.741		ND								
D 57 d3-MeFOSA CAS: SESI-0109													
515 > 169		4.749	4.749	0.000	94449	26	>100:1			2000.00	1497.60	69	
26 N-methylperfluoro-1-octanesulfonamide (MeFOSA) CAS: 31506-32-8													U
512 > 169	57		4.758		ND								
D 62 d9-EtFOSE CAS: SESI-0130													
639 > 59		4.974	4.982	0.000	183018	22	>100:1			2000.00	1738.28	93	
33 2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE) CAS: 1691-99-2													U
630 > 59	62		4.998		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		5.005	5.005	0.000	1354606	25	>100:1			2000.00	2062.33	104	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		5.005		ND								
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		5.377		ND								
D 59 d5-EtFOSA CAS: SESI-0108													
531 > 169		5.012	5.013	0.000	100619	30	>100:1			2000.00	1688.11	81	
27 N-ethylperfluoro-1-octanesulfonamide (EtFOSA) CAS: 4151-50-2													U
526 > 169	59		5.013		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		5.709	5.716	0.000	1448259	22	>100:1			2000.00	2082.43	103	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		5.709		ND								
D 40 13C2_PFHxDA CAS: SESI-0103													
815 > 770		6.295	6.295	0.000	792102	25	>100:1			2000.00	1797.86	83	
35 Perfluoro-n-hexadecanoic acid (PFHxDA) CAS: 67905-19-5													U
813 > 769	40		6.295		ND								
36 Perfluoro-n-octadecanoic acid (PFODA) CAS: 16517-11-6													U
913 > 869	40		6.804		ND								

Compound Type Legend

D - Isotopic Dilution Std.

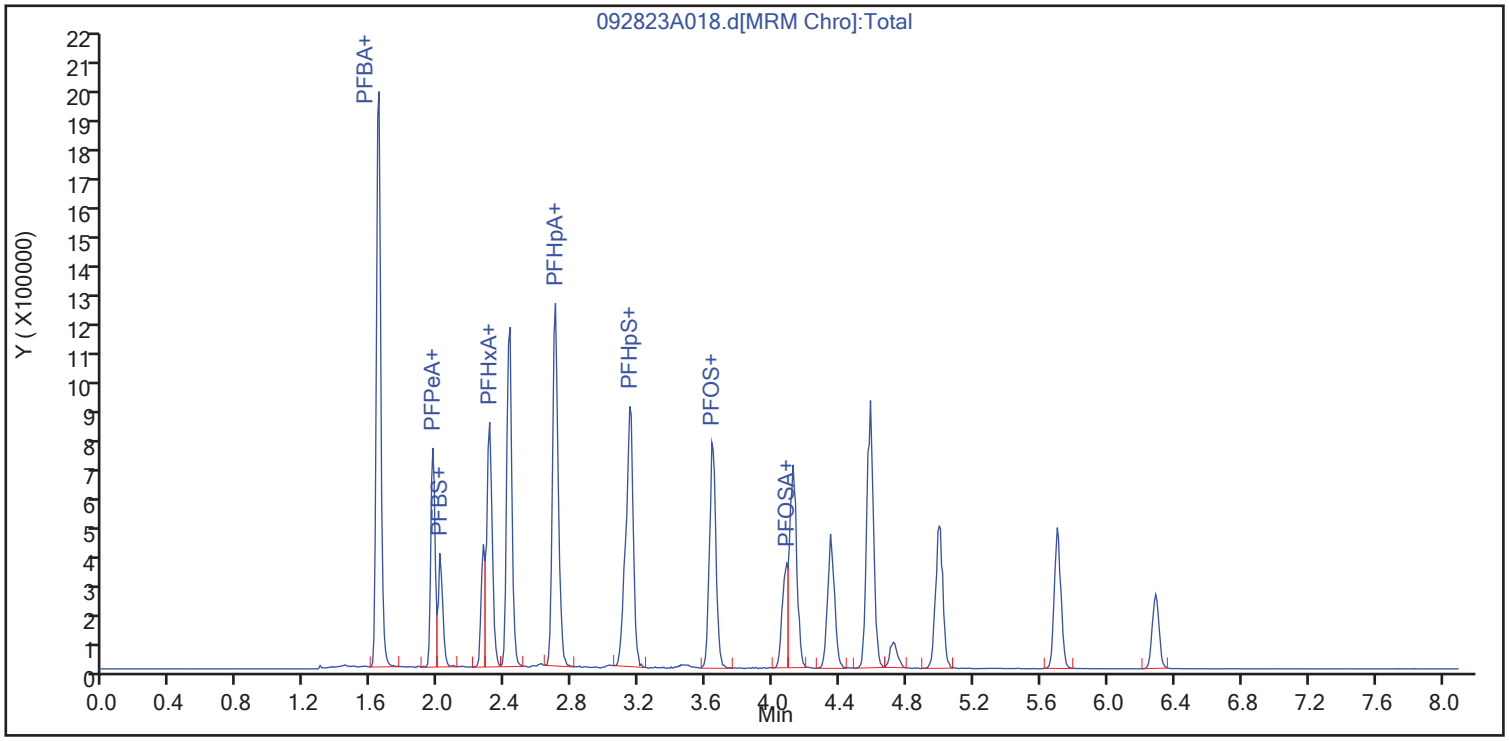
QC Flag Legend

U - Result Less Than Method Detection Limit
J - Compound Concentration Below Quantitation Limit
M - Compound Hit/Peak Manually Integrated

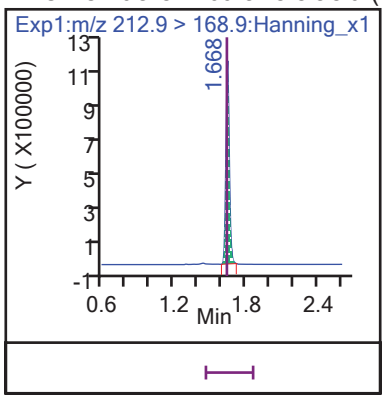
Report Date: 29-Sep-2023 17:46:59 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

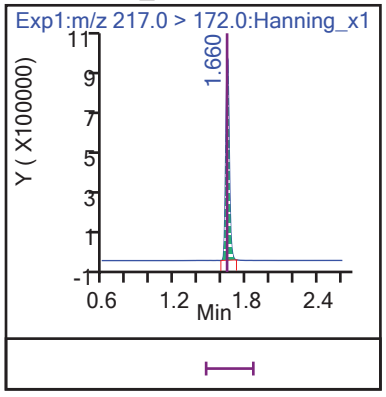
Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Inst. ID:	LCMSMS01.i
Client ID:	WSTF-A08-INF0001-20230914	Lab ID:	YI15029-003
Sample Info:	YI15029-003		
Dil. Factor:	1	Operator:	eqi.svoa



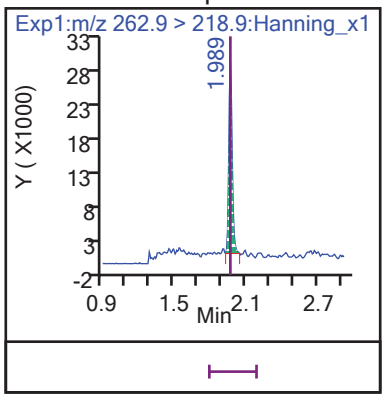
8 Perfluoro-n-butanoic acid (PFBA)



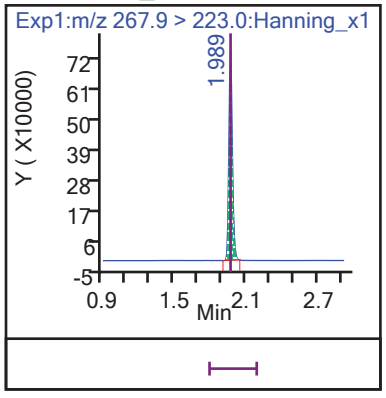
D 46 13C4_PFBA



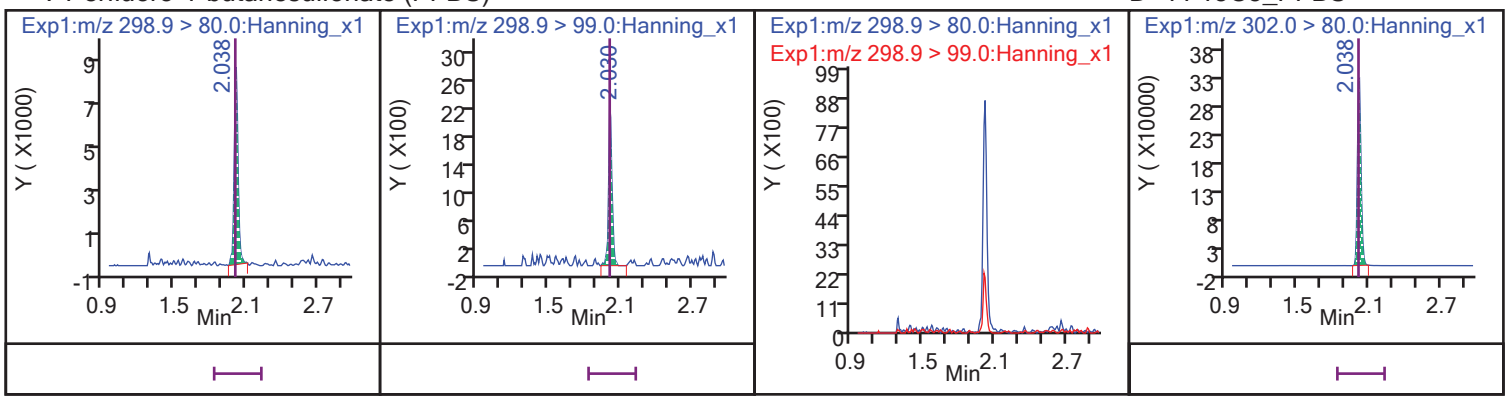
21 Perfluoro-n-pentanoic acid (PFPeA)



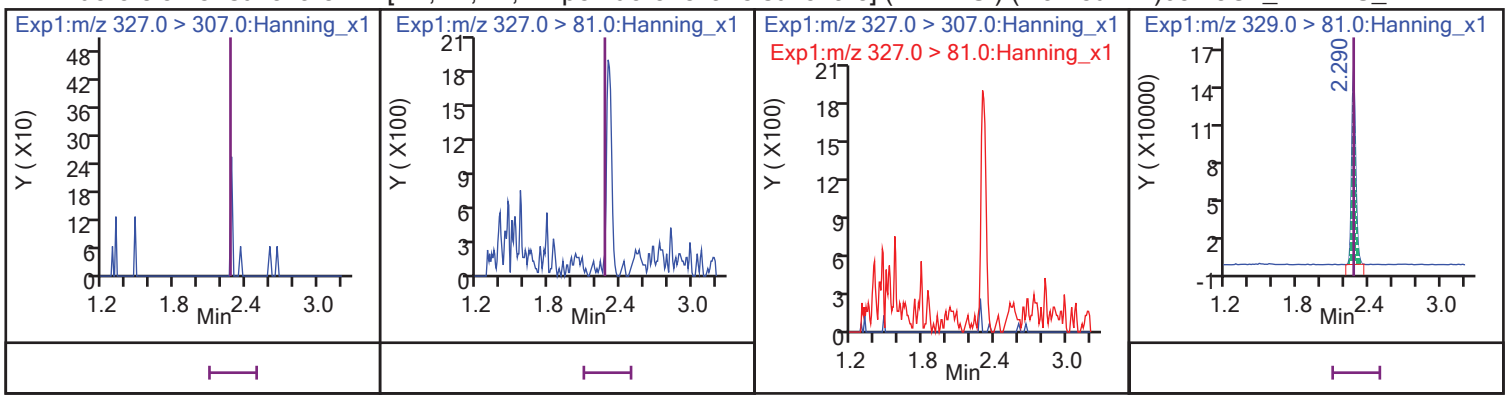
D 50 13C5_PFPeA



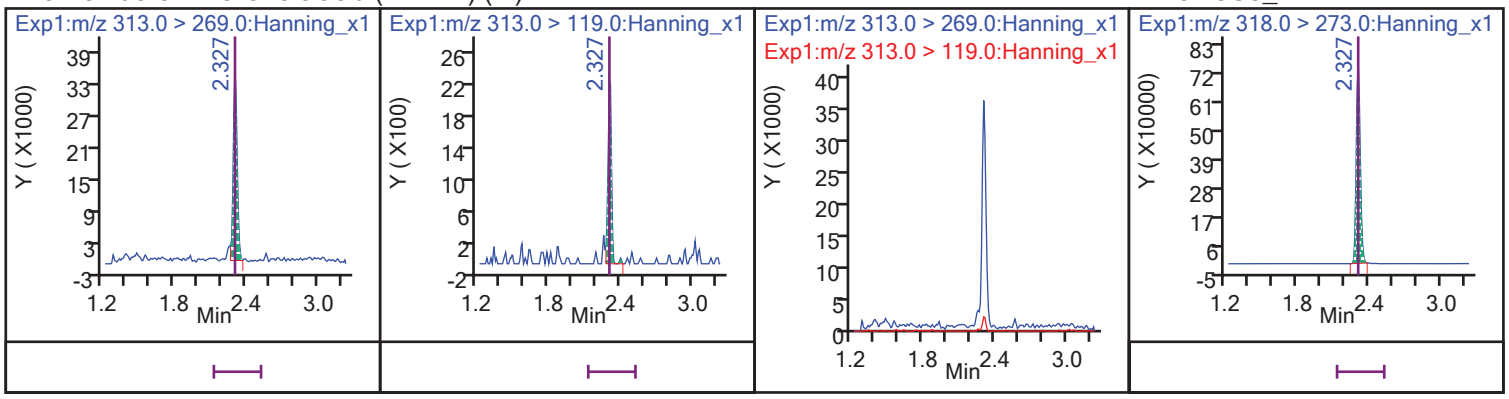
7 Perfluoro-1-butanesulfonate (PFBS) D 44 13C3_PFBS



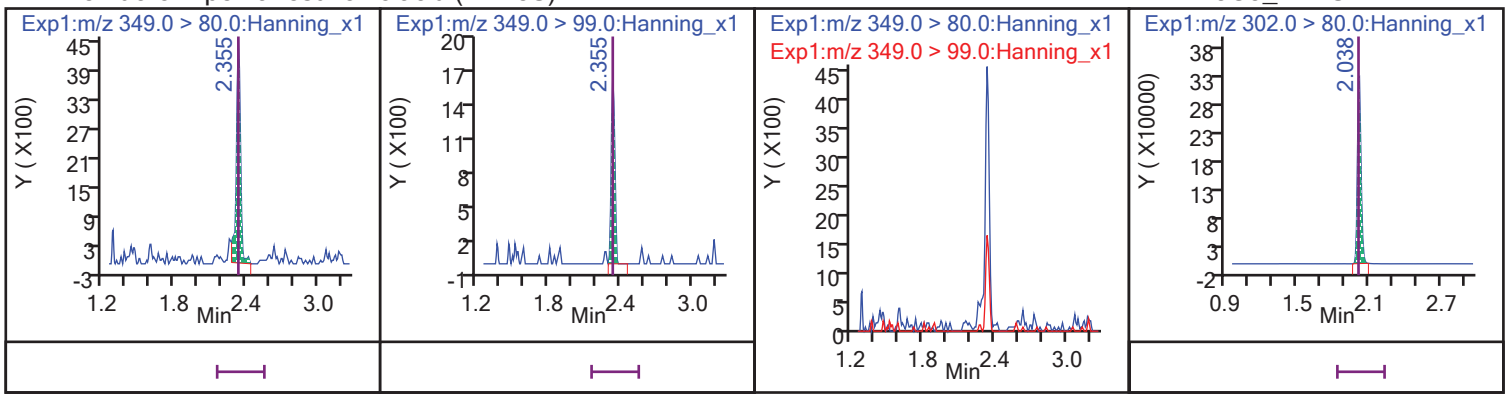
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonate] (4:2 FTS) (Marked ND) 63 13C2_4:2 FTS_2



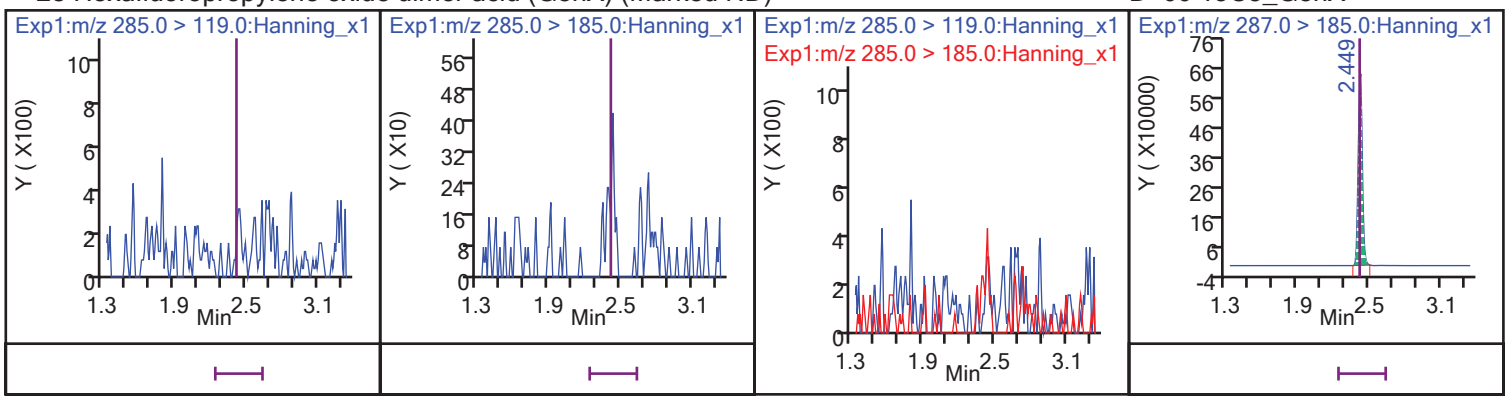
15 Perfluoro-n-hexanoic acid (PFHxA) (M) D 49 13C5_PFHxA



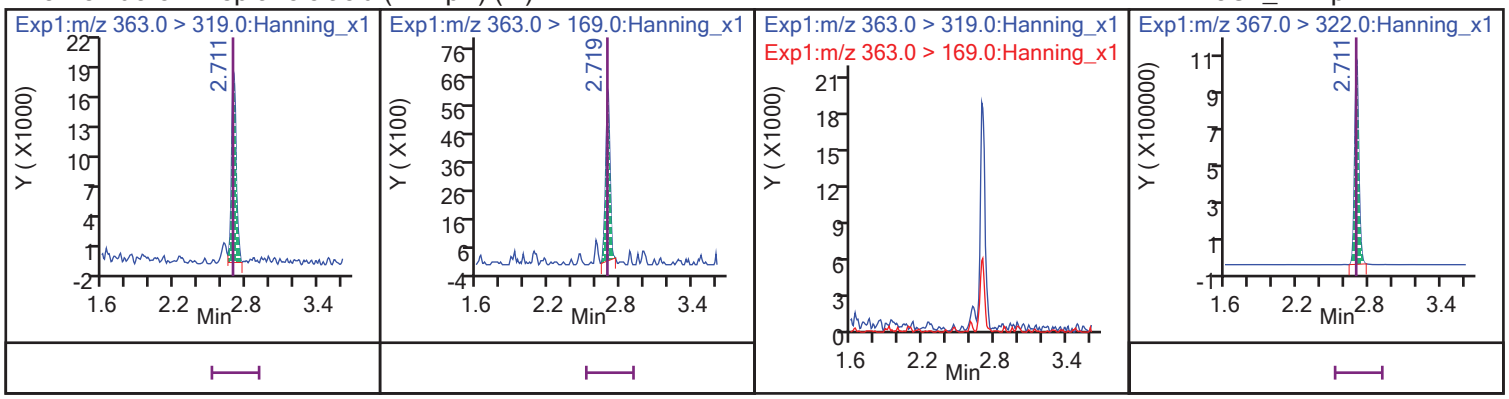
22 Perfluoro-1-pentanesulfonic acid (PFPeS) D 44 13C3_PFBS



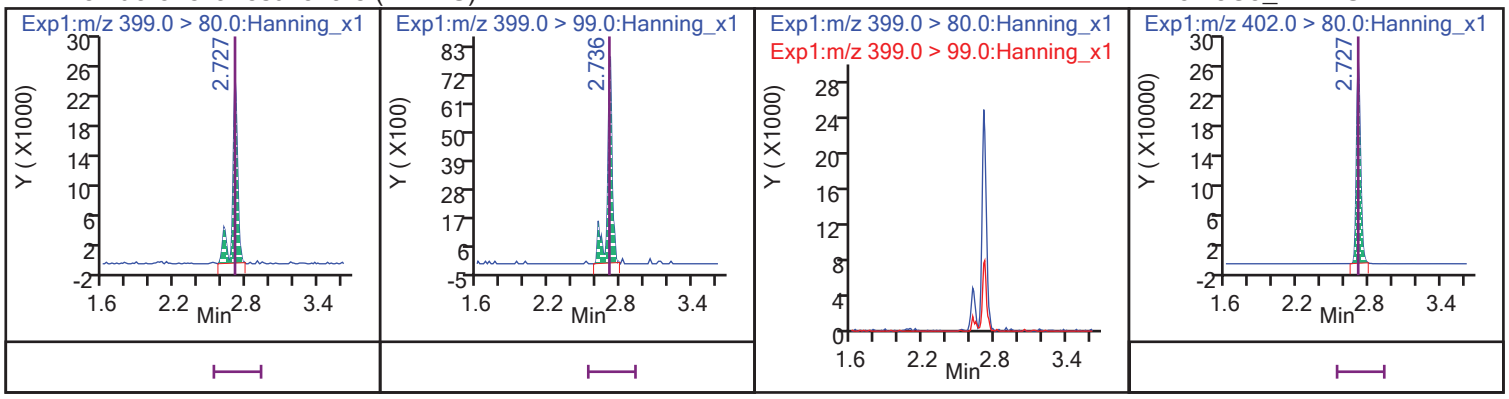
28 Hexafluoropropylene oxide dimer acid (GenX) (Marked ND) D 66 13C3_GenX



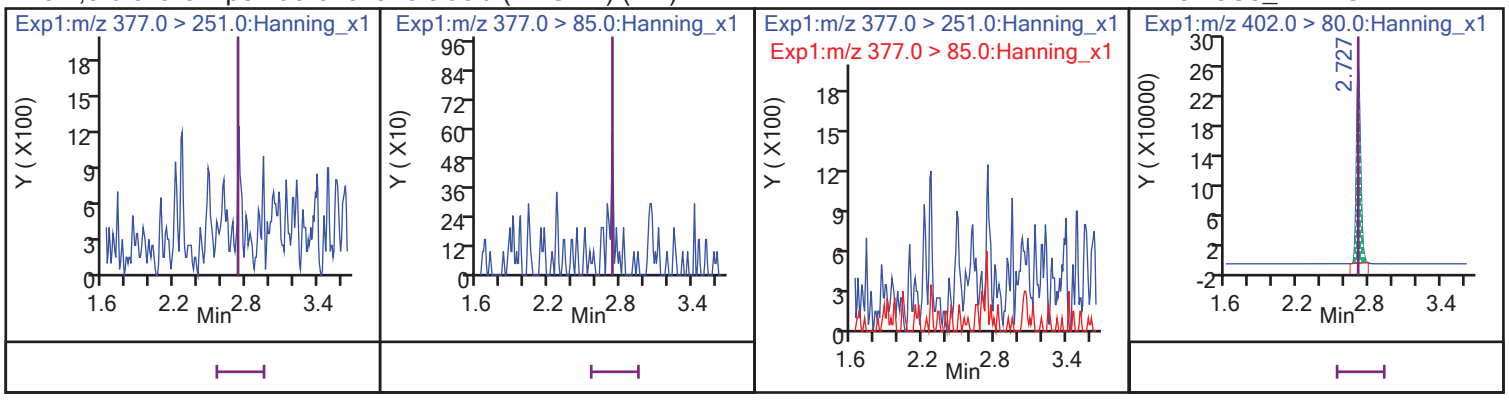
13 Perfluoro-n-heptanoic acid (PFHpA) (M) D 47 13C4_PFHpA



14 Perfluorohexanesulfonate (PFHxS) D 45 13C3_PFHxS

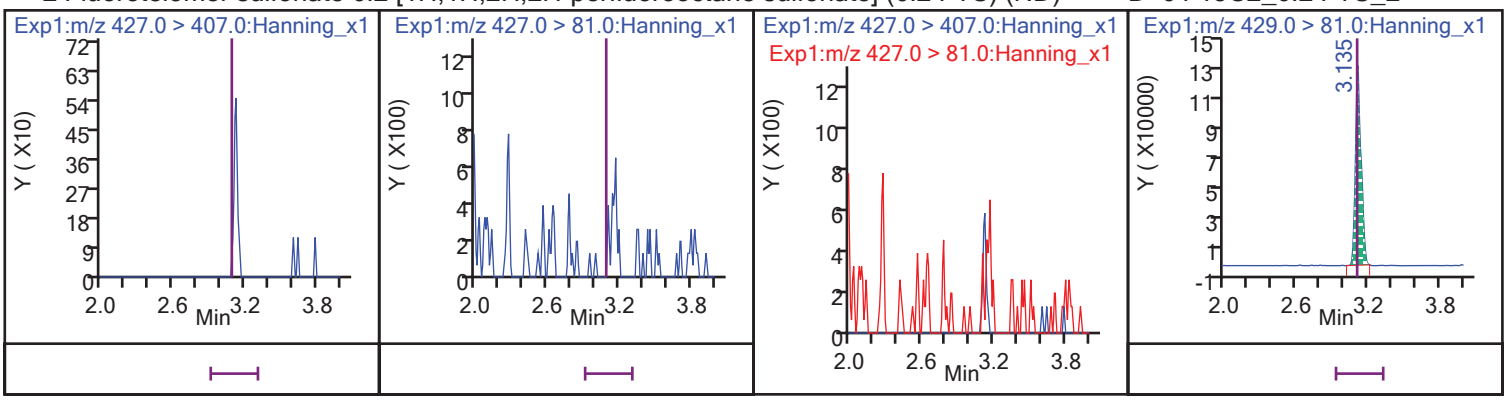


29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) (ND) D 45 13C3_PFHxS



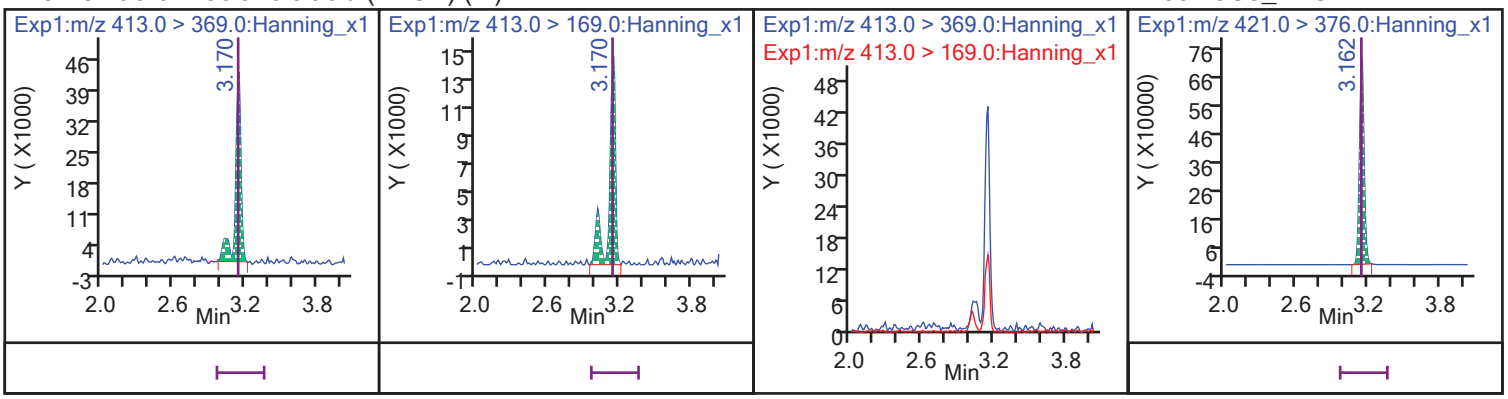
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonate] (6:2 FTS) (ND)

D 64 13C2_6:2 FTS_2



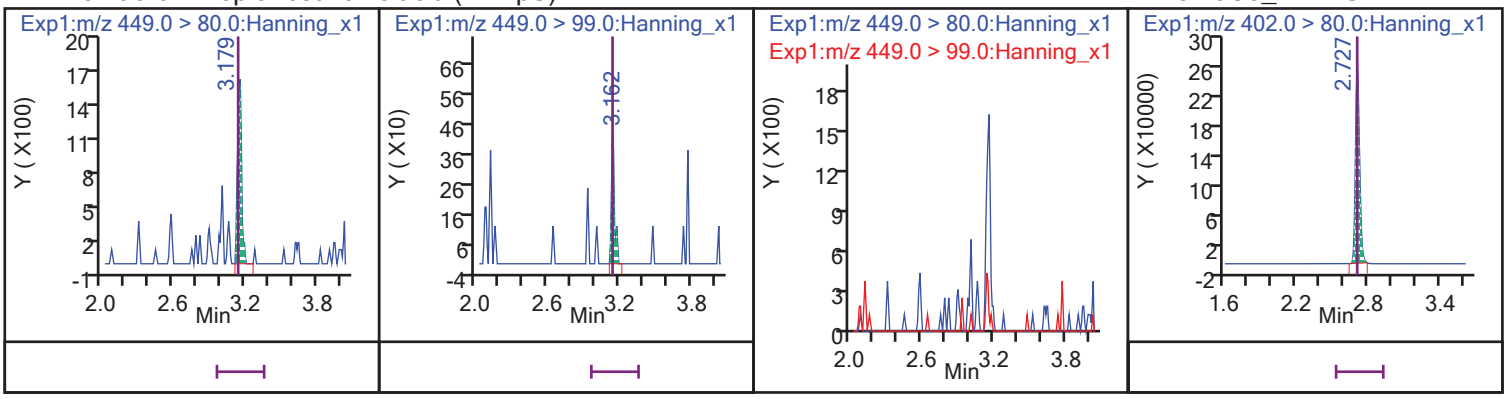
20 Perfluoro-n-octanoic acid (PFOA) (M)

D 53 13C8_PFOA



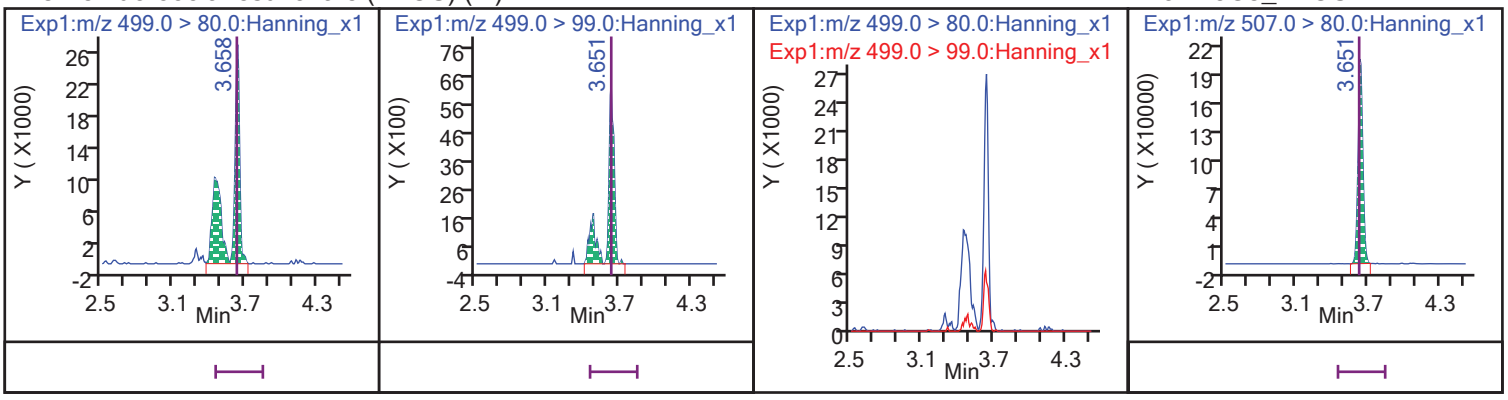
12 Perfluoro-1-heptanesulfonic acid (PFHpS)

D 45 13C3_PFHxS

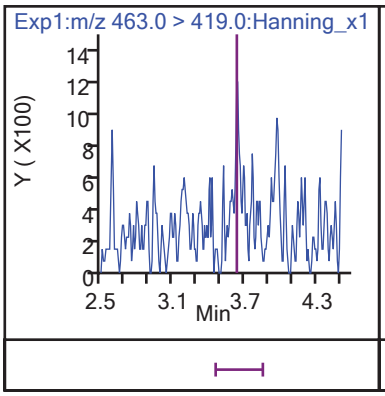


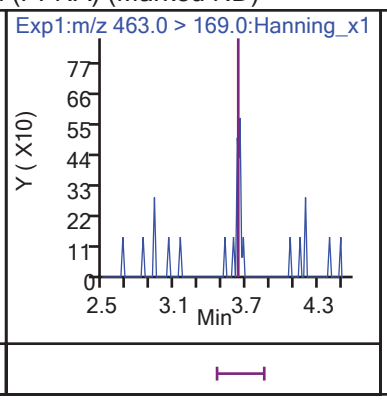
18 Perfluorooctanesulfonate (PFOS) (M)

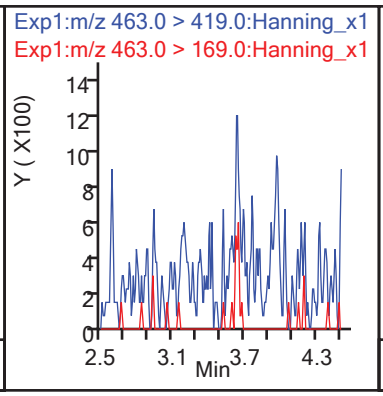
D 54 13C8_PFOS



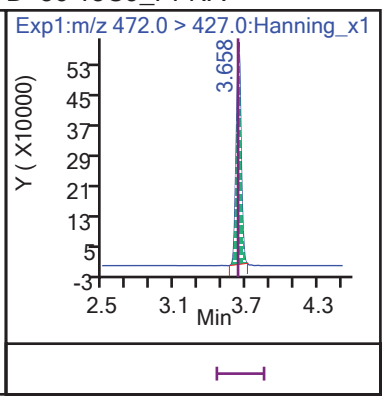
17 Perfluoro-n-nonanoic acid (PFNA) (Marked ND)



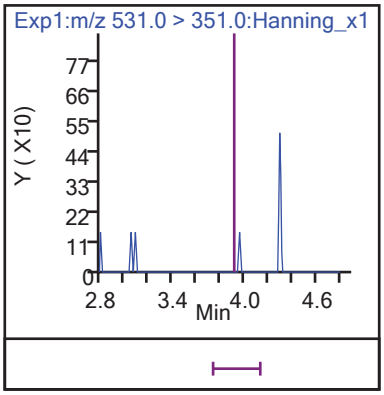




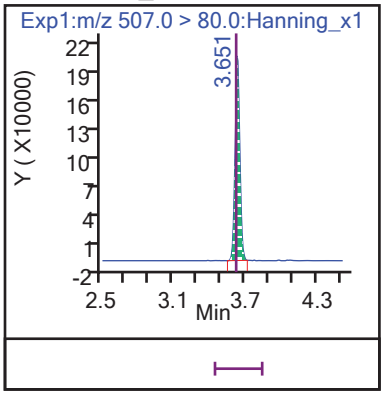
D 56 13C9_PFNA



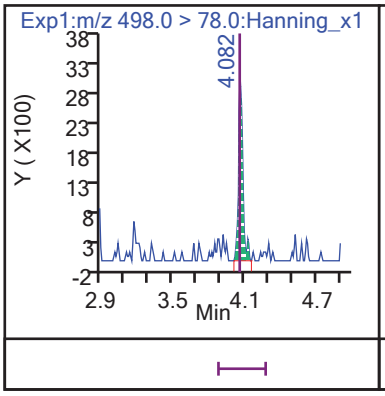
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) (Marked ND)

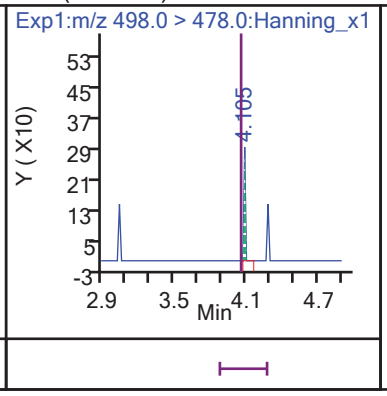


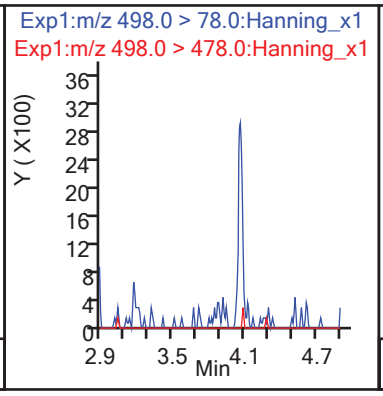
D 54 13C8_PFOS



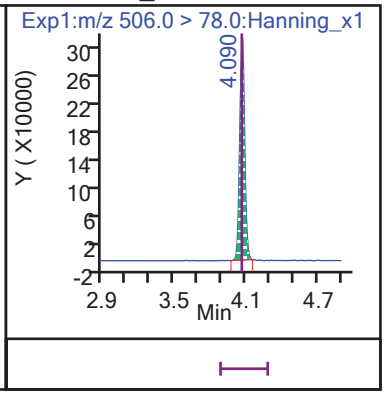
19 Perfluoro-1-octanesulfonamide (PFOSA)



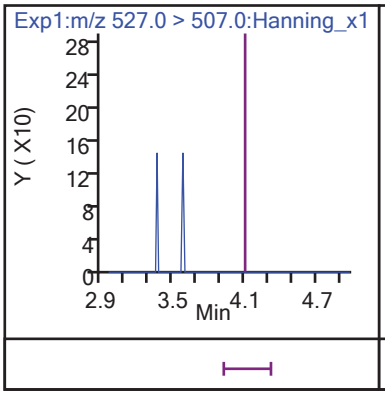


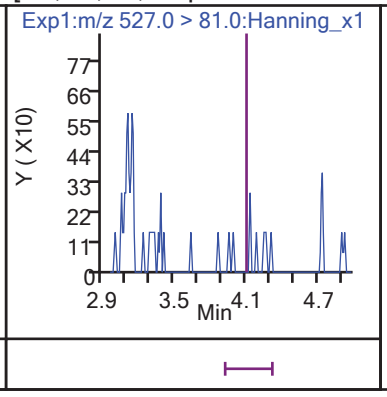


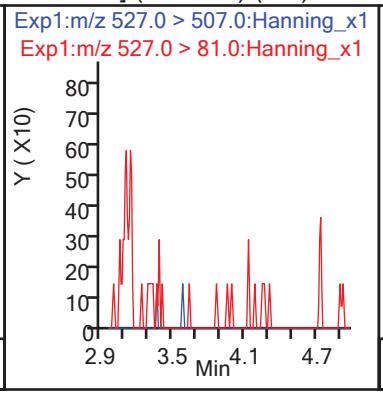
D 55 13C8_PFOSA



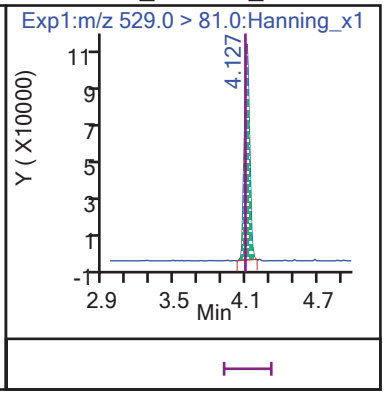
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonate] (8:2 FTS) (ND)



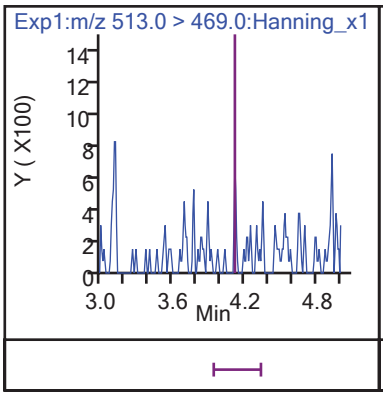


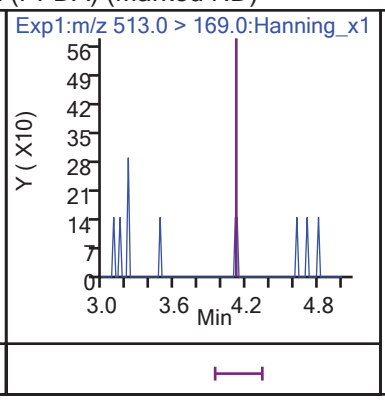


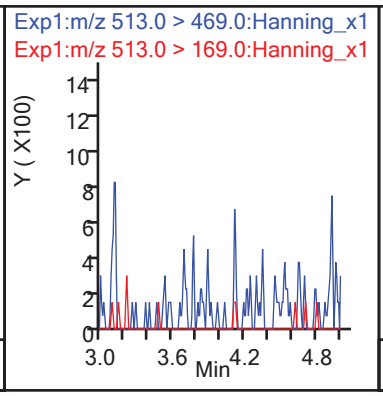
D 65 13C2_8:2 FTS_2



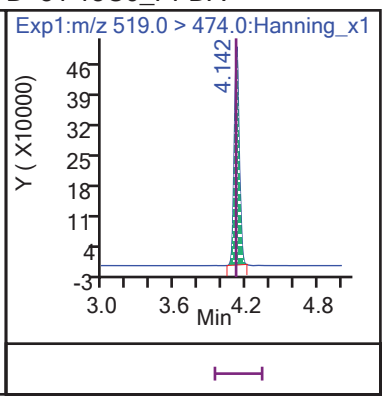
10 Perfluoro-n-decanoic acid (PFDA) (Marked ND)



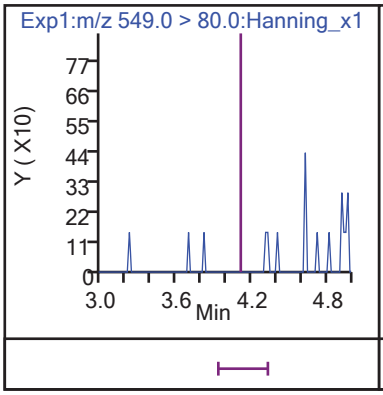


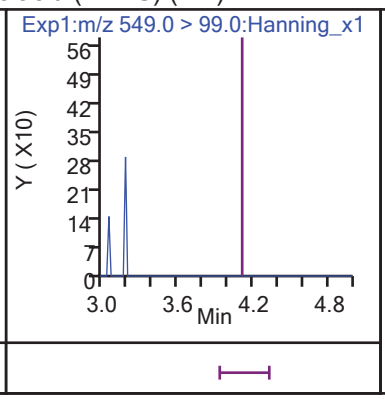


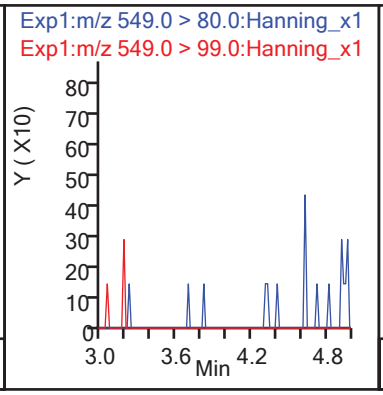
D 51 13C6_PFDA



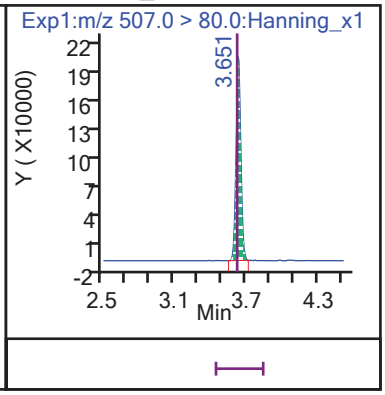
16 Perfluoro-1-nonanesulfonic acid (PFNS) (ND)



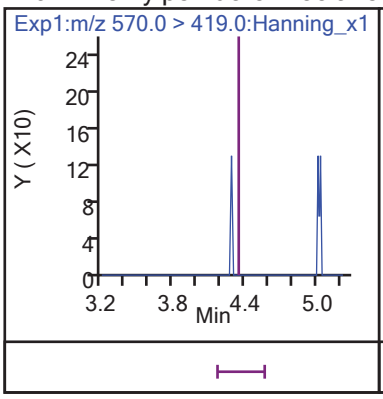


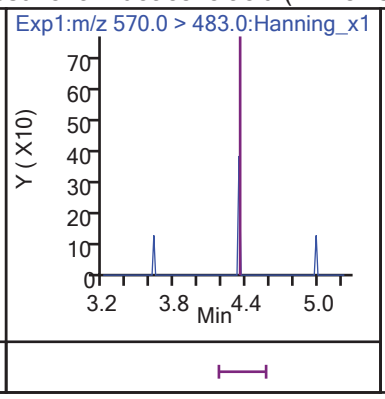


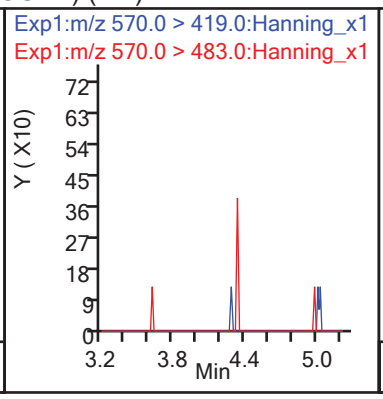
D 54 13C8_PFOS



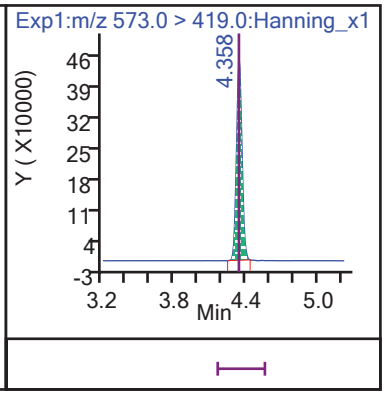
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) (ND)



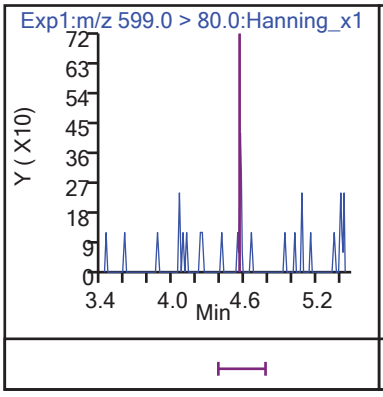


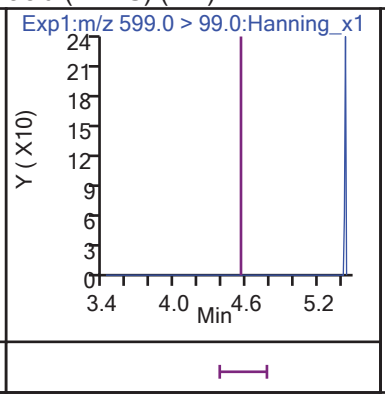


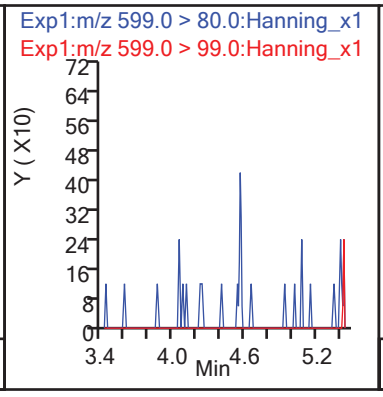
D 58 d3-MeFOSAA



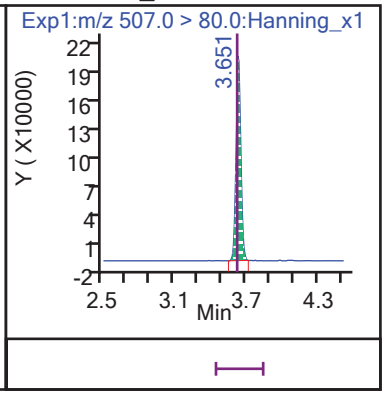
9 Perfluoro-1-decanesulfonic acid (PFDS) (ND)



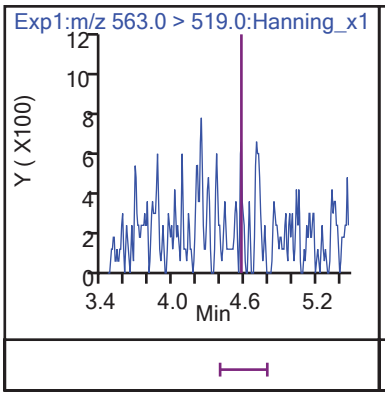


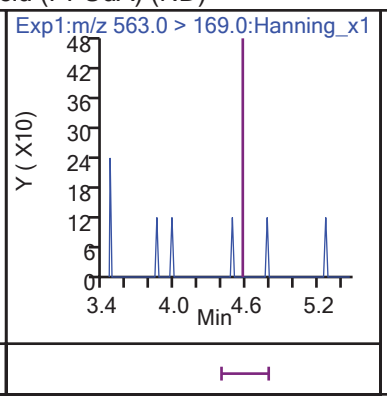


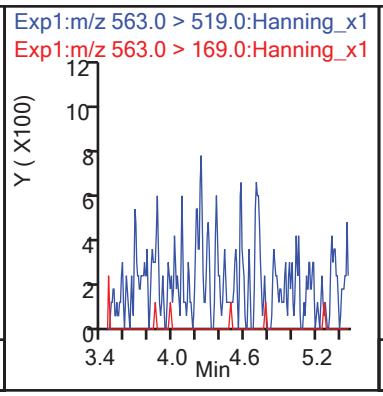
D 54 13C8_PFOS



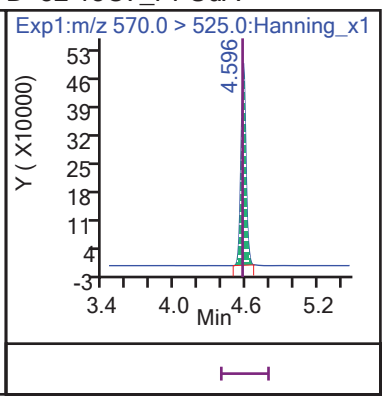
25 Perfluoro-n-undecanoic acid (PFUdA) (ND)



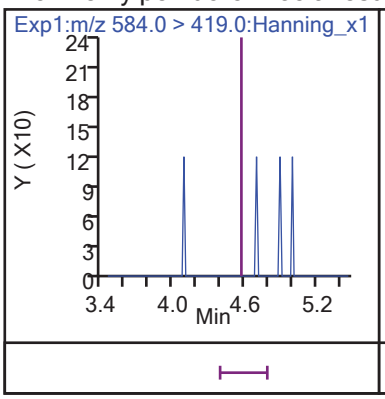


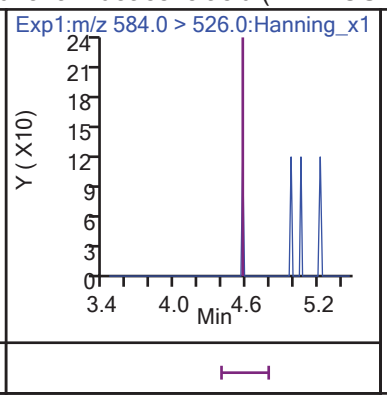


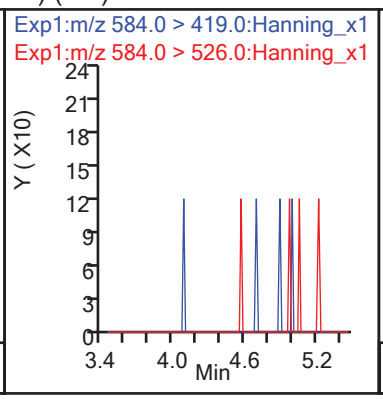
D 52 13C7_PFUdA



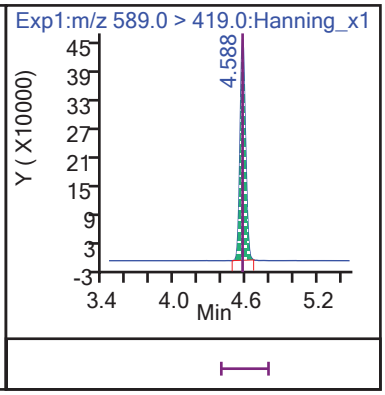
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) (ND)



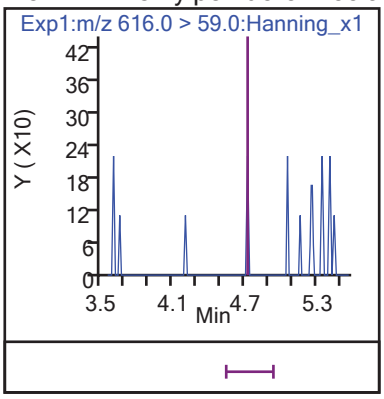




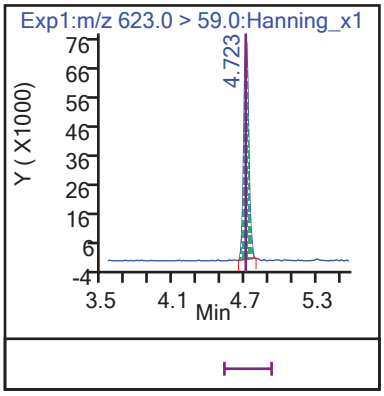
D 60 d5-EtFOSAA



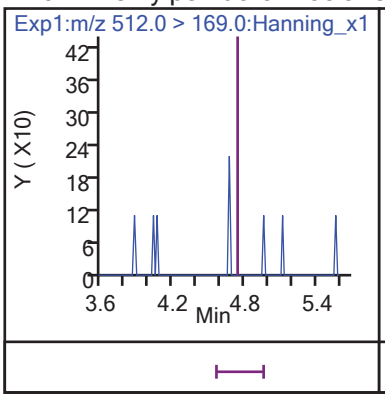
32 2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE) (Marked ND)

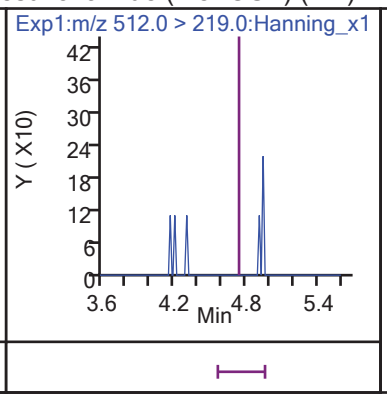


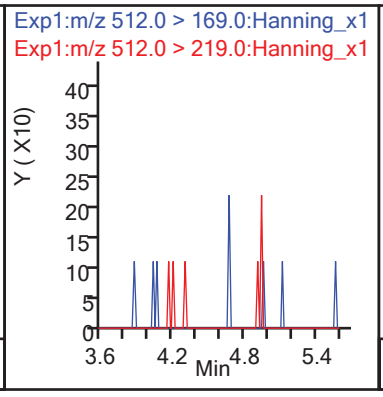
D 61 d7-MeFOSE



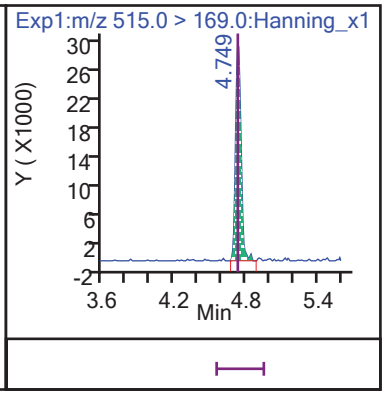
26 N-methylperfluoro-1-octanesulfonamide (MeFOSA) (ND)



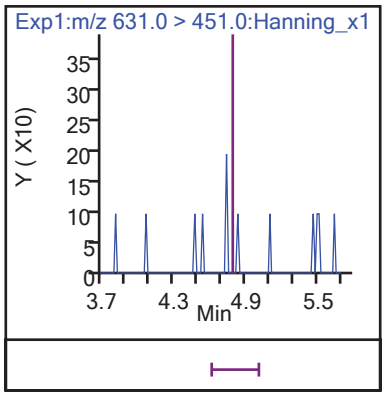




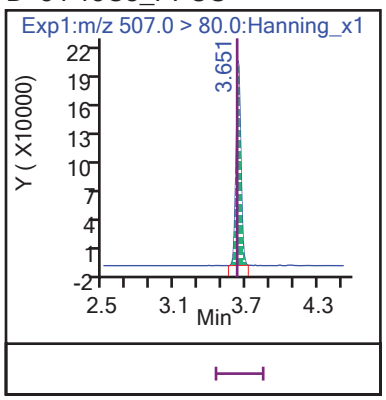
D 57 d3-MeFOSA



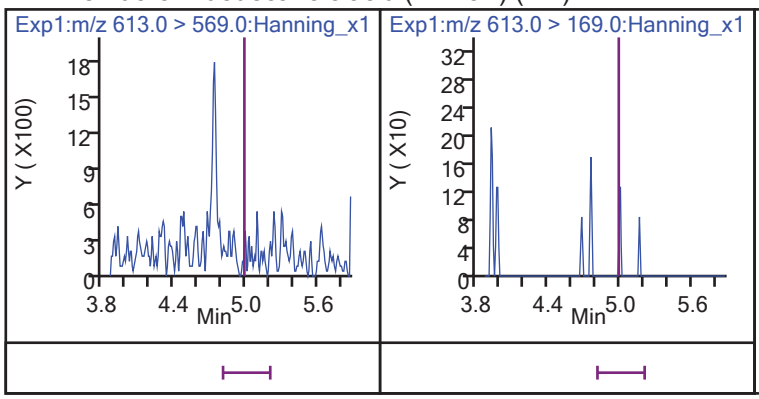
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) (Marked ND)



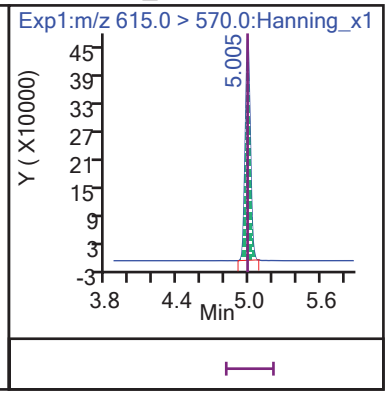
D 54 13C8_PFOS



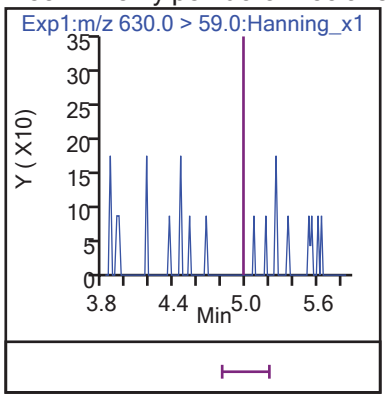
11 Perfluoro-n-dodecanoic acid (PFDoA) (ND)



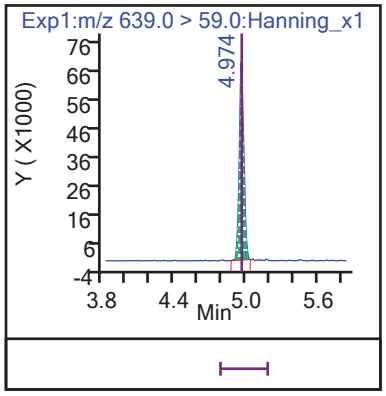
D 38 13C2_PFDoA



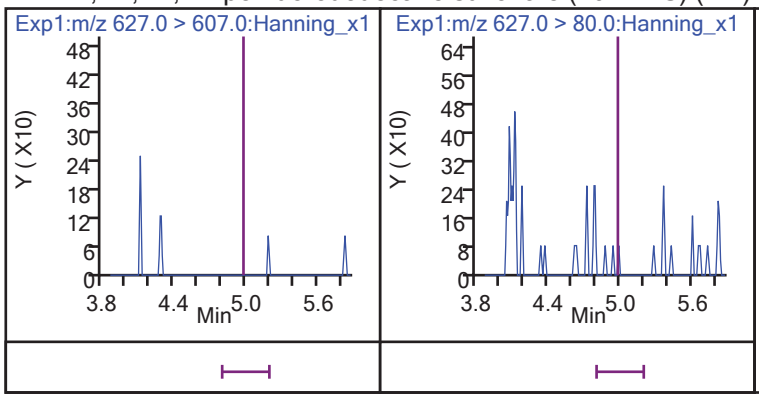
33 2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE) (ND)



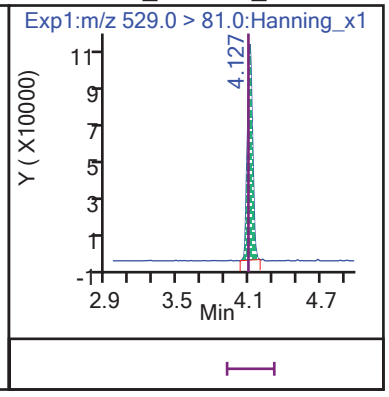
D 62 d9-EtFOSE



4 1H,1H,2H,2H-perfluorododecane sulfonate (10:2FTS) (ND)

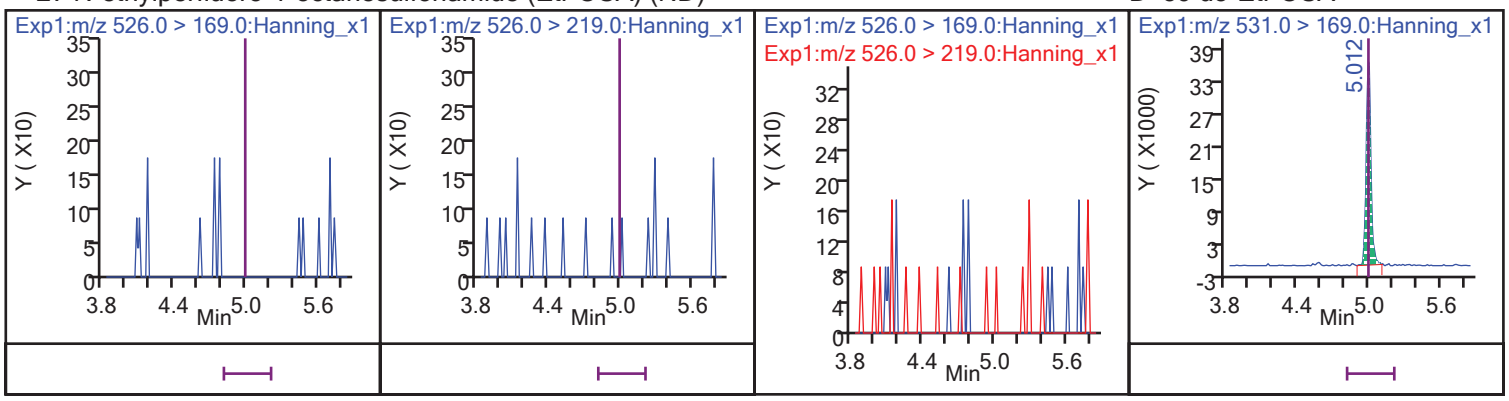


D 65 13C2_8:2 FTS_2



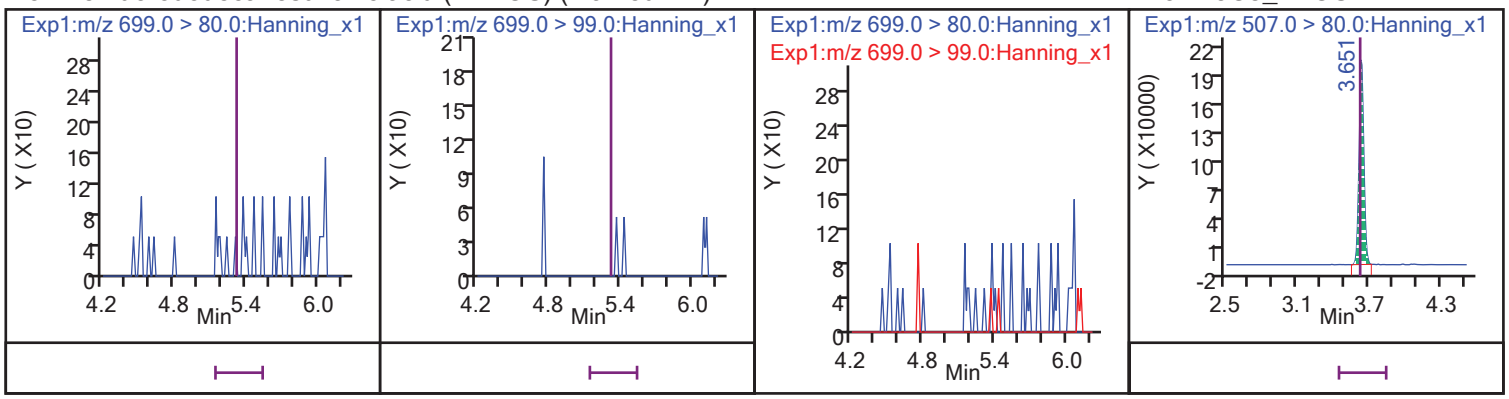
27 N-ethylperfluoro-1-octanesulfonamide (EtFOSA) (ND)

D 59 d5-EtFOSA



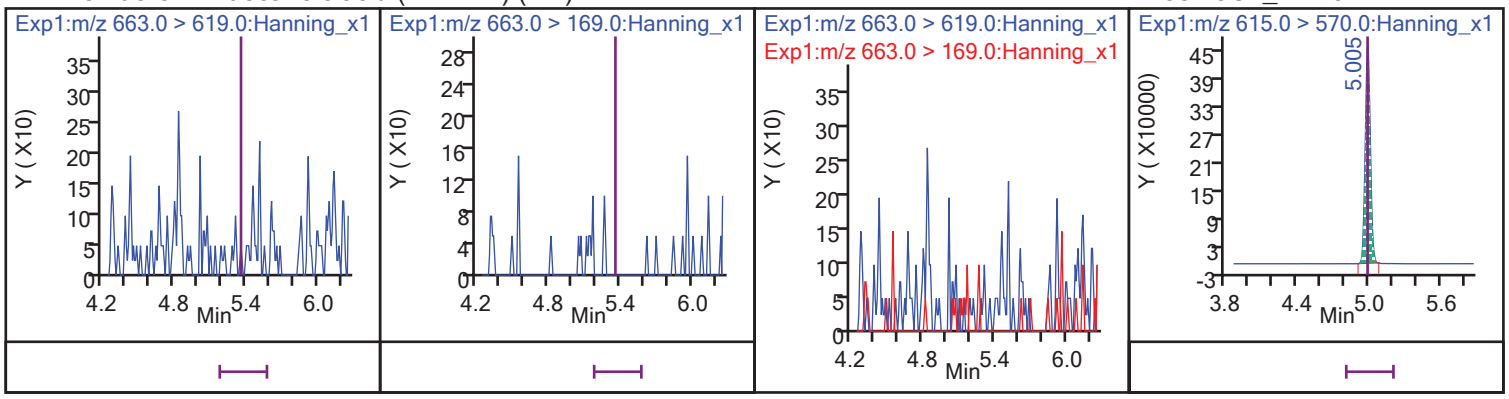
34 Perfluorododecanesulfonic acid (PFDOS) (Marked ND)

D 54 13C8_PFOS



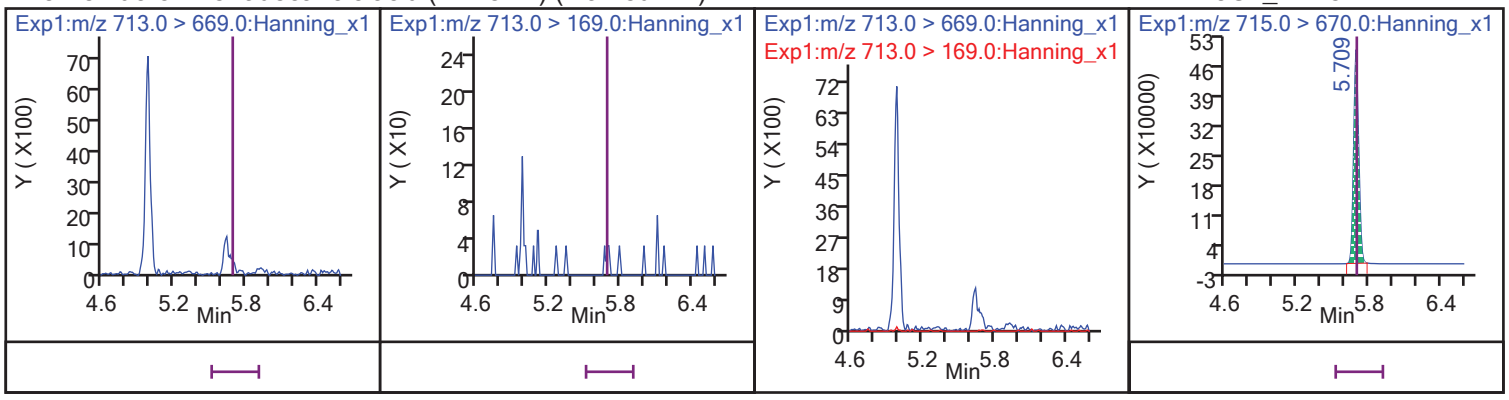
24 Perfluoro-n-tridecanoic acid (PFTrDA) (ND)

D 38 13C2_PFDoA

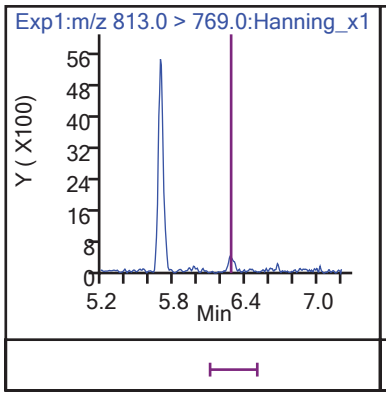


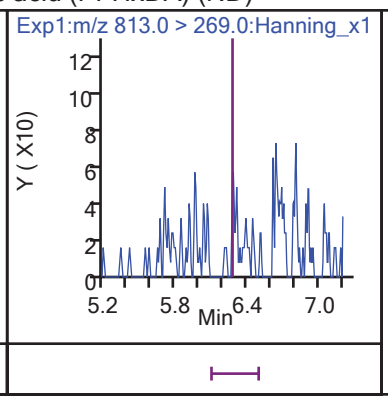
23 Perfluoro-n-tetradecanoic acid (PFTeDA) (Marked ND)

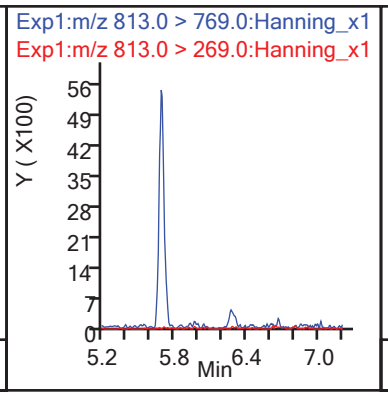
D 42 13C2_PFTeDA



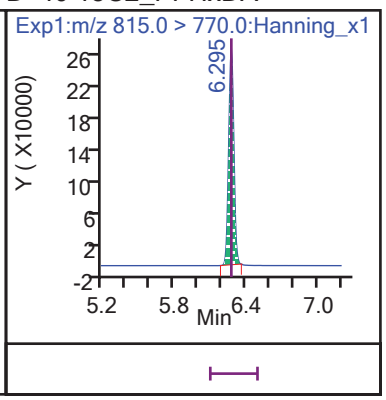
35 Perfluoro-n-hexadecanoic acid (PFHxDA) (ND)



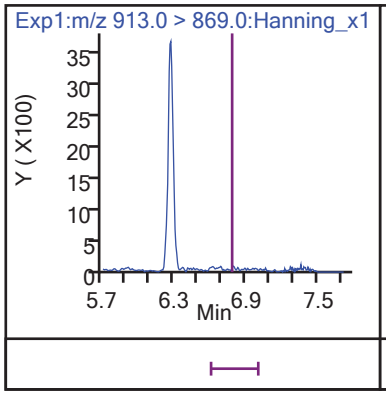


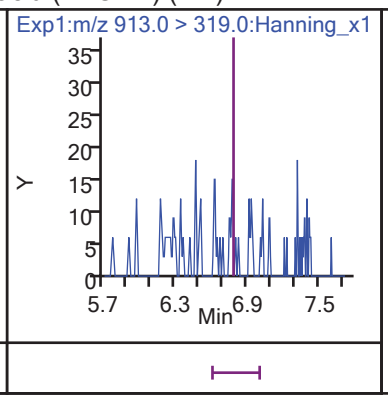


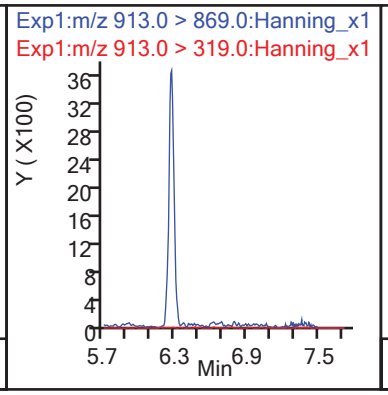
D 40 13C2_PFHxDA



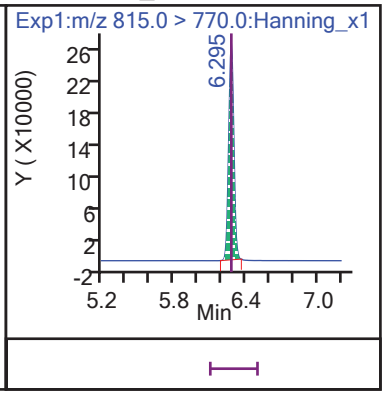
36 Perfluoro-n-octadecanoic acid (PFODA) (ND)







D 40 13C2_PFHxDA



Report Date: 29-Sep-2023 17:46:59 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

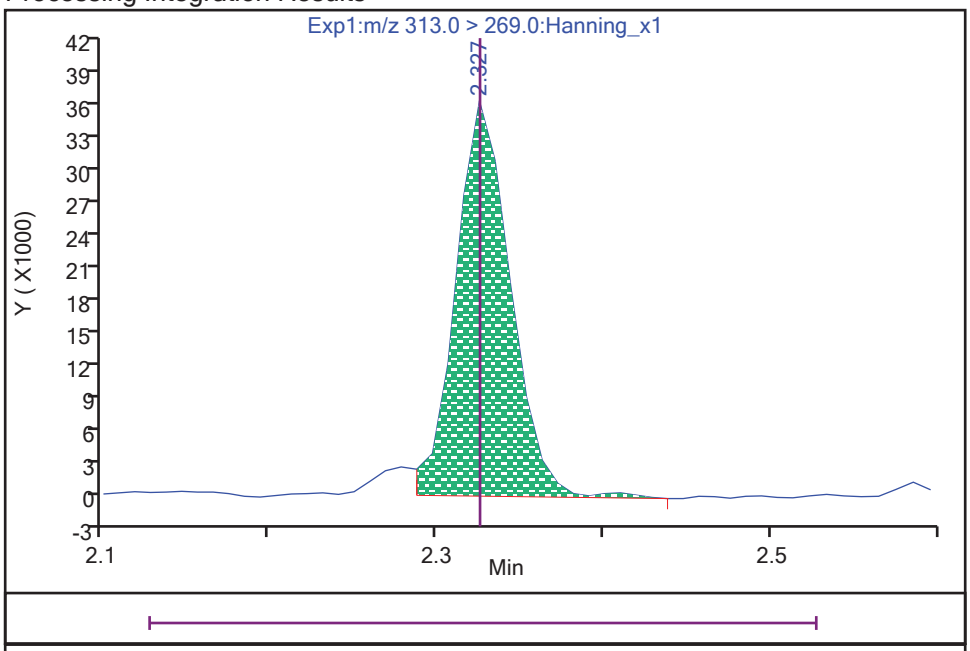
Manual Integration Report

Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Inst. ID:	LCMSMS01.i
Client ID:	WSTF-A08-INF0001-20230914	Lab ID:	YI15029-003
Sample Info:	YI15029-003		
Dil. Factor:	1	Operator:	eqi.svoa

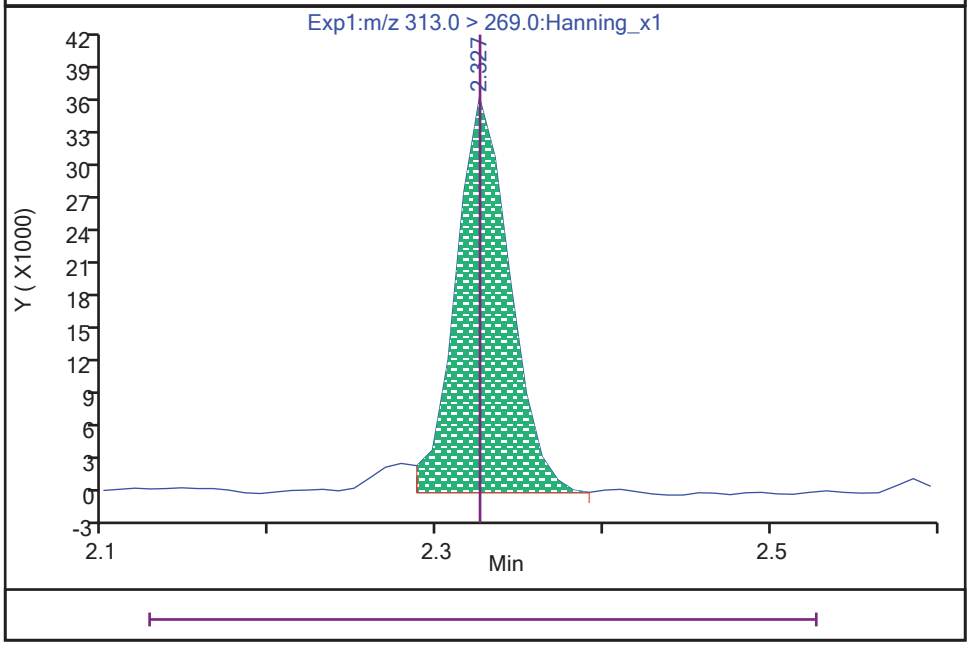
15 PFHxA, CAS: 307-24-4

Processing Integration Results

RT: 2.327
Area: 79774
Conc: 1.8253
Conc Units: ng/L



RT: 2.327
Area: 79100
Conc: 1.8099
Conc Units: ng/L



Data Editor: Olivia.Shugart, 29-Sep-2023 17:28:28
Audit Action: Mint
Audit Reason: M-03, Incorrect Auto Integration

Report Date: 29-Sep-2023 17:46:59 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

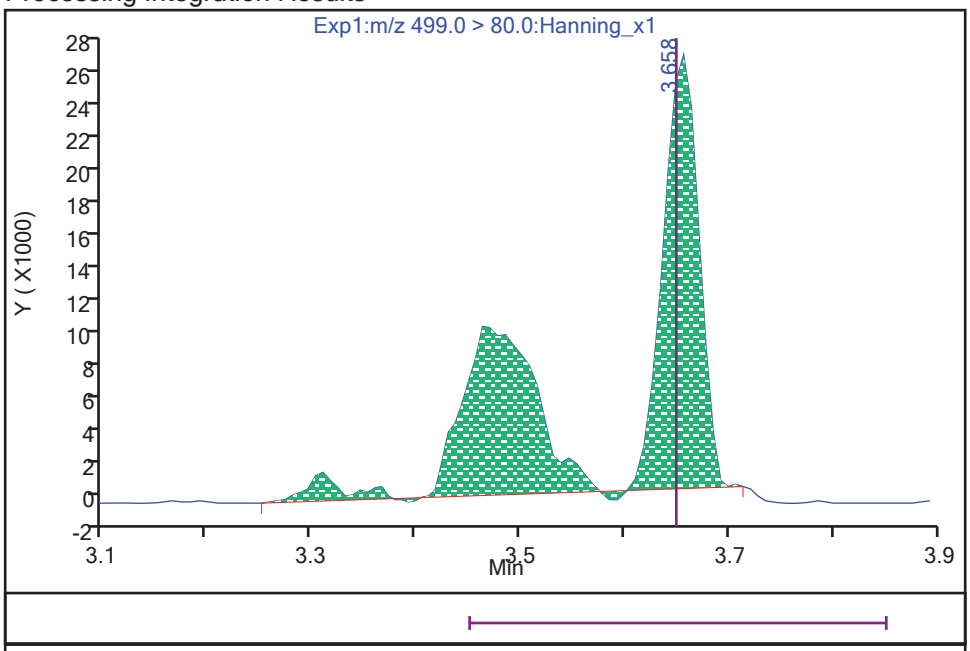
Manual Integration Report

Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Inst. ID:	LCMSMS01.i
Client ID:	WSTF-A08-INF0001-20230914	Lab ID:	YI15029-003
Sample Info:	YI15029-003		
Dil. Factor:	1	Operator:	eqi.svoa

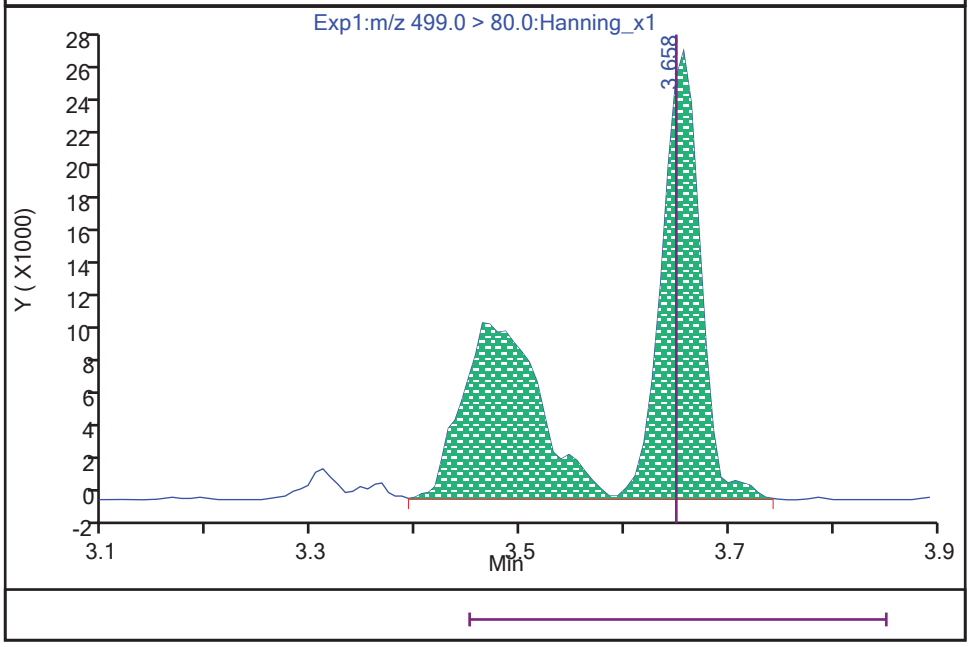
18 PFOS, CAS: 1763-23-1

Processing Integration Results

RT: 3.658
Area: 115822
Conc: 6.7779
Conc Units: ng/L



RT: 3.658
Area: 124429
Conc: 7.2816
Conc Units: ng/L



Data Editor: Olivia.Shugart, 29-Sep-2023 17:29:25
Audit Action: Mint
Audit Reason: M-06, Wrong Isomer

Report Date: 29-Sep-2023 17:46:59 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

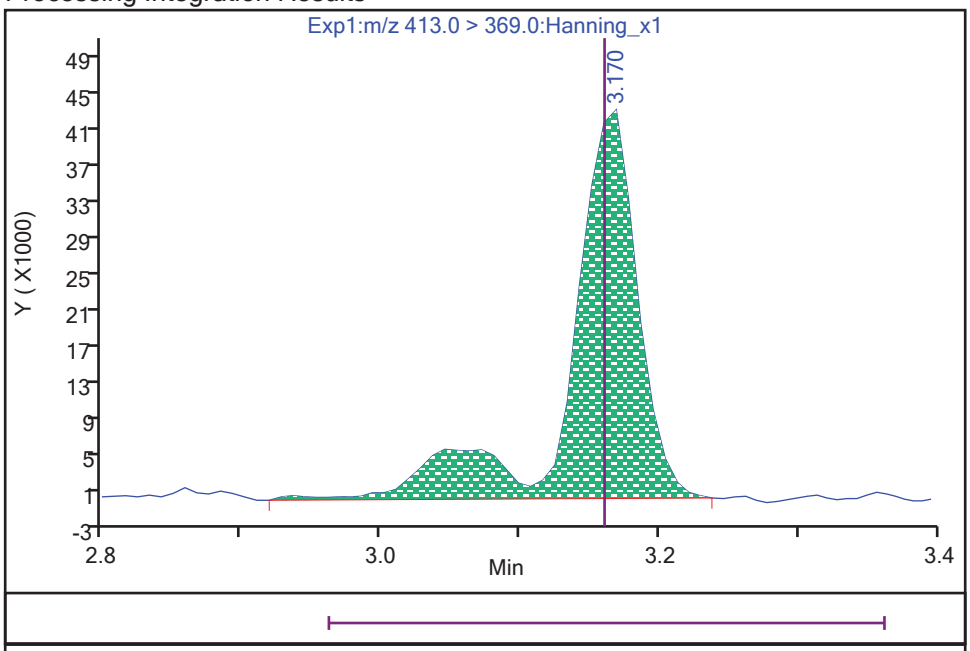
Manual Integration Report

Data File:	\\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A018.d		
Injection Date:	29-Sep-2023 05:28:06	Inst. ID:	LCMSMS01.i
Client ID:	WSTF-A08-INF0001-20230914	Lab ID:	YI15029-003
Sample Info:	YI15029-003		
Dil. Factor:	1	Operator:	eqi.svoa

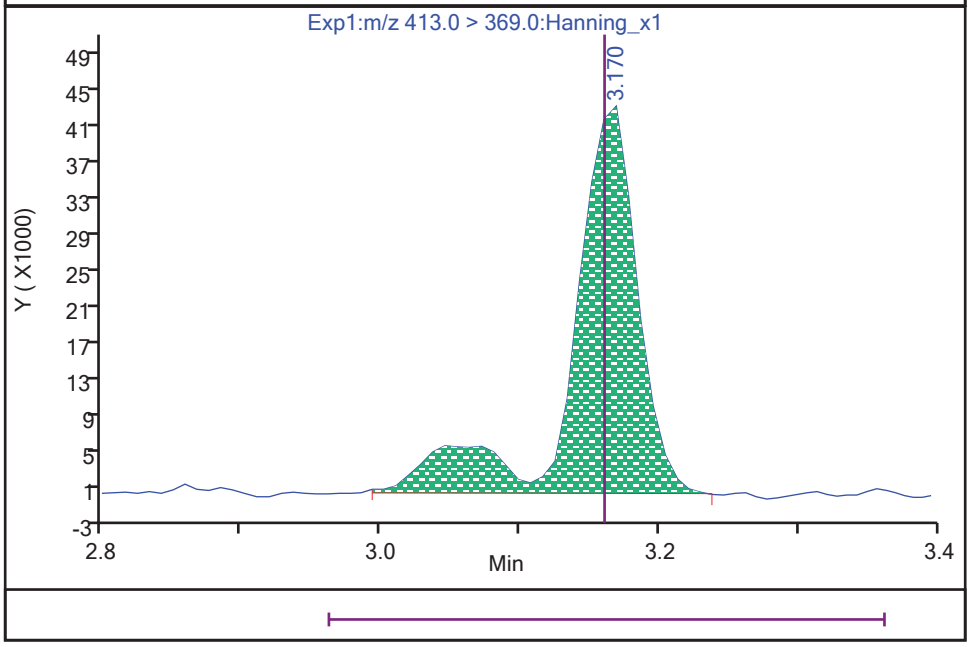
20 PFOA, CAS: 335-67-1

Processing Integration Results

RT: 3.170
Area: 142535
Conc: 2.8779
Conc Units: ng/L



RT: 3.170
Area: 137753
Conc: 2.7814
Conc Units: ng/L



Data Editor: Olivia.Shugart, 29-Sep-2023 17:29:05
Audit Action: Mint
Audit Reason: M-03, Incorrect Auto Integration

YI15029

KE82

TETRA TECH

CHAIN OF CUSTODY

NO. 9132023-01

| | | |

DC#_Title: ENV-FRM-WCOL-0286 v02_Samples Receipt Checklist (SRC)
Effective Date: 8/2/2022

Sample Receipt Checklist (SRC)

Client: TETRA TECH Cooler Inspected by/date: KDRW / 09/15/2023 Lot #: YE15029

Means of receipt: ☐ Pace ☐ Client ☐ UPS ☑ FedEx ☐ Other:

☑ Yes	☐ No		1. Were custody seals present on the cooler?
☑ Yes	☐ No	☐ NA	2. If custody seals were present, were they intact and unbroken?

pH Strip ID: NA Chlorine Strip ID: NA Tested by: NA

Original temperature upon receipt / Derived (Corrected) temperature upon receipt %Solid Snap-Cup ID: NA

5.0 / 5.0 °C NA / NA °C NA / NA °C NA / NA °C

Method: ☐ Temperature Blank ☑ Against Bottles IR Gun ID: 8 IR Gun Correction Factor: 0 °C

Method of coolant: ☑ Wet Ice ☐ Ice Packs ☐ Dry Ice ☐ None

☑ Yes	☐ No	☐ NA	3. Were all coolers received at or below 6.0°C? If no, was Project Manager notified? PM was Notified by: phone / email / face-to-face (circle one).
☐ Yes	☐ No	☑ NA	4. Is the commercial courier's packing slip attached to this form?
☑ Yes	☐ No		5. Were proper custody procedures (relinquished/received) followed?
☑ Yes	☐ No		6. Were sample IDs listed on the COC and all sample containers?
☑ Yes	☐ No		7. Was collection date & time listed on the COC and all sample containers?
☑ Yes	☐ No		8. Did all container label information (ID, date, time) agree with the COC?
☑ Yes	☐ No		9. Were tests to be performed listed on the COC?
☑ Yes	☐ No		10. Did all samples arrive in the proper containers for each test and/or in good condition (unbroken, lids on, etc.)?
☑ Yes	☐ No		11. Was adequate sample volume available?
☑ Yes	☐ No		12. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
☑ Yes	☐ No		13. Were all samples containers accounted for? (No missing/excess)
☐ Yes	☐ No	☑ NA	14. Were VOA, 8015C and RSK-175 samples free of bubbles >"pea-size" (¼"or 6mm in diameter) in any of the VOA vials?
☐ Yes	☐ No	☑ NA	15. Were all DRO/metals/nutrient samples received at a pH of < 2?
☐ Yes	☐ No	☑ NA	16. Were all cyanide samples received at a pH > 12 and sulfide samples received at a pH > 9?
☐ Yes	☐ No	☑ NA	17. Were all applicable NH_3/TKN/cyanide/phenol/625.1/608.3 (< 0.5mg/L) samples free of residual chlorine?
☐ Yes	☐ No	☑ NA	18. Was the quote number listed on the container label? If yes, Quote #

Sample Preservation (Must be completed for any sample(s) incorrectly preserved or with headspace.)

Sample(s) NA were received incorrectly preserved and were adjusted accordingly in sample receiving with NA mL of circle one: H2SO4, HNO3, HCl, NaOH using SR # NA. Time of preservation NA. If more than one preservative is needed, please note in the comments below.

Sample(s) NA were received with bubbles >6 mm in diameter.

Samples(s) NA were received with TRC > 0.5 mg/L (If #19 is ***no***) and were adjusted accordingly in sample receiving with sodium thiosulfate ($Na_2S_2O_3$) with Unique ID: NA.

Comments:

Case Narrative
Tetra Tech
Lot Number: YI15029

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the Pace Quality Assurance Management Plan (QAMP), applicable Shealy standard operating procedures (SOPs), the 2003 NELAC standard, and Shealy policies. Additionally, the DoD QSM version 5.4 has been followed for these samples, and specifically Table B-15 was followed for all PFAS samples. Any exceptions to the QAMP, SOPs, NELAC standards, the DoD QSM, or policies are qualified on the results page or discussed below.

All QC associated with these samples were compliant with DOD QSM 5.4 table B-15 and our PFAS SOP.

Correction factors (CF) are used to calculate the original sample concentration. The CF is the inverse of the concentration factor (sample volume / extract final volume) times the dilution factor (DF). The CF is calculated as follows:

CF = DF * FV / Vo

FV is volume of extract (mL)
Vo is initial sample volume (mL)
DF is dilution factor. For undiluted analysis, DF = 1.

Sample concentration for aqueous samples:
Concentration (ng/L) = Cs*CF,

$$C_s = \frac{\left(\frac{(A_s x C_{is})}{A_{is}}\right) - B}{M1}$$

Where

C_s is on column concentration of target analyte in the sample (ng/L)
C_{is} is concentration of internal standard in the sample (ng/L)
A_s is peak response of target analyte in the sample
A_{is} is peak response of internal standard in the sample
M1 is the average RF from ICAL or the slope from linear regression ICAL
B is the y-intercept from the ICAL

Pace is a DoD/DOE accredited laboratory; however, the following analyses are currently not listed on our DoD/DOE scope of accreditation: Drinking Water: pH EPA 150.1, Turbidity EPA 180.1, Metals EPA 200.7 & 200.8, Mercury EPA 245.1, Anions EPA 300.0, Cyanide EPA 335.4, Nitrates EPA 353.2, Orthophosphate & Phosphorus EPA 365.1, EDB/DBCP EPA 504.1, HPC SIMPLATE, Color SM 2120 B-2011, Alkalinity SM 2320 B-2011, Specific Conductance SM 2510 B-2011, Residue-filterable (TDS) SM 2540 C, Calcium Hardness (CaCO2) SM 3500-Ca B-2011, TRC SM 4500 Cl G-2011, pH SM 4500 H=B-2011, E.Coli, Total Coliform. Non-Potable Water: Metals EPA 200.7, Strontium EPA 200.8, Chlorate EPA 300.0, Cyanide EPA 335.4, Phenolics EPA 420.4, 2-Methyl-4,6-Dinitrophenol EPA 625.1, Propane RSK-175, Specific Conductance SM 2510 B-2011, Salinity SM2520 B, Residue- total SM 2540 B, Sulfite SM 4500 SO32- B-2011, Amenable Cyanide SM 4500-CN- G-2011, BOD & CBOD SM 5210 B, MBAS SM 5540 C-2011, Boron & Titanium SW-846 6010D, Boron, Molybdenum, & Titanium SW-846 6020B, Alcohols & Glycols SW-846 8015C, Pentachlorophenol SW-846 8151A, Ethyl Acetate, Hexane, & n-Hexane SW-846 8260D, SVOC 1,4-Dioxane, 4-Dimethyl aminoazobenzene, 1,4-Naphthoquinone, 3,5-Dinitroaniline, PETN SW-846 8270E, Amenable Cyanide SW-846 9012B. Solid and Chemical Materials: Boron & Titanium SW-846 6010D, Molybdenum SW-846 6020B, Ethylene Glycol SW-846 8015B, Pentachlorophenol SW-846 8151A, Chloroprene SW-846 8260B, SVOC 1,4-Dioxane, 1,3,5-Trinitrobenzene, 1,4- Naphthoquinone, 1,4-Phenylenediamine, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, 3-Methylcholanthrene, 4-Aminobiphenyl, 4-Dimethyl aminoazobenzene, 4-Nitroquinoline-1-oxide, 7,12-Dimethylbenzo(a)anthracene, Chlorobenzilate, Diallate, Ethyl methanesulfonate, Isodrin, Isosafrole, Methyl methanesulfonate, n-Nitrosomethylethylamine, n-Nitrosomorpholine, n-Nitrosopiperidine, Piperonyl butoxide, Pronamide, Safrole, 3,5- Dinitroaniline, PETN SW-846 8270E, Oil & Grease SW-846 9071B.

Pace is a TNI accredited laboratory; however, the following analyses are currently not listed on our TNI scope of accreditation: Drinking Water: VOC (excluding BTEX, MTBE, Naphthalene, & 1,2-dichloroethane) EPA 524.2, E. coli and Total coliforms SM 9223 B-2004, Solid Chemical Material: TOC Walkley-Black, Biological Tissue: All, Non-Potable Water: SGT-HEM EPA 1664B, Silica EPA 200.7, Boron, Calcium, Silicon, Strontium EPA 200.8, Bicarbonate, Carbonate, and Hydroxide Alkalinity SM 2320 B-2011, SM 9221 C E-2006 & SM 9222D-2006, Strontium SW-846 6010D, VOC SM 6200 B-2011, Fecal Coliform Colilert-18, PFAS by Isotope Dilution SOP.

If you have any questions regarding this report, please contact the Pace Project Manager listed on the cover page.

PFAS
Surrogate recovery for the following samples was outside the upper control limit: YI15029-007, YI15029-008, YI15029-009. These samples did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

Sample Summary
Tetra Tech
Lot Number: YI15029
Project Name: NASA White Sands
Project Number: 112G09033

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	WSTF-A03-100-001-GW-240-20230913	Aqueous	09/13/2023 1110	09/15/2023
002	WSTF-A11-600C-005-GW-402-20230913	Aqueous	09/13/2023 1430	09/15/2023
003	WSTF-A08-INF0001-20230914	Aqueous	09/14/2023 1145	09/15/2023
004	WSTF-A08-EFF0001-20230914	Aqueous	09/14/2023 0800	09/15/2023
005	WSTF-A08-INF0002-20230914	Aqueous	09/14/2023 1340	09/15/2023
006	WSTF-A08-EFF0002-20230914	Aqueous	09/14/2023 1350	09/15/2023
007	WSTF-EB-20230913-07	Aqueous	09/13/2023 1550	09/15/2023
008	WSTF-FB-20230913-08	Aqueous	09/13/2023 1600	09/15/2023
009	WSTF-FB-20230914-09	Aqueous	09/14/2023 0925	09/15/2023

(9 samples)

FORM 2
ISOTOPE DILUTION STANDARD RECOVERY

Lab Name: Pace Analytical Services, LLC Lot No.: YI15029

Project No.: 112G09033

AnalyticalMethod: PFAS by ID SOP QSM B-15 Matrix: Water

CLIENT SAMPLE ID	IDS1	IDS2	IDS3	IDS4	IDS5	IDS6	IDS7	IDS8	IDS9
WSTF-A03-100-001-GW-240-20230913	96	113	87	79	84	85	86	91	91
WSTF-A11-600C-005-GW-402-20230913	102	117	98	87	86	92	94	95	98
WSTF-A08-INF0001-20230914	103	129	115	104	83	103	103	101	109
WSTF-A08-EFF0001-20230914	104	102	97	89	87	97	95	97	98
WSTF-A08-INF0002-20230914	95	114	103	95	92	102	99	104	104
WSTF-A08-EFF0002-20230914	112	130	114	103	105	112	112	114	113
WSTF-EB-20230913-07	134	161 *	125	112	101	121	123	128	129
WSTF-FB-20230913-08	114	165 *	119	111	94	107	115	113	123
WSTF-FB-20230914-09	119	153 *	120	104	63	82	117	116	119
YQ85972-001	91	102	100	98	80	95	96	95	98
YQ85972-002	109	124	114	97	90	103	107	113	121

	QC LIMITS
IDS1 = 13C2_4:2FTS	50-150
IDS2 = 13C2_6:2FTS	50-150
IDS3 = 13C2_8:2FTS	50-150
IDS4 = 13C2_PFDoA	50-150
IDS5 = 13C2_PFHxDA	50-150
IDS6 = 13C2_PFTeDA	50-150
IDS7 = 13C3_PFBS	50-150
IDS8 = 13C3_PFHxS	50-150
IDS9 = 13C3-HFPO-DA	50-150

* Recoveries outside QC limits
D IDS Diluted Out

FORM 2
ISOTOPE DILUTION STANDARD RECOVERY

Lab Name: Pace Analytical Services, LLC Lot No.: YI15029

Project No.: 112G09033

AnalyticalMethod: PFAS by ID SOP QSM B-15 Matrix: Water

CLIENT SAMPLE ID	IDS10	IDS11	IDS12	IDS13	IDS14	IDS15	IDS16	IDS17	
WSTF-A03-100-001-GW-240-20230913	96	90	88	94	83	85	89	85	
WSTF-A11-600C-005-GW-402-20230913	94	84	89	95	88	90	98	87	
WSTF-A08-INF0001-20230914	100	104	108	101	103	105	111	99	
WSTF-A08-EFF0001-20230914	85	91	94	92	97	87	96	86	
WSTF-A08-INF0002-20230914	97	93	100	97	103	97	103	103	
WSTF-A08-EFF0002-20230914	110	103	112	110	117	112	113	110	
WSTF-EB-20230913-07	123	121	123	119	120	114	130	112	
WSTF-FB-20230913-08	116	111	111	119	119	101	122	102	
WSTF-FB-20230914-09	114	106	108	109	112	114	119	107	
YQ85972-001	97	94	90	95	101	98	94	89	
YQ85972-002	106	103	103	109	105	103	116	105	

	QC LIMITS
IDS10 = 13C4_PFBA	50-150
IDS11 = 13C4_PFHpA	50-150
IDS12 = 13C5_PFHxA	50-150
IDS13 = 13C5_PFPeA	50-150
IDS14 = 13C6_PFDA	50-150
IDS15 = 13C7_PFUdA	50-150
IDS16 = 13C8_PFOA	50-150
IDS17 = 13C8_PFOS	50-150

* Recoveries outside QC limits
D IDS Diluted Out

FORM 2
ISOTOPE DILUTION STANDARD RECOVERY

Lab Name: Pace Analytical Services, LLC Lot No.: YI15029

Project No.: 112G09033

AnalyticalMethod: PFAS by ID SOP QSM B-15 Matrix: Water

CLIENT SAMPLE ID	IDS18	IDS19	IDS20	IDS21	IDS22	IDS23	IDS24	IDS25	TOT OUT
WSTF-A03-100-001-GW-240-20230913	91	89	64	82	78	73	82	86	0
WSTF-A11-600C-005-GW-402-20230913	90	90	70	87	97	74	87	88	0
WSTF-A08-INF0001-20230914	100	103	81	104	93	69	89	101	0
WSTF-A08-EFF0001-20230914	92	90	73	89	84	83	94	91	0
WSTF-A08-INF0002-20230914	98	101	67	97	93	70	94	86	0
WSTF-A08-EFF0002-20230914	115	105	85	107	102	86	104	99	0
WSTF-EB-20230913-07	113	124	83	111	114	82	122	105	1
WSTF-FB-20230913-08	116	113	73	109	105	79	107	112	1
WSTF-FB-20230914-09	104	113	76	107	94	72	106	97	1
YQ85972-001	98	97	69	92	86	64	88	96	0
YQ85972-002	108	103	66	100	96	69	105	106	0

	QC LIMITS
IDS18 = 13C8_PFOSA	50-150
IDS19 = 13C9_PFNA	50-150
IDS20 = d-EtFOSA	50-150
IDS21 = d5-EtFOSAA	50-150
IDS22 = d9-EtFOSE	50-150
IDS23 = d-MeFOSA	50-150
IDS24 = d3-MeFOSAA	50-150
IDS25 = d7-MeFOSE	50-150

* Recoveries outside QC limits
D IDS Diluted Out

CLIENT SAMPLE ID

YQ85972-001

FORM 4
METHOD BLANK SUMMARY

Lab Name: Pace Analytical Services, LLC
Lot No.: YI15029
Project No.: 112G09033
Lab Sample ID: YQ85972-001
Analytical Method: PFAS by ID SOP QSM B-15
Matrix: Water
Instrument ID: Sciex 4500_LCMSMS1
Lab File ID: YQ85972-001.txt
Extraction Type: SOP SPE
Date Extracted: 09/27/2023
LC Column: Gemini C18 ID: 2.00 (mm)
Date Analyzed: 09/29/2023
Time Analyzed: 02:48

CLIENT SAMPLE ID	LAB SAMPLE ID	LAB FILE ID	DATE/TIME ANALYZED
WSTF-A03-100-001-GW-240-20230913	YI15029-001	YI15029-001.txt	05:06
WSTF-A11-600C-005-GW-402-20230913	YI15029-002	YI15029-002.txt	05:17
WSTF-A08-INF0001-20230914	YI15029-003	YI15029-003.txt	05:28
WSTF-A08-EFF0001-20230914	YI15029-004	YI15029-004.txt	06:00
WSTF-A08-INF0002-20230914	YI15029-005	YI15029-005.txt	06:10
WSTF-A08-EFF0002-20230914	YI15029-006	YI15029-006.txt	06:21
WSTF-EB-20230913-07	YI15029-007	YI15029-007.txt	06:31
WSTF-FB-20230913-08	YI15029-008	YI15029-008.txt	06:42
WSTF-FB-20230914-09	YI15029-009	YI15029-009.txt	06:52
YQ85972-002	YQ85972-002	YQ85972-002.txt	02:59

PFAS by LC/MS/MS - MB

Sample ID: YQ85972-001
Batch: 85972
Analytical Method: PFAS by ID SOP QSM B-15

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 09/27/2023 2024

Parameter	Result	Q	Dil	LOQ	LOD	DL	Units	Analysis Date
9Cl-PF3ONS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
11Cl-PF3OUdS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
8:2 FTS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
6:2 FTS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
10:2 FTS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
4:2 FTS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
GenX	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
ADONA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
EtFOSA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
EtFOSAA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
EtFOSE	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
MeFOSA	8.0	U	1	16	8.0	4.0	ng/L	09/29/2023 0248
MeFOSAA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
MeFOSE	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
PFBS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFDS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFHpS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFNS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFOSA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFPeS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFDOS	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
PFHxS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFBA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFDA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFDoA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFHpA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFHxDA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
PFHxA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFNA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFODA	4.0	U	1	8.0	4.0	2.0	ng/L	09/29/2023 0248
PFOA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFPeA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFTeDA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFTrDA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFUdA	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248
PFOS	2.0	U	1	4.0	2.0	1.0	ng/L	09/29/2023 0248

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		91	50-150
13C2_6:2FTS		102	50-150
13C2_8:2FTS		100	50-150
13C2_PFDoA		98	50-150
13C2_PFHxDA		80	50-150

LOQ = Limit of Quantitation
DL = Detection Limit
LOD = Limit of Detection

U = Not detected at or above the LOD
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria

N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MB

Sample ID: YQ85972-001
Batch: 85972
Analytical Method: PFAS by ID SOP QSM B-15

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 09/27/2023 2024

Surrogate	Q	% Rec	Acceptance Limit
13C2_PFTeDA		95	50-150
13C3_PFBS		96	50-150
13C3_PFHxS		95	50-150
13C3-HFPO-DA		98	50-150
13C4_PFBA		97	50-150
13C4_PFHpA		94	50-150
13C5_PFHxA		90	50-150
13C5_PFPeA		95	50-150
13C6_PFDA		101	50-150
13C7_PFUdA		98	50-150
13C8_PFOA		94	50-150
13C8_PFOS		89	50-150
13C8_PFOSA		98	50-150
13C9_PFNA		97	50-150
d-EtFOSA		69	50-150
d5-EtFOSAA		92	50-150
d9-EtFOSE		86	50-150
d-MeFOSA		64	50-150
d3-MeFOSAA		88	50-150
d7-MeFOSE		96	50-150

LOQ = Limit of Quantitation
DL = Detection Limit
LOD = Limit of Detection

U = Not detected at or above the LOD
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria

N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

FORM 3
LABORATORY CONTROL/LABORATORY CONTROL DUPLICATE SAMPLE RECOVERY

Lab Name: Pace Analytical Services, LLC Lot No.: YI15029

Project No.: 112G09033

Analytical Method: PFAS by ID SOP QSM B-15 Matrix: Water

Client Sample ID: YQ85972-002 Lab Sample ID: YQ85972-002

Instrument ID: _Sciex 4500_LCMSMS1

Concentration Units (ug/L, mg/L, ug/kg): ng/L

ANALYTE	SPIKE ADDED	LCS CONCENTRATION	LCS %REC #	QC LIMITS REC.
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	15	14	93	50-150
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	15	14	94	67-138
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	15	16	104	64-140
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	15	14	89	50-150
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	15	15	101	63-143
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	16	16	98	50-150
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	16	14	86	50-150
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	15	15	100	50-150
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	15	14	94	50-150
Hexafluoropropylene oxide dimer acid (GenX)	32	32	99	50-150
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	16	16	102	50-150
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	16	18	110	61-135
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	16	16	101	68-141
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	16	16	98	65-136
Perfluoro-1-butanesulfonic acid (PFBS)	14	14	98	72-130
Perfluoro-1-decanesulfonic acid (PFDS)	15	13	87	53-142
Perfluoro-1-heptanesulfonic acid (PFHpS)	15	15	98	69-134
Perfluoro-1-nonanesulfonic acid (PFNS)	15	15	98	69-127
Perfluoro-1-octanesulfonamide (PFOSA)	16	16	100	67-137
Perfluoro-1-pentanesulfonic acid (PFPeS)	15	14	94	71-127
Perfluoro-n-butanoic acid (PFBA)	16	15	96	73-129
Perfluoro-n-decanoic acid (PFDA)	16	17	109	71-129
Perfluoro-n-dodecanoic acid (PFDoA)	16	17	104	72-134
Perfluoro-n-heptanoic acid (PFHpA)	16	15	96	72-130
Perfluoro-n-hexadecanoic acid (PFHxDA)	16	16	98	50-150
Perfluoro-n-hexanoic acid (PFHxA)	16	16	98	72-129
Perfluoro-n-nonanoic acid (PFNA)	16	16	100	69-130
Perfluoro-n-octadecanoic acid (PFODA)	16	13	82	50-150
Perfluoro-n-octanoic acid (PFOA)	16	15	95	71-133
Perfluoro-n-pentanoic acid (PFPeA)	16	16	103	72-129
Perfluoro-n-tetradecanoic acid (PFTeDA)	16	15	95	71-132
Perfluoro-n-tridecanoic acid (PFTrDA)	16	16	98	65-144
Perfluoro-n-undecanoic acid (PFUdA)	16	16	98	69-133
Perfluorododecanesulfonic acid (PFDOS)	15	14	92	50-150
Perfluorohexanesulfonic acid (PFHxS)	15	15	102	68-131
Perfluorooctanesulfonic acid (PFOS)	15	14	97	65-140

* Values outside of QC Limits

PFAS by LC/MS/MS - LCS

Sample ID: YQ85972-002
Batch: 85972
Analytical Method: PFAS by ID SOP QSM B-15

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 09/27/2023 2024

Parameter	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	%Rec Limit	Analysis Date
9Cl-PF3ONS	15	14		1	94	50-150	09/29/2023 0259
11Cl-PF3OUdS	15	14		1	93	50-150	09/29/2023 0259
8:2 FTS	15	14		1	94	67-138	09/29/2023 0259
6:2 FTS	15	16		1	104	64-140	09/29/2023 0259
10:2 FTS	15	14	M-03	1	89	50-150	09/29/2023 0259
4:2 FTS	15	15		1	101	63-143	09/29/2023 0259
GenX	32	32		1	99	50-150	09/29/2023 0259
ADONA	15	15		1	100	50-150	09/29/2023 0259
EtFOSA	16	16		1	102	50-150	09/29/2023 0259
EtFOSAA	16	18	M-03	1	110	61-135	09/29/2023 0259
EtFOSE	16	16		1	98	50-150	09/29/2023 0259
MeFOSA	16	16		1	101	68-141	09/29/2023 0259
MeFOSAA	16	16	M-03	1	98	65-136	09/29/2023 0259
MeFOSE	16	14		1	86	50-150	09/29/2023 0259
PFBS	14	14		1	98	72-130	09/29/2023 0259
PFDS	15	13		1	87	53-142	09/29/2023 0259
PFHpS	15	15		1	98	69-134	09/29/2023 0259
PFNS	15	15		1	98	69-127	09/29/2023 0259
PFOSA	16	16		1	100	67-137	09/29/2023 0259
PFPeS	15	14		1	94	71-127	09/29/2023 0259
PFDOS	15	14		1	92	50-150	09/29/2023 0259
PFHxS	15	15		1	102	68-131	09/29/2023 0259
PFBA	16	15		1	96	73-129	09/29/2023 0259
PFDA	16	17		1	109	71-129	09/29/2023 0259
PFDoA	16	17		1	104	72-134	09/29/2023 0259
PFHpA	16	15		1	96	72-130	09/29/2023 0259
PFHxDA	16	16		1	98	50-150	09/29/2023 0259
PFHxA	16	16		1	98	72-129	09/29/2023 0259
PFNA	16	16		1	100	69-130	09/29/2023 0259
PFODA	16	13		1	82	50-150	09/29/2023 0259
PFOA	16	15		1	95	71-133	09/29/2023 0259
PFPeA	16	16		1	103	72-129	09/29/2023 0259
PFTeDA	16	15		1	95	71-132	09/29/2023 0259
PFTrDA	16	16		1	98	65-144	09/29/2023 0259
PFUdA	16	16		1	98	69-133	09/29/2023 0259
PFOS	15	14	M-03	1	97	65-140	09/29/2023 0259

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		109	50-150
13C2_6:2FTS		124	50-150
13C2_8:2FTS		114	50-150
13C2_PFDoA		97	50-150
13C2_PFHxDA		90	50-150

LOQ = Limit of Quantitation
DL = Detection Limit
LOD = Limit of Detection

U = Not detected at or above the LOD
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria

N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: YQ85972-002
Batch: 85972
Analytical Method: PFAS by ID SOP QSM B-15

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 09/27/2023 2024

Surrogate	Q	% Rec	Acceptance Limit
13C2_PFTeDA		103	50-150
13C3_PFBS		107	50-150
13C3_PFHxS		113	50-150
13C3-HFPO-DA		121	50-150
13C4_PFBA		106	50-150
13C4_PFHpA		103	50-150
13C5_PFHxA		103	50-150
13C5_PFPeA		109	50-150
13C6_PFDA		105	50-150
13C7_PFUdA		103	50-150
13C8_PFOA		116	50-150
13C8_PFOS		105	50-150
13C8_PFOSA		108	50-150
13C9_PFNA		103	50-150
d-EtFOSA	M-03	66	50-150
d5-EtFOSAA		100	50-150
d9-EtFOSE		96	50-150
d-MeFOSA		69	50-150
d3-MeFOSAA		105	50-150
d7-MeFOSE		106	50-150

LOQ = Limit of Quantitation
DL = Detection Limit
LOD = Limit of Detection

U = Not detected at or above the LOD
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria

N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Pace Environmental Services, LLC
Initial Calibration Signal Ratios Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
3	092023A007.d	CCV 200_SVLC-3079	20-Sep-2023 17:56:11
4	092023A008.d	CCV 500_SVLC-3080	20-Sep-2023 18:06:40
5	092023A009.d	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11
6	092023A010.d	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49
7	092023A011.d	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28
8	092023A012.d	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08
9	092023A013.d	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48
10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Column: 1 Detector: LCMS-Q3

Compound	Ratio Level 2	Ratio Level 3	Ratio Level 4	Ratio Level 5	Ratio Level 6	Ratio Level 7	Ratio Level 8	Ratio Level 9	Ratio Level 10	Average Ratio	Avg. +/-3 SD Ratio Limits	StdD Limit	50% Limit
7 PFBS	2.941	3.318	3.731	3.494	3.545	3.663	3.707	3.566	3.642	3.511	2.737-4.285	0.25802	1.755
1 4:2 FTS	0.502	1.021	1.256	1.316	1.497	1.749	1.642	1.610	1.601	1.354	0.187-2.521	0.38897	0.677
15 PFHxA	17.692	14.482	14.916	16.944	15.149	16.898	16.208	15.694	15.617	15.955	12.558-19.353	1.13249	7.977
22 PFPeS	3.182	3.234	3.431	3.258	3.502	3.375	3.424	3.617	3.480	3.389	2.983-3.794	0.13514	1.694
28 GenX	0.726	0.751	0.736	0.755	0.768	0.764	0.783	0.772	0.734	0.754	0.672-0.835	0.02715	0.377
13 PFHpA	3.008	2.909	3.074	3.043	2.757	2.920	3.056	2.998	3.027	2.976	2.667-3.286	0.10320	1.488
14 PFHxS	3.598	4.191	3.678	3.425	3.357	3.675	3.262	3.449	3.501	3.570	2.781-4.360	0.26322	1.785
29 ADONA	2.332	2.566	2.287	2.253	2.399	2.410	2.270	2.191	2.176	2.320	1.950-2.690	0.12344	1.160
2 6:2 FTS	1.005	1.349	1.410	1.259	1.483	1.263	1.320	1.393	1.362	1.316	0.904-1.727	0.13715	0.658
20 PFOA	2.839	2.658	2.560	2.426	2.395	2.819	2.722	2.659	2.505	2.620	2.162-3.077	0.15250	1.310
12 PFHpS	3.921	2.992	3.110	3.324	3.396	2.977	3.149	3.286	3.046	3.244	2.375-4.113	0.28958	1.622
17 PFNA	4.500	5.760	5.220	5.328	5.071	5.125	5.138	5.018	4.757	5.101	4.086-6.117	0.33840	2.550
18 PFOS	3.420	3.949	4.313	3.832	3.954	3.960	4.090	4.116	4.369	4.000	3.206-4.793	0.26450	2.000
19 PFOSA	28.603	43.825	41.617	43.988	35.433	40.705	41.056	43.965	42.594	40.198	25.153-55.242	5.01483	20.099
3 8:2 FTS	1.065	1.192	1.499	1.321	1.275	1.465	1.397	1.441	1.433	1.343	0.875-1.810	0.15577	0.671
16 PFNS	3.058	3.350	3.443	3.372	3.100	3.014	3.114	3.330	3.346	3.236	2.757-3.715	0.15961	1.618
10 PFDA	7.012	9.195	11.455	10.385	9.779	10.308	10.118	10.131	9.695	9.786	6.305-13.267	1.16041	4.893
6 N-MeFOSAA	0.951	1.712	1.472	1.461	1.558	1.575	1.611	1.535	1.568	1.493	0.841-2.146	0.21753	0.746
9 PFDS	2.709	3.493	3.129	2.981	3.036	3.069	3.162	3.060	2.932	3.063	2.469-3.657	0.19795	1.531
5 N-EtFOSAA	1.440	1.677	1.764	1.890	1.723	1.575	1.662	1.675	1.741	1.683	1.321-2.044	0.12051	0.841
25 PFUdA	10.796	9.671	8.858	11.564	11.038	10.573	10.485	10.574	11.132	10.521	8.050-12.991	0.82355	5.260
26 MeFOSA	0.920	0.972	1.111	1.039	0.904	1.084	1.049	1.062	1.027	1.018	0.797-1.239	0.07371	0.509
11 PFDoA	9.687	10.173	9.361	8.727	8.236	9.610	8.988	8.622	9.002	9.156	7.435-10.876	0.57355	4.578
4 10:2 FTS	4.856	1.543	2.159	2.288	2.627	2.086	2.350	2.543	2.311	2.529	-0.182-5.240	0.90377	1.264
27 EtFOSA	1.116	1.131	0.908	1.070	1.011	0.950	0.971	0.961	1.003	1.013	0.787-1.239	0.07522	0.506
34 PFDOS	3.585	2.528	3.149	3.615	3.371	3.274	3.196	3.303	3.308	3.258	2.344-4.172	0.30464	1.629
24 PFTrDA	3.227	3.309	3.413	3.738	3.755	3.489	3.934	4.097	3.691	3.628	2.748-4.508	0.29331	1.814
23 PFTeDA	11.176	8.823	8.743	9.381	9.052	9.106	9.020	9.185	9.127	9.290	7.146-11.434	0.71465	4.645
35 PFHxDA	12.970	11.360	11.623	11.976	11.779	11.887	11.972	11.924	12.024	11.946	10.624-13.268	0.44063	5.973
36 PFODA	11.901	11.293	11.529	11.440	11.524	11.594	11.729	11.913	11.487	11.601	10.981-12.220	0.20640	5.800

Report Date: 22-Sep-2023 09:40:04 AIM Revision: 2.0.2023.0816

Pace Environmental Services, LLC

Initial Calibration RF Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
3	092023A007.d	CCV 200_SVLC-3079	20-Sep-2023 17:56:11
4	092023A008.d	CCV 500_SVLC-3080	20-Sep-2023 18:06:40
5	092023A009.d	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11
6	092023A010.d	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49
7	092023A011.d	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28
8	092023A012.d	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08
9	092023A013.d	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48
10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Curve Legend: Ex. Avg:H Wt:C2 Org:F Dep:R

Curve Type: Avg, Ln, Qd Response Type: H-Height, A-Area
Wt: Curve Weighting, C-1/Conc, C2-1/Conc^2, R-1/Rsp, R2-1/Rsp^2, N-None
Org: Origin, F-Force, I-Include, N-Neither
Dep: Dependent Variable, C-Concentration, R-Response

%Rec = (Measured Amount / True Amount) * 100

Column: 1 Detector: LCMS-Q3

Compound	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
D 46 13C4_PFBA	931	906	925	936	983	885	852	827	825	Avg:A Wt:C2	897		RSD=6.0	
	103	101	103	104	109	98	95	92	92	Org:N Dep:R				
8 PFBA	0.851753	0.853451	0.803939	0.774163	0.676711	0.837058	0.829124	0.849346	0.789300	Avg:A Wt:C2	0.807205		RSD=7.0	
	105	105	99	95	83	103	102	105	97	Org:N Dep:R				
D 50 13C5_PFPeA	775	755	761	776	801	705	682	676	691	Avg:A Wt:C2	736		RSD=6.4	
	105	102	103	105	108	95	92	91	93	Org:N Dep:R				
21 PFPeA	1.088320	1.210925	1.126458	1.086135	0.984418	1.176324	1.181436	1.149907	1.107253	Avg:A Wt:C2	1.123464		RSD=6.0	
	96	107	100	96	87	104	105	102	98	Org:N Dep:R				
D 44 13C3_PFBS	334	309	305	312	332	302	300	274	287	Avg:A Wt:C2	306		RSD=6.2	
	109	100	99	101	108	98	97	89	93	Org:N Dep:R				
7 PFBS	0.975047	1.200219	1.200355	1.078225	1.023519	1.180846	1.179777	1.244620	1.157247	Avg:A Wt:C2	1.137762		RSD=8.0	
	85	105	105	94	89	103	103	109	101	Org:N Dep:R				

Compound	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
1 4:2 FTS	1.570336	1.972779	1.651439	1.607044	1.430419	1.570098	1.750803	1.566949	1.578494	Avg:A Wt:C2	1.633151		RSD=9.4	
	96	120	101	98	87	96	107	95	96	Org:N Dep:R				
D 63 13C2_4:2 FTS_2	36.7425	34.2754	33.7633	34.1617	34.7703	35.6656	31.7193	32.5180	32.9508	Avg:A Wt:C2	34.0630		RSD=4.6	
	107	100	99	100	102	104	93	95	96	Org:N Dep:R				
D 49 13C5_PFHxA	824	731	792	768	752	717	758	711	728	Avg:A Wt:C2	754		RSD=4.9	
	109	96	105	101	99	95	100	94	96	Org:N Dep:R				
15 PFHxA	0.836037	1.004760	0.860212	0.885064	0.818266	0.991754	0.896038	0.894255	0.816962	Avg:A Wt:C2	0.889261		RSD=7.7	
	94	112	96	99	92	111	100	100	91	Org:N Dep:R				
22 PFPeS	1.137335	1.219263	1.108903	1.097721	0.995269	1.104169	1.107026	1.212705	1.108633	Avg:A Wt:C2	1.121225		RSD=5.9	
	101	108	98	97	88	98	98	108	98	Org:N Dep:R				
28 GenX	0.765206	0.718449	0.694203	0.673384	0.657594	0.709563	0.725998	0.803634	0.736808	Avg:A Wt:C2	0.720538		RSD=6.2	
	106	99	96	93	91	98	100	111	102	Org:N Dep:R				
D 66 13C3_GenX	150	148	159	159	152	148	150	136	135	Avg:A Wt:C2	149		RSD=5.7	
	100	99	107	106	102	99	100	91	91	Org:N Dep:R				
13 PFHpA	0.844325	0.891142	0.839620	0.858526	0.707373	0.813402	0.924209	0.887821	0.858553	Avg:A Wt:C2	0.847219		RSD=7.3	
	99	105	99	101	83	96	109	104	101	Org:N Dep:R				
D 47 13C4_PFHpA	1124	1066	1089	1044	1119	1062	934	922	915	Avg:A Wt:C2	1031		RSD=8.2	
	109	103	105	101	108	103	90	89	88	Org:N Dep:R				
D 45 13C3_PFHxS	319	309	310	314	334	293	290	275	304	Avg:A Wt:C2	305		RSD=5.7	
	104	101	101	102	109	95	95	90	99	Org:N Dep:R				
14 PFHxS	1.178329	1.205525	1.174779	1.119152	0.985909	1.202485	1.158646	1.221785	1.076081	Avg:A Wt:C2	1.146966		RSD=6.6	
	102	105	102	97	85	104	101	106	93	Org:N Dep:R				
29 ADONA	4.780411	5.111176	4.583129	4.448174	4.256819	5.002695	4.671396	4.919684	4.157848	Avg:A Wt:C2	4.659037		RSD=7.1	
	102	109	98	95	91	107	100	105	89	Org:N Dep:R				
D 64 13C2_6:2 FTS_2	34.7358	31.8778	32.7120	32.7505	35.0939	32.1574	31.8417	28.2299	29.9431	Avg:A Wt:C2	32.1491		RSD=6.6	
	108	99	101	101	109	100	99	87	93	Org:N Dep:R				
2 6:2 FTS	1.553620	1.695392	1.759893	1.657784	1.638071	1.673145	1.700030	1.859474	1.679703	Avg:A Wt:C2	1.690790		RSD=5.0	
	91	100	104	98	96	98	100	109	99	Org:N Dep:R				
D 53 13C8_PFOA	872	785	850	839	881	783	769	729	761	Avg:A Wt:C2	808		RSD=6.7	
	107	97	105	103	109	96	95	90	94	Org:N Dep:R				
20 PFOA	0.947964	0.982921	0.871150	0.873567	0.742242	0.985724	0.962789	0.951898	0.846563	Avg:A Wt:C2	0.907202		RSD=8.9	
	104	108	96	96	81	108	106	104	93	Org:N Dep:R				
12 PFHpS	0.899647	0.841061	0.879515	0.836353	0.714821	0.827686	0.884081	0.914158	0.767245	Avg:A Wt:C2	0.840507		RSD=7.7	
	107	100	104	99	85	98	105	108	91	Org:N Dep:R				
D 54 13C8_PFOS	299	257	277	265	276	267	250	244	252	Avg:A Wt:C2	265		RSD=6.4	
	112	97	104	99	104	100	94	91	95	Org:N Dep:R				
D 56 13C9_PFNA	894	751	821	817	777	782	735	677	729	Avg:A Wt:C2	776		RSD=8.2	
	115	96	105	105	100	100	94	87	93	Org:N Dep:R				
17 PFNA	0.863459	1.103173	0.856630	0.955943	0.864550	0.947736	0.963933	1.028275	0.867777	Avg:A Wt:C2	0.939053		RSD=9.1	
	91	117	91	101	92	100	102	109	92	Org:N Dep:R				
18 PFOS	1.068238	1.131865	1.135767	1.093328	0.959254	1.152294	1.145156	1.135505	1.133739	Avg:A Wt:C2	1.106127		RSD=5.5	
	96	102	102	98	86	104	103	102	102	Org:N Dep:R				

Compound	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
30 9Cl-PF3ONS	2.378936	2.976351	2.584125	2.769250	2.300018	2.669911	2.805868	3.239607	2.897564	Avg:A Wt:C2	2.735737		RSD=10.7	
	86	108	94	101	84	97	102	118	105	Org:N Dep:R				
D 55 13C8_PFOSA	459	458	440	444	492	449	438	419	447	Avg:A Wt:C2	450		RSD=4.4	
	102	101	97	98	109	99	97	93	99	Org:N Dep:R				
19 PFOSA	0.993622	1.081290	1.138577	0.997636	0.888555	1.070686	1.019550	1.107423	0.969521	Avg:A Wt:C2	1.029651		RSD=7.5	
	96	105	110	96	86	103	99	107	94	Org:N Dep:R				
D 65 13C2_8:2 FTS_2	30.9048	30.9965	32.5591	30.6900	33.8855	28.4637	29.8116	25.3893	25.3374	Avg:A Wt:C2	29.7820		RSD=9.9	
	103	104	109	103	113	95	100	85	85	Org:N Dep:R				
3 8:2 FTS	1.531405	1.521486	1.387937	1.615114	1.166491	1.600515	1.416873	1.544678	1.659631	Avg:A Wt:C2	1.493792		RSD=10.1	
	102	101	92	108	78	107	94	103	111	Org:N Dep:R				
16 PFNS	0.850920	1.074451	0.838700	0.907531	0.790833	0.883897	0.933239	0.975797	0.913986	Avg:A Wt:C2	0.907706		RSD=9.2	
	93	118	92	99	87	97	102	107	100	Org:N Dep:R				
D 51 13C6_PFDA	752	722	765	751	819	697	708	607	668	Avg:A Wt:C2	721		RSD=8.5	
	104	100	106	104	113	96	98	84	92	Org:N Dep:R				
10 PFDA	0.945284	1.042678	0.969870	0.943501	0.838587	1.013221	0.981566	1.062801	0.895483	Avg:A Wt:C2	0.965888		RSD=7.3	
	97	107	100	97	86	104	101	110	92	Org:N Dep:R				
D 58 d3-MeFOSAA	165	157	166	160	162	154	151	141	146	Avg:A Wt:C2	156		RSD=5.4	
	106	100	106	102	103	99	96	90	93	Org:N Dep:R				
6 N-MeFOSAA	0.770387	0.960248	0.758380	0.807325	0.725133	0.864978	0.878768	0.872209	0.861573	Avg:A Wt:C2	0.833222		RSD=8.8	
	92	115	91	96	87	103	105	104	103	Org:N Dep:R				
9 PFDS	0.719484	0.921065	0.795597	0.779704	0.737780	0.802985	0.868605	0.828281	0.776728	Avg:A Wt:C2	0.803359		RSD=7.8	
	89	114	99	97	91	99	108	103	96	Org:N Dep:R				
D 60 d5-EtFOSAA	143	143	131	128	142	123	118	107	110	Avg:A Wt:C2	127		RSD=10.7	
	112	112	102	100	111	96	92	84	86	Org:N Dep:R				
5 N-EtFOSAA	0.840057	0.966961	0.976673	1.038640	0.862880	1.026185	1.065643	1.105700	1.038806	Avg:A Wt:C2	0.991283		RSD=9.1	
	84	97	98	104	87	103	107	111	104	Org:N Dep:R				
D 52 13C7_PFUdA	689	684	646	732	683	649	656	588	596	Avg:A Wt:C2	658		RSD=6.9	
	104	103	98	111	103	98	99	89	90	Org:N Dep:R				
25 PFUdA	0.903564	0.953994	0.933502	0.835610	0.838728	0.934143	0.849400	0.926267	0.874415	Avg:A Wt:C2	0.894402		RSD=5.1	
	101	106	104	93	93	104	94	103	97	Org:N Dep:R				
D 61 d7-MeFOSE	113	109	124	120	136	115	110	109	111	Avg:A Wt:C2	116		RSD=7.7	
	96	94	106	103	116	98	94	93	95	Org:N Dep:R				
32 MeFOSE	0.885931	1.036212	0.933499	0.933911	0.752493	0.964046	0.983777	0.934163	0.936167	Avg:A Wt:C2	0.928911		RSD=8.4	
	95	111	100	100	81	103	105	100	100	Org:N Dep:R				
26 MeFOSA	0.929062	0.947166	0.920095	1.045998	0.790786	1.111457	0.954982	1.080221	0.980801	Avg:A Wt:C2	0.973396		RSD=9.9	
	95	97	94	107	81	114	98	110	100	Org:N Dep:R				
D 57 d3-MeFOSA	69.1665	61.4095	67.7365	60.4695	69.4670	59.2885	62.2480	56.9660	60.8515	Avg:A Wt:C2	63.0670		RSD=7.2	
	109	97	107	95	110	94	98	90	96	Org:N Dep:R				
31 11Cl-PF3OUDS	1.529209	1.905461	1.818053	1.841926	1.614814	1.800816	1.990140	1.945358	1.953518	Avg:A Wt:C2	1.822144		RSD=8.6	
	83	104	99	101	88	98	109	106	107	Org:N Dep:R				
D 62 d9-EtFOSE	111	101	109	98.3870	115	106	111	92.0195	104	Avg:A Wt:C2	105		RSD=6.9	
	105	95	103	93	109	100	105	87	99	Org:N Dep:R				

Compound	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
11 PFDoA	1.020683	1.104147	0.933013	0.979857	0.874597	1.127705	1.008037	1.053824	1.043929	Avg:A Wt:C2	1.016199		RSD=7.8	
	100	108	91	96	86	110	99	103	102	Org:N Dep:R				
D 38 13C2_PFDoA	667	693	697	684	705	608	643	616	598	Avg:A Wt:C2	657		RSD=6.3	
	101	105	106	104	107	92	97	93	91	Org:N Dep:R				
D 59 d5-EtFOSA	59.6725	59.9830	60.8975	66.3875	60.2940	62.5970	53.7710	55.5200	57.3185	Avg:A Wt:C2	59.6046		RSD=6.3	
	100	100	102	111	101	105	90	93	96	Org:N Dep:R				
33 EtFOSE	1.128979	0.909839	0.930799	0.988708	0.810020	0.972944	0.886426	1.042550	0.899044	Avg:A Wt:C2	0.952145		RSD=9.9	
	118	95	97	103	85	102	93	109	94	Org:N Dep:R				
4 10:2 FTS	1.400365	1.262356	1.286903	1.387250	1.183170	1.358365	1.409961	1.526296	1.468759	Avg:A Wt:C2	1.364825		RSD=7.8	
	102	92	94	101	86	99	103	111	107	Org:N Dep:R				
27 EtFOSA	1.329591	1.274945	0.985591	1.050845	1.010333	1.022723	1.166698	1.110944	1.062694	Avg:A Wt:C2	1.112707		RSD=10.9	
	119	114	88	94	90	91	104	99	95	Org:N Dep:R				
34 PFDOS	0.627375	0.681750	0.658493	0.686678	0.621623	0.699217	0.725147	0.746202	0.699033	Avg:A Wt:C2	0.682835		RSD=6.1	
	91	99	96	100	91	102	106	109	102	Org:N Dep:R				
24 PFTrDA	0.427575	0.443832	0.412712	0.441792	0.413576	0.512395	0.475469	0.525290	0.479061	Avg:A Wt:C2	0.459078		RSD=9.0	
	93	96	89	96	90	111	103	114	104	Org:N Dep:R				
D 42 13C2_PFTeDA	715	668	715	725	749	684	688	639	676	Avg:A Wt:C2	695		RSD=4.8	
	102	96	102	104	107	98	98	91	97	Org:N Dep:R				
23 PFTeDA	1.042388	1.126243	0.982133	0.995008	0.913775	1.029467	0.995289	1.044974	0.989657	Avg:A Wt:C2	1.013215		RSD=5.7	
	102	111	96	98	90	101	98	103	97	Org:N Dep:R				
35 PFHxDA	1.320745	1.344680	1.181893	1.275687	1.079468	1.259602	1.250893	1.314731	1.166903	Avg:A Wt:C2	1.243845		RSD=6.9	
	106	108	95	102	86	101	100	105	93	Org:N Dep:R				
D 40 13C2_PFHxDA	447	432	464	440	484	432	431	399	438	Avg:A Wt:C2	441		RSD=5.3	
	101	97	105	99	109	98	97	90	99	Org:N Dep:R				
36 PFODA	0.939098	0.982548	0.899946	0.947768	0.809585	0.967764	0.959732	1.016298	0.893700	Avg:A Wt:C2	0.935160		RSD=6.5	
	100	105	96	101	86	103	102	108	95	Org:N Dep:R				

Pace Environmental Services, LLC
Initial Calibration Ion Suppression Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
3	092023A007.d	CCV 200_SVLC-3079	20-Sep-2023 17:56:11
4	092023A008.d	CCV 500_SVLC-3080	20-Sep-2023 18:06:40
5	092023A009.d	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11
6	092023A010.d	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49
7	092023A011.d	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28
8	092023A012.d	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08
9	092023A013.d	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48
10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Column: 1 Detector: LCMS-Q3

Compound	Response Level 2	Response Level 3	Response Level 4	Response Level 5	Response Level 6	Response Level 7	Response Level 8	Response Level 9	Response Level 10	RPD
* 43 13C3_PFBA	10505	8099	9506	8343	11803	9704	8601	8386	7851	7.22
* 39 13C2_PFHxA	313	838	839	1600	1677	2592	5716	5792	9074	46.66
* 41 13C2_PFOA		261	261	913	1385	3015	7171	10959	10016	47.46
* 48 13C4_PFOS	6033	6458	4330	2852	3958	4512	6101	4147	4019	10.01
* 37 13C2_PFDA			522	648	1525		8315	6943	15599	46.76

13C3_PFBA ((|7851 - 10505| / (7851 + 10505)) / 2) * 100 = 7.23
13C2_PFHxA ((|9074 - 313| / (9074 + 313)) / 2) * 100 = 46.67
13C2_PFOA ((|10016 - 261| / (10016 + 261)) / 2) * 100 = 47.46
13C4_PFOS ((|4019 - 6033| / (4019 + 6033)) / 2) * 100 = 10.02
13C2_PFDA ((|15599 - 522| / (15599 + 522)) / 2) * 100 = 46.76

Pace Environmental Services, LLC
Initial Calibration Response Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
3	092023A007.d	CCV 200_SVLC-3079	20-Sep-2023 17:56:11
4	092023A008.d	CCV 500_SVLC-3080	20-Sep-2023 18:06:40
5	092023A009.d	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11
6	092023A010.d	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49
7	092023A011.d	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28
8	092023A012.d	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08
9	092023A013.d	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48
10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Quantitation Standards (* - Istd) (D - Iso Dil Std)

* 43 13C3_PFBA	* 39 13C2_PFHxA	* 41 13C2_PFOA
* 48 13C4_PFOS	* 37 13C2_PFDA	D 46 13C4_PFBA
D 50 13C5_PFPeA	D 44 13C3_PFBS	D 63 13C2_4:2 FTS_2
D 49 13C5_PFHxA	D 66 13C3_GenX	D 47 13C4_PFHpA
D 45 13C3_PFHxS	D 64 13C2_6:2 FTS_2	D 53 13C8_PFOA
D 54 13C8_PFOS	D 56 13C9_PFNA	D 55 13C8_PFOSA
D 65 13C2_8:2 FTS_2	D 51 13C6_PFDA	D 58 d3-MeFOSAA
D 60 d5-EtFOSAA	D 52 13C7_PFUdA	D 61 d7-MeFOSE
D 57 d3-MeFOSA	D 62 d9-EtFOSE	D 38 13C2_PFDoA
D 59 d5-EtFOSA	D 42 13C2_PFTeDA	D 40 13C2_PFHxDA

Column: 1 Detector: LCMS-Q3

Compound	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
* 43 13C3_PFBA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	10505	8099	9506	8343	11803	9704	8601	8386	7851	
* 39 13C2_PFHxA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	313	838	839	1600	1677	2592	5716	5792	9074	
* 41 13C2_PFOA		2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
		261	261	913	1385	3015	7171	10959	10016	
* 48 13C4_PFOS	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	6033	6458	4330	2852	3958	4512	6101	4147	4019	
* 37 13C2_PFDA			2000.00	2000.00	2000.00		2000.00	2000.00	2000.00	
			522	648	1525		8315	6943	15599	
D 46 13C4_PFBA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1861830	1812383	1850403	1871451	1966070	1770319	1704059	1654323	1650030	
8 PFBA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#46
	79291	154678	371903	724404	1330462	3704649	7064385	10538193	13023689	
D 50 13C5_PFPeA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1550831	1509433	1521100	1551610	1602317	1409821	1363024	1352430	1381885	
21 PFPeA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#50
	84390	182781	428364	842629	1577349	4146015	8051629	11663764	15300960	
D 44 13C3_PFBS	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	668885	618326	610023	623958	663225	604825	599208	548709	574710	

Compound	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
7 PFBS	88.400	176.80	442.00	884.00	1768.00	4420.00	8840.00	13260	17680	#44
	28827	65604	161826	297363	600080	1578393	3124638	4527852	5879320	
1 4:2 FTS	93.400	186.80	467.00	934.00	1868.00	4670.00	9340.00	14010	18680	#63
	5389	12631	26039	51276	92907	261513	518690	713866	971596	
D 63 13C2_4:2 FTS_2	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	367425	342754	337633	341617	347703	356656	317193	325180	329508	
D 49 13C5_PFHxA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1648994	1461662	1583474	1536838	1504823	1434359	1515483	1422542	1455551	
15 PFHxA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#49
	68931	146862	340531	680100	1231345	3556328	6789649	9540866	11891301	
22 PFPeS	93.800	187.60	469.00	938.00	1876.00	4690.00	9380.00	14070	18760	#44
	35679	70716	158629	321233	619162	1566059	3111059	4681246	5976396	
28 GenX	200.00	400.00	1000.00	2000.00	4000.00	10000	20000	30000	40000	#66
	22935	42436	110424	213710	401087	1052086	2175729	3280568	3984871	
D 66 13C3_GenX	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	1498617	1476653	1590658	1586835	1524827	1482724	1498441	1360723	1352072	
13 PFHpA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#47
	94881	190061	457079	896341	1582404	4320927	8628581	12280663	15714393	
D 47 13C4_PFHpA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	2247499	2132781	2177552	2088094	2237014	2124866	1867235	1844315	1830335	
D 45 13C3_PFHxS	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	638509	617605	619096	628720	667188	585138	580146	550576	608091	
14 PFHxS	91.000	182.00	455.00	910.00	1820.00	4550.00	9100.00	13650	18200	#45
	34233	67753	165461	320153	598586	1600735	3058436	4591078	5954634	
29 ADONA	94.200	188.40	471.00	942.00	1884.00	4710.00	9420.00	14130	18840	#45
	143765	297360	668207	1317225	2675373	6893713	12764531	19136682	23817055	
D 64 13C2_6:2 FTS_2	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	347358	318778	327120	327505	350939	321574	318417	282299	299431	
2 6:2 FTS	94.800	189.60	474.00	948.00	1896.00	4740.00	9480.00	14220	18960	#64
	5116	10247	27288	51470	108994	255031	513170	746447	953603	
D 53 13C8_PFOA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1743505	1569912	1700498	1678084	1761004	1566306	1537698	1458544	1522519	
20 PFOA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#53
	82639	154310	370347	732959	1307092	3859863	7402392	10412893	12889078	
12 PFHpS	95.200	190.40	476.00	952.00	1904.00	4760.00	9520.00	14280	19040	#45
	27343	49451	129592	250296	454028	1152659	2441385	3593659	4441601	
D 54 13C8_PFOS	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	597564	514885	553769	530037	552943	534495	499127	488047	504185	
D 56 13C9_PFNA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1787694	1501061	1642152	1634740	1553601	1564561	1470404	1353344	1457019	
17 PFNA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#56
	77180	165593	351679	781359	1343165	3706976	7086853	10437074	12643672	
18 PFOS	92.800	185.60	464.00	928.00	1856.00	4640.00	9280.00	13920	18560	#54
	29619	54082	145917	268890	492223	1428877	2652123	3857093	5304578	
30 9Cl-PF3ONS	93.200	186.40	466.00	932.00	1864.00	4660.00	9320.00	13980	18640	#54
	66245	142827	333425	683997	1185298	3325036	6526258	11051751	13615667	
D 55 13C8_PFOSA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	918881	915185	880039	887849	984551	898268	876171	838761	894827	
19 PFOSA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#55
	45651	98958	250498	442875	874828	2404408	4466502	6966472	8675533	
D 65 13C2_8:2 FTS_2	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	309048	309965	325591	306900	338855	284637	298116	253893	253374	
3 8:2 FTS	95.800	191.60	479.00	958.00	1916.00	4790.00	9580.00	14370	19160	#65
	4534	9036	21646	47486	75734	218216	404652	563567	805692	
16 PFNS	96.000	192.00	480.00	960.00	1920.00	4800.00	9600.00	14400	19200	#54
	24407	53109	111467	230892	419794	1133853	2235862	3428890	4423851	

Compound	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
D 51 13C6_PFDA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1504648	1444559	1529929	1502156	1637053	1394405	1416501	1213113	1335838	
10 PFDA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#51
	71116	150621	370958	708643	1372811	3532101	6951948	9669731	11962208	
D 58 d3-MeFOSAA	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	1652416	1571626	1659116	1596631	1616242	1544277	1506478	1413871	1463138	
6 N-MeFOSAA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#58
	12730	30183	62912	128900	234398	667883	1323845	1849787	2521199	
9 PFDS	96.400	192.80	482.00	964.00	1928.00	4820.00	9640.00	14460	19280	#54
	20723	45717	106179	199197	393264	1034352	2089684	2922655	3775164	
D 60 d5-EtFOSAA	10000	10000	10000	10000	10000	10000	10000	10000	10000	
	1428832	1428807	1305493	1284815	1421368	1233253	1184263	1074073	1102495	
5 N-EtFOSAA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#60
	12003	27632	63752	133446	245294	632773	1262001	1781404	2290556	
D 52 13C7_PFUdA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1377877	1368593	1292844	1464123	1366459	1298528	1312073	1176781	1192919	
25 PFUdA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#52
	62250	130563	301718	611718	1146087	3032527	5572375	8175097	10431059	
D 61 d7-MeFOSE	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	225074	218768	248343	239766	271807	229424	219886	217777	222751	
32 MeFOSE	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#61
	9970	22669	57957	111960	204533	552938	1081594	1525794	2085322	
26 MeFOSA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#57
	6426	11633	31162	63251	109867	329483	594457	923038	1193664	
D 57 d3-MeFOSA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	138333	122819	135473	120939	138934	118577	124496	113932	121703	
31 11Cl-PF3OUDS	94.200	188.40	471.00	942.00	1884.00	4710.00	9420.00	14130	18840	#54
	43040	92419	237097	459832	841112	2266752	4678596	6707696	9278085	
D 62 d9-EtFOSE	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	222254	201684	217727	196774	229814	211278	222813	184039	208785	
11 PFDoA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#38
	68110	153012	325245	670466	1232770	3426098	6478764	9741590	12495370	
D 38 13C2_PFDoA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1334596	1385794	1394385	1368498	1409529	1215246	1285422	1232538	1196956	
D 59 d5-EtFOSA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	119345	119966	121795	132775	120588	125194	107542	111040	114637	
33 EtFOSE	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#62
	12546	18350	50665	97276	186154	513904	987536	1439024	1877068	
4 10:2 FTS	96.400	192.80	482.00	964.00	1928.00	4820.00	9640.00	14460	19280	#65
	4172	7544	20196	41042	77298	186361	405200	560348	717496	
27 EtFOSA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#59
	7934	15295	30010	69763	121834	320097	627345	925194	1218241	
34 PFDOS	96.800	193.60	484.00	968.00	1936.00	4840.00	9680.00	14520	19360	#54
	18145	33979	88246	176159	332723	904422	1751791	2643960	3411636	
24 PFTrDA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#38
	28532	61506	143870	302296	582947	1556715	3055894	4855799	5734147	
D 42 13C2_PFTeDA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	1429698	1335564	1430593	1450169	1497923	1368490	1375742	1277586	1352622	
23 PFTeDA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#42
	74515	150417	351258	721465	1368765	3522039	6846303	10012833	13386312	
35 PFHxDA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#40
	59004	116046	274053	561511	1043870	2721304	5394151	7859640	10214919	
D 40 13C2_PFHxDA	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	
	893496	863001	927505	880327	967023	864179	862448	797085	875387	
36 PFODA	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#40
	41954	84794	208676	417173	782887	2090804	4138594	6075567	7823336	

Pace Environmental Services, LLC
Initial Calibration RT Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b
Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24
Instrument: LCMSMS01.i Integrator: picker
Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28
Method Lock: Unknown Lock Date:
Calib Method: PFAS-ID2 No.Compounds: 66
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes
Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Level	Cal File	Cal Sample ID	Cal Date
2	092023A006.d	CCV 100_SVLC-3078	20-Sep-2023 17:45:42
3	092023A007.d	CCV 200_SVLC-3079	20-Sep-2023 17:56:11
4	092023A008.d	CCV 500_SVLC-3080	20-Sep-2023 18:06:40
5	092023A009.d	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11
6	092023A010.d	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49
7	092023A011.d	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28
8	092023A012.d	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08
9	092023A013.d	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48
10	092023A014.d	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28

Column: 1 Detector: LCMS-Q3

Compound	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Avg. RT	%Rsd RT
D 46 13C4_PFBA	1.645	1.650	1.650	1.651	1.652	1.650	1.650	1.651	1.650	1.650	0.133
8 PFBA	1.652	1.650	1.650	1.651	1.652	1.650	1.650	1.651	1.650	1.650	0.053
D 50 13C5_PFPeA	1.966	1.972	1.964	1.964	1.966	1.964	1.971	1.964	1.964	1.965	0.159
21 PFPeA	1.966	1.972	1.964	1.964	1.966	1.964	1.971	1.964	1.972	1.966	0.176
D 44 13C3_PFBS	2.005	2.020	2.012	2.012	2.014	2.012	2.011	2.012	2.011	2.011	0.183
7 PFBS	2.005	2.020	2.012	2.012	2.014	2.012	2.019	2.012	2.011	2.012	0.218
1 4:2 FTS	2.254	2.270	2.261	2.261	2.263	2.261	2.260	2.261	2.270	2.262	0.238
D 63 13C2_4:2 FTS_2	2.263	2.261	2.261	2.261	2.263	2.261	2.269	2.261	2.261	2.262	0.132
* 39 13C2_PFHxA	2.301	2.298	2.317	2.289	2.301	2.308	2.297	2.299	2.308	2.301	0.344
D 49 13C5_PFHxA	2.301	2.298	2.298	2.298	2.301	2.298	2.297	2.299	2.298	2.298	0.044
15 PFHxA	2.301	2.298	2.298	2.298	2.301	2.298	2.297	2.299	2.298	2.298	0.044
22 PFPeS	2.329	2.326	2.326	2.326	2.329	2.326	2.335	2.327	2.326	2.327	0.114
28 GenX	2.413	2.420	2.411	2.411	2.413	2.411	2.419	2.411	2.420	2.413	0.168
D 66 13C3_GenX	2.413	2.420	2.411	2.411	2.413	2.411	2.419	2.411	2.411	2.412	0.150
13 PFHpA	2.679	2.685	2.677	2.677	2.679	2.677	2.684	2.677	2.685	2.680	0.134
D 47 13C4_PFHpA	2.671	2.685	2.677	2.677	2.679	2.677	2.684	2.677	2.677	2.678	0.161
D 45 13C3_PFHxS	2.696	2.702	2.694	2.694	2.696	2.694	2.692	2.694	2.694	2.694	0.115
14 PFHxS	2.696	2.702	2.694	2.694	2.696	2.694	2.700	2.694	2.694	2.695	0.127
29 ADONA	2.721	2.727	2.727	2.719	2.730	2.727	2.725	2.727	2.727	2.725	0.130
D 64 13C2_6:2 FTS_2	3.086	3.092	3.083	3.092	3.095	3.083	3.091	3.092	3.092	3.090	0.142
2 6:2 FTS	3.086	3.083	3.092	3.092	3.095	3.083	3.091	3.092	3.092	3.090	0.142
* 41 13C2_PFOA		3.136	3.101	3.092	3.095	3.136	3.118	3.128	3.136	3.117	0.611
D 53 13C8_PFOA	3.121	3.127	3.118	3.119	3.122	3.118	3.118	3.128	3.119	3.121	0.125
20 PFOA	3.113	3.127	3.127	3.119	3.122	3.118	3.118	3.128	3.119	3.121	0.172
12 PFHpS	3.130	3.136	3.127	3.127	3.130	3.127	3.135	3.136	3.136	3.132	0.133
* 48 13C4_PFOS	3.591	3.622	3.614	3.589	3.616	3.622	3.604	3.606	3.614	3.608	0.333
D 54 13C8_PFOS	3.599	3.614	3.605	3.597	3.607	3.605	3.604	3.606	3.605	3.604	0.131
D 56 13C9_PFNA	3.607	3.605	3.605	3.606	3.607	3.605	3.612	3.606	3.614	3.607	0.088
17 PFNA	3.607	3.614	3.605	3.606	3.607	3.605	3.612	3.614	3.614	3.609	0.108
18 PFOS	3.607	3.605	3.605	3.606	3.607	3.605	3.612	3.614	3.605	3.607	0.095
30 9Cl-PF3ONS	3.897	3.895	3.895	3.895	3.897	3.895	3.903	3.895	3.895	3.896	0.061
D 55 13C8_PFOSA	4.031	4.038	4.029	4.030	4.039	4.038	4.036	4.038	4.038	4.035	0.099
19 PFOSA	4.039	4.038	4.037	4.030	4.039	4.038	4.036	4.038	4.046	4.037	0.108

Compound	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Avg. RT	%Rsd RT
D 65 13C2_8:2 FTS_2	4.078	4.085	4.077	4.070	4.078	4.084	4.075	4.077	4.085	4.078	0.124
3 8:2 FTS	4.063	4.077	4.084	4.077	4.078	4.077	4.083	4.077	4.077	4.077	0.143
16 PFNS	4.078	4.092	4.084	4.085	4.086	4.084	4.090	4.084	4.085	4.085	0.098
D 51 13C6_PFDA	4.093	4.100	4.092	4.085	4.101	4.092	4.098	4.100	4.092	4.094	0.128
10 PFDA	4.086	4.100	4.092	4.085	4.101	4.092	4.098	4.100	4.100	4.094	0.154
* 37 13C2_PFDA			4.069	4.100	4.116		4.090	4.107	4.100	4.096	0.397
D 58 d3-MeFOSAA	4.311	4.318	4.309	4.301	4.311	4.310	4.317	4.310	4.310	4.310	0.112
6 N-MeFOSAA	4.320	4.318	4.318	4.318	4.320	4.318	4.317	4.318	4.318	4.318	0.021
9 PFDS	4.524	4.531	4.530	4.523	4.532	4.531	4.529	4.531	4.530	4.528	0.077
D 60 d5-EtFOSAA	4.539	4.531	4.545	4.538	4.547	4.538	4.545	4.546	4.538	4.540	0.119
5 N-EtFOSAA	4.547	4.553	4.553	4.546	4.555	4.546	4.552	4.553	4.553	4.550	0.079
D 52 13C7_PFUdA	4.547	4.553	4.545	4.546	4.555	4.546	4.552	4.553	4.553	4.550	0.087
25 PFUdA	4.539	4.553	4.553	4.546	4.547	4.553	4.552	4.553	4.553	4.550	0.108
D 61 d7-MeFOSE	4.684	4.700	4.682	4.692	4.693	4.691	4.690	4.691	4.683	4.689	0.123
32 MeFOSE	4.710	4.709	4.700	4.700	4.701	4.700	4.708	4.709	4.700	4.703	0.093
26 MeFOSA	4.718	4.726	4.734	4.717	4.719	4.717	4.725	4.717	4.717	4.721	0.120
D 57 d3-MeFOSA	4.710	4.717	4.717	4.717	4.719	4.717	4.716	4.709	4.708	4.714	0.091
31 11Cl-PF3OUDS	4.770	4.786	4.777	4.777	4.778	4.777	4.776	4.777	4.768	4.776	0.105
D 62 d9-EtFOSE	4.946	4.945	4.944	4.945	4.954	4.944	4.943	4.944	4.944	4.945	0.063
11 PFDoA	4.954	4.969	4.968	4.953	4.962	4.960	4.967	4.960	4.960	4.961	0.117
D 38 13C2_PFDoA	4.954	4.969	4.960	4.953	4.962	4.960	4.967	4.960	4.960	4.960	0.108
D 59 d5-EtFOSA	4.978	4.985	4.976	4.969	4.978	4.976	4.983	4.976	4.976	4.977	0.093
33 EtFOSE	4.970	4.961	4.968	4.969	4.962	4.960	4.967	4.960	4.960	4.964	0.081
4 10:2 FTS	4.978	4.969	4.968	4.969	4.962	4.968	4.975	4.968	4.968	4.969	0.094
27 EtFOSA	4.986	5.000	4.992	4.985	4.986	4.984	4.991	4.984	4.984	4.987	0.105
34 PFDOS	5.299	5.307	5.297	5.298	5.308	5.298	5.306	5.298	5.298	5.301	0.089
24 PFTrDA	5.326	5.335	5.334	5.334	5.336	5.335	5.333	5.334	5.334	5.333	0.050
D 42 13C2_PFTeDA	5.662	5.662	5.669	5.662	5.670	5.662	5.668	5.662	5.662	5.664	0.056
23 PFTeDA	5.662	5.669	5.669	5.662	5.670	5.669	5.668	5.662	5.662	5.666	0.062
35 PFHxDA	6.247	6.247	6.254	6.247	6.248	6.247	6.254	6.247	6.247	6.248	0.049
D 40 13C2_PFHxDA	6.247	6.247	6.254	6.247	6.248	6.247	6.246	6.247	6.247	6.247	0.040
36 PFODA	6.759	6.759	6.759	6.753	6.760	6.759	6.758	6.759	6.759	6.758	0.028

Pace Environmental Services, LLC
Initial Calibration Verification Report

Data File: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b\092023A016.d
Injection Date: 20-Sep-2023 19:31:39 Injection Vol: 10.0 uL
Sample Type: ICV Auto Sampler: 80
Sample Info: ICV_3035 Misc. Info:
Inst. ID: LCMSMS01.i Operator: eqi.svoa

Method: LCMSMS01_PFAS-ID2 Version: V16 30-Jun-2022 10:54:24
Calib Method: PFAS-ID2 Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: ICV-43 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			1000.00	951.58	95	70 - 130
D 46 13C4_PFBA	1871451	2058575			110	50 - 150
D 50 13C5_PFPeA	1551610	1680287			108	50 - 150
21 PFPeA			1000.00	959.09	96	70 - 130
7 PFBS			1000.00	1021.39	102	70 - 130
D 44 13C3_PFBS	623958	682309			109	50 - 150
1 4:2 FTS			1000.00	931.11	93	70 - 130
D 63 13C2_4:2 FTS_2	341617	369093			108	50 - 150
D 49 13C5_PFHxA	1536838	1639784			107	50 - 150
15 PFHxA			1000.00	1006.51	101	70 - 130
22 PFPeS			1000.00	969.55	97	70 - 130
D 66 13C3_GenX	1586835	1545590			97	50 - 150
28 GenX			1000.00	1023.14	102	70 - 130
13 PFHpA			1000.00	917.44	92	70 - 130
D 47 13C4_PFHpA	2088094	2241866			107	50 - 150
14 PFHxS			1000.00	975.79	98	70 - 130
D 45 13C3_PFHxS	628720	666029			106	50 - 150
29 ADONA			1000.00	932.12	93	70 - 130
2 6:2 FTS			1000.00	1027.30	103	70 - 130
D 64 13C2_6:2 FTS_2	327505	332531			102	50 - 150
20 PFOA			1000.00	844.76	84	70 - 130
D 53 13C8_PFOA	1678084	1835963			109	50 - 150
12 PFHpS			1000.00	936.25	94	70 - 130
D 54 13C8_PFOS	530037	577270			109	50 - 150
18 PFOS			1000.00	930.35	93	70 - 130
17 PFNA			1000.00	961.00	96	70 - 130
D 56 13C9_PFNA	1634740	1773290			108	50 - 150
30 9Cl-PF3ONS			1000.00	858.36	86	70 - 130
19 PFOSA			1000.00	909.29	91	70 - 130
D 55 13C8_PFOSA	887849	974966			110	50 - 150
D 65 13C2_8:2 FTS_2	306900	340790			111	50 - 150
3 8:2 FTS			1000.00	983.24	98	70 - 130
D 51 13C6_PFDA	1502156	1682916			112	50 - 150
16 PFNS			1000.00	942.52	94	70 - 130
10 PFDA			1000.00	925.31	93	70 - 130
D 58 d3-MeFOSAA	1596631	1672774			105	50 - 150

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			1000.00	999.27	100	70 - 130
9 PFDS			1000.00	966.42	97	70 - 130
D 60 d5-EtFOSAA	1284815	1362314			106	50 - 150
5 N-EtFOSAA			1000.00	995.40	100	70 - 130
25 PFUdA			1000.00	877.01	88	70 - 130
D 52 13C7_PFUdA	1464123	1474471			101	50 - 150
D 61 d7-MeFOSE	239766	248568			104	50 - 150
32 MeFOSE			1000.00	1144.65	114	70 - 130
D 57 d3-MeFOSA	120939	132128			109	50 - 150
26 MeFOSA			1000.00	1196.69	120	70 - 130
31 11Cl-PF3OUDS			1000.00	963.92	96	70 - 130
D 62 d9-EtFOSE	196774	226507			115	50 - 150
D 38 13C2_PFDoA	1368498	1398396			102	50 - 150
11 PFDoA			1000.00	895.01	90	70 - 130
D 59 d5-EtFOSA	132775	128467			97	50 - 150
33 EtFOSE			1000.00	897.58	90	70 - 130
4 10:2 FTS			968.00	999.92	103	70 - 130
27 EtFOSA			1000.00	994.72	99	70 - 130
34 PFDOS			1000.00	1057.29	106	70 - 130
24 PFTrDA			1000.00	941.90	94	70 - 130
23 PFTeDA			1000.00	1015.74	102	70 - 130
D 42 13C2_PFTeDA	1450169	1611657			111	50 - 150
35 PFHxDA			1000.00	920.07	92	70 - 130
D 40 13C2_PFHxDA	880327	921252			105	50 - 150
36 PFODA			1000.00	991.11	99	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A001.d
Injection Date: 29-Sep-2023 02:27:48 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 97
Sample Info: CCV 200A_SVLC-3079 Misc. Info:
Inst. ID: LCMSMS01.i Operator: eqi.svoa

Method: LCMSMS01_PFAS-ID2 Version: V16 30-Jun-2022 10:54:24
Calib Method: PFAS-ID2 Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-3 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			200.00	204.44	102	70 - 130
D 46 13C4_PFBA	1871451	1858941			99	50 - 150
D 50 13C5_PFPeA	1551610	1482989			96	50 - 150
21 PFPeA			200.00	211.32	105	70 - 130
7 PFBS			176.80	191.82	108	70 - 130
D 44 13C3_PFBS	623958	662185			106	50 - 150
1 4:2 FTS			186.80	196.94	105	70 - 130
D 63 13C2_4:2 FTS_2	341617	347875			102	50 - 150
D 49 13C5_PFHxA	1536838	1622949			106	50 - 150
15 PFHxA			200.00	222.54	111	70 - 130
22 PFPeS			187.60	192.74	102	70 - 130
D 66 13C3_GenX	1586835	1416346			89	50 - 150
28 GenX			400.00	399.09	99	70 - 130
13 PFHpA			200.00	194.99	97	70 - 130
D 47 13C4_PFHpA	2088094	2388048			114	50 - 150
14 PFHxS			182.00	193.58	106	70 - 130
D 45 13C3_PFHxS	628720	621967			99	50 - 150
29 ADONA			188.40	206.89	109	70 - 130
2 6:2 FTS			189.60	203.85	107	70 - 130
D 64 13C2_6:2 FTS_2	327505	334928			102	50 - 150
20 PFOA			200.00	202.14	101	70 - 130
D 53 13C8_PFOA	1678084	1754642			105	50 - 150
12 PFHpS			190.40	197.55	103	70 - 130
D 54 13C8_PFOS	530037	557998			105	50 - 150
18 PFOS			185.60	199.39	107	70 - 130
17 PFNA			200.00	202.50	101	70 - 130
D 56 13C9_PFNA	1634740	1582813			97	50 - 150
30 9Cl-PF3ONS			186.40	208.17	111	70 - 130
19 PFOSA			200.00	202.22	101	70 - 130
D 55 13C8_PFOSA	887849	903613			102	50 - 150
D 65 13C2_8:2 FTS_2	306900	285342			93	50 - 150
3 8:2 FTS			191.60	244.58	127	70 - 130
D 51 13C6_PFDA	1502156	1410047			94	50 - 150
16 PFNS			192.00	224.77	117	70 - 130
10 PFDA			200.00	203.45	101	70 - 130
D 58 d3-MeFOSAA	1596631	1615067			101	50 - 150

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			200.00	228.29	114	70 - 130
9 PFDS			192.80	206.68	107	70 - 130
D 60 d5-EtFOSAA	1284815	1384036			108	50 - 150
5 N-EtFOSAA			200.00	223.52	111	70 - 130
25 PFUdA			200.00	239.87	119	70 - 130
D 52 13C7_PFUdA	1464123	1328072			91	50 - 150
D 61 d7-MeFOSE	239766	218216			91	50 - 150
32 MeFOSE			200.00	200.05	100	70 - 130
D 57 d3-MeFOSA	120939	136442			113	50 - 150
26 MeFOSA			200.00	216.29	108	70 - 130
31 11Cl-PF3OUDS			188.40	196.11	104	70 - 130
D 62 d9-EtFOSE	196774	197334			100	50 - 150
D 38 13C2_PFDoA	1368498	1306907			95	50 - 150
11 PFDoA			200.00	203.45	101	70 - 130
D 59 d5-EtFOSA	132775	124637			94	50 - 150
33 EtFOSE			200.00	206.12	103	70 - 130
4 10:2 FTS			192.80	226.55	117	70 - 130
27 EtFOSA			200.00	201.05	100	70 - 130
34 PFDOS			193.60	213.71	110	70 - 130
24 PFTrDA			200.00	212.89	106	70 - 130
23 PFTeDA			200.00	216.48	108	70 - 130
D 42 13C2_PFTeDA	1450169	1411980			97	50 - 150
35 PFHxDA			200.00	214.64	107	70 - 130
D 40 13C2_PFHxDA	880327	959143			109	50 - 150
36 PFODA			200.00	194.23	97	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A019.d
Injection Date: 29-Sep-2023 05:38:47 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 78
Sample Info: CCV 1000A_SVLC-3076 Misc. Info:
Inst. ID: LCMSMS01.i Operator: eqi.svoa

Method: LCMSMS01_PFAS-ID2 Version: V16 30-Jun-2022 10:54:24
Calib Method: PFAS-ID2 Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-5 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			1000.00	937.93	93	70 - 130
D 46 13C4_PFBA	1858941	1885510			101	50 - 150
D 50 13C5_PFPeA	1482989	1524389			103	50 - 150
21 PFPeA			1000.00	985.03	98	70 - 130
7 PFBS			884.00	869.04	98	70 - 130
D 44 13C3_PFBS	662185	652494			99	50 - 150
1 4:2 FTS			934.00	871.02	93	70 - 130
D 63 13C2_4:2 FTS_2	347875	355051			102	50 - 150
D 49 13C5_PFHxA	1622949	1478759			91	50 - 150
15 PFHxA			1000.00	1018.15	101	70 - 130
22 PFPeS			938.00	929.95	99	70 - 130
D 66 13C3_GenX	1416346	1445358			102	50 - 150
28 GenX			2000.00	2041.57	102	70 - 130
13 PFHpA			1000.00	924.14	92	70 - 130
D 47 13C4_PFHpA	2388048	2278356			95	50 - 150
14 PFHxS			910.00	874.40	96	70 - 130
D 45 13C3_PFHxS	621967	643096			103	50 - 150
29 ADONA			942.00	942.51	100	70 - 130
2 6:2 FTS			948.00	1003.63	105	70 - 130
D 64 13C2_6:2 FTS_2	334928	350504			105	50 - 150
20 PFOA			1000.00	954.77	95	70 - 130
D 53 13C8_PFOA	1754642	1754525			100	50 - 150
12 PFHpS			952.00	957.41	100	70 - 130
D 54 13C8_PFOS	557998	530535			95	50 - 150
18 PFOS			928.00	1006.72	108	70 - 130
17 PFNA			1000.00	934.08	93	70 - 130
D 56 13C9_PFNA	1582813	1609468			102	50 - 150
30 9Cl-PF3ONS			932.00	881.63	94	70 - 130
19 PFOSA			1000.00	943.44	94	70 - 130
D 55 13C8_PFOSA	903613	969848			107	50 - 150
D 65 13C2_8:2 FTS_2	285342	289647			102	50 - 150
3 8:2 FTS			958.00	999.83	104	70 - 130
D 51 13C6_PFDA	1410047	1484036			105	50 - 150
16 PFNS			960.00	942.64	98	70 - 130
10 PFDA			1000.00	993.94	99	70 - 130
D 58 d3-MeFOSAA	1615067	1520700			94	50 - 150

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			1000.00	999.21	99	70 - 130
9 PFDS			964.00	944.46	97	70 - 130
D 60 d5-EtFOSAA	1384036	1304695			94	50 - 150
5 N-EtFOSAA			1000.00	1002.35	100	70 - 130
25 PFUdA			1000.00	931.09	93	70 - 130
D 52 13C7_PFUdA	1328072	1385774			104	50 - 150
D 61 d7-MeFOSE	218216	220786			101	50 - 150
32 MeFOSE			1000.00	1095.74	109	70 - 130
D 57 d3-MeFOSA	136442	131594			96	50 - 150
26 MeFOSA			1000.00	1006.28	100	70 - 130
31 11Cl-PF3OUDS			942.00	954.08	101	70 - 130
D 62 d9-EtFOSE	197334	194773			99	50 - 150
D 38 13C2_PFDoA	1306907	1370546			105	50 - 150
11 PFDoA			1000.00	946.65	94	70 - 130
D 59 d5-EtFOSA	124637	122442			98	50 - 150
33 EtFOSE			1000.00	1011.65	101	70 - 130
4 10:2 FTS			964.00	1036.96	107	70 - 130
27 EtFOSA			1000.00	1018.83	101	70 - 130
34 PFDOS			968.00	1008.51	104	70 - 130
24 PFTrDA			1000.00	921.58	92	70 - 130
23 PFTeDA			1000.00	989.91	98	70 - 130
D 42 13C2_PFTeDA	1411980	1439219			102	50 - 150
35 PFHxDA			1000.00	993.73	99	70 - 130
D 40 13C2_PFHxDA	959143	925588			97	50 - 150
36 PFODA			1000.00	941.69	94	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS01.i\092823A-DOD.b\092823A029.d
Injection Date: 29-Sep-2023 07:24:33 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 87
Sample Info: CCV 1000B_SVLC-3076 Misc. Info:
Inst. ID: LCMSMS01.i Operator: eqi.svoa

Method: LCMSMS01_PFAS-ID2 Version: V16 30-Jun-2022 10:54:24
Calib Method: PFAS-ID2 Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-5 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			1000.00	979.83	97	70 - 130
D 46 13C4_PFBA	1858941	2164026			116	50 - 150
D 50 13C5_PFPeA	1482989	1755198			118	50 - 150
21 PFPeA			1000.00	969.78	96	70 - 130
7 PFBS			884.00	876.04	99	70 - 130
D 44 13C3_PFBS	662185	773904			117	50 - 150
1 4:2 FTS			934.00	936.48	100	70 - 130
D 63 13C2_4:2 FTS_2	347875	415461			119	50 - 150
D 49 13C5_PFHxA	1622949	1829432			113	50 - 150
15 PFHxA			1000.00	987.70	98	70 - 130
22 PFPeS			938.00	879.62	93	70 - 130
D 66 13C3_GenX	1416346	1820551			129	50 - 150
28 GenX			2000.00	1903.91	95	70 - 130
13 PFHpA			1000.00	920.11	92	70 - 130
D 47 13C4_PFHpA	2388048	2706503			113	50 - 150
14 PFHxS			910.00	1013.90	111	70 - 130
D 45 13C3_PFHxS	621967	731751			118	50 - 150
29 ADONA			942.00	996.65	105	70 - 130
2 6:2 FTS			948.00	947.34	99	70 - 130
D 64 13C2_6:2 FTS_2	334928	421132			126	50 - 150
20 PFOA			1000.00	1061.03	106	70 - 130
D 53 13C8_PFOA	1754642	1856813			106	50 - 150
12 PFHpS			952.00	918.37	96	70 - 130
D 54 13C8_PFOS	557998	640990			115	50 - 150
18 PFOS			928.00	959.87	103	70 - 130
17 PFNA			1000.00	955.58	95	70 - 130
D 56 13C9_PFNA	1582813	1919539			121	50 - 150
30 9Cl-PF3ONS			932.00	886.72	95	70 - 130
19 PFOSA			1000.00	948.55	94	70 - 130
D 55 13C8_PFOSA	903613	1102445			122	50 - 150
D 65 13C2_8:2 FTS_2	285342	341393			120	50 - 150
3 8:2 FTS			958.00	942.96	98	70 - 130
D 51 13C6_PFDA	1410047	1699302			121	50 - 150
16 PFNS			960.00	983.82	102	70 - 130
10 PFDA			1000.00	1048.22	104	70 - 130
D 58 d3-MeFOSAA	1615067	1903074			118	50 - 150

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			1000.00	976.42	97	70 - 130
9 PFDS			964.00	952.26	98	70 - 130
D 60 d5-EtFOSAA	1384036	1593528			115	50 - 150
5 N-EtFOSAA			1000.00	1012.22	101	70 - 130
25 PFUdA			1000.00	900.54	90	70 - 130
D 52 13C7_PFUdA	1328072	1611811			121	50 - 150
D 61 d7-MeFOSE	218216	279222			128	50 - 150
32 MeFOSE			1000.00	993.65	99	70 - 130
D 57 d3-MeFOSA	136442	166760			122	50 - 150
26 MeFOSA			1000.00	935.01	93	70 - 130
31 11Cl-PF3OUDS			942.00	939.69	99	70 - 130
D 62 d9-EtFOSE	197334	224769			114	50 - 150
D 38 13C2_PFDoA	1306907	1482062			113	50 - 150
11 PFDoA			1000.00	978.31	97	70 - 130
D 59 d5-EtFOSA	124637	146398			117	50 - 150
33 EtFOSE			1000.00	988.22	98	70 - 130
4 10:2 FTS			964.00	904.38	93	70 - 130
27 EtFOSA			1000.00	992.76	99	70 - 130
34 PFDOS			968.00	922.45	95	70 - 130
24 PFTrDA			1000.00	1046.06	104	70 - 130
23 PFTeDA			1000.00	975.02	97	70 - 130
D 42 13C2_PFTeDA	1411980	1685064			119	50 - 150
35 PFHxDA			1000.00	1001.42	100	70 - 130
D 40 13C2_PFHxDA	959143	1084519			113	50 - 150
36 PFODA			1000.00	936.27	93	70 - 130

SCIEX
The Power of Precision

SCIEX Triple Quad 4500/4500MD Systems

Planned Maintenance Procedure



GEN-IDV-08-6710-G

November 2021

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(GEN-IDV-09-10816-D)

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Introduction 1

Note: For regulatory and safety information for the mass spectrometer, refer to the document: *System User Guide*.

The planned maintenance (PM) procedure is designed to help maintain overall system performance.

Planned maintenance is not intended to take the place of an Operational Qualification (OQ) nor is it intended to verify the instrument specifications. Separate Installation Qualification (IQ) and OQ services are available. Contact a SCIEX representative.

The procedure must be performed by a trained SCIEX Field Service Employee (FSE).

The procedure has been developed for the SCIEX Triple Quad 4500/4500MD System with the Turbo V Ion Source. It does not apply to any other products or processes.

The procedure does not address any customer-specific analytical protocol (performance qualification) or method validation.

Note: If an issue is identified and the system requires repair, then the customer is responsible for the cost of the repair, except to the extent that the system and required repairs are covered by a SCIEX warranty or service contract. Open a separate service call for the repair. Do not charge repair service call hours to planned maintenance procedures.

Planned Maintenance Tasks 2

Note: Perform all procedures using the Turbo V Ion Source, unless otherwise specified.

Pre-Planned Maintenance

Note: Guideline values are for reference only. The pre-PM test results are not required to meet or exceed these values.

Pre-PM Tasks

Task	Complete	N/A
Ask the customer about system performance since the last visit and record comments.	✓	—
If the customer maintains a log for the system, then review it.	○	◉
Review the work to be performed with the customer.	✓	—

PC Health Check

Task	Complete	N/A
Inspect the status of the RAID 1 hard drives.	✓	—

Vacuum System Tests

Task			Complete
Record the turbo pump operational values.			✓
Parameter	**Results**		
Temperature (°C)	43		
Current (A)	3.9		
Voltage (V)	23		
Power (W)	85		
Driving frequency (Hz)	800		
Inspect the vacuum gauge filament using the appropriate service tool (Analyst Service Diagnostics (ASD) for Analyst software or Tuning Tools for SCIEX OS) and identify the filament position. If the mass spectrometer is using filament 2, then order a replacement vacuum gauge as a separate service call.	1	◉	✓
	2	○	

Pre-PM Pressure Test

Pre-PM Pressure Test is Complete	✓

Test	Guideline	Result
Vacuum chamber pressure with CAD gas off	0.4×10^{-5} torr ≤ $P_{CAD\,0}$ ≤ 1.1×10^{-5} torr	0.5e-5
Pressure difference (CAD_{12} minus CAD_0)	1.8×10^{-5} torr ≤ ($P_{CAD\,12} - P_{CAD\,0}$) ≤ 2.8×10^{-5} torr	2.1e-5

Inspect for Contamination

Task	Complete	N/A
Inspect for front-end contamination. Refer to Inspect for Contamination.	✓	—

Record Probe Position

Task	Result
Record the vertical and horizontal probe positions.	0.5, 5.0

Pre-PM System Tests

Q1 Positive MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
175.133	≥ 8.0×10^6	2.9e7	0.6 to 0.8	1.08
500.380	≥ 8.0×10^6	3.2e7	0.6 to 0.8	1.10
906.673	≥ 2.0×10^7	5.4e7	0.6 to 0.8	1.19
1,952.427	≥ 8.8×10^5	1.1e7	0.6 to 0.8	n/a

Q3 Positive MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
175.133	≥ 8.0×10^6	3.2e7	0.6 to 0.8	0.68
500.380	≥ 8.0×10^6	2.5e7	0.6 to 0.8	0.69
906.673	≥ 2.0×10^7	5.0e7	0.6 to 0.8	0.65
1,952.427	≥ 8.8×10^5	1.1e7	0.6 to 0.8	0.70

Q1 Negative MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
933.636	$\geq 1.8 \times 10^7$	2.6e7	0.6 to 0.8	0.81
1,863.306	$\geq 1.4 \times 10^6$	4.5e6	0.6 to 0.8	0.79

Q3 Negative MS Test is Complete	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
933.636	$\geq 1.8 \times 10^7$	3.6e7	0.6 to 0.8	0.85
1,863.306	$\geq 2.0 \times 10^6$	5.5e6	0.6 to 0.8	1.10

Reserpine MS/MS Transmission Test is Complete	✓

- **Test solution:** Reserpine solution 0.167 pmol/µL
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s (both MS and MS/MS)
- **Scan mode:** Product Ion (MS2)
- **Product Of:** 609.3 (or as calibrated)
- **Product Ion:** 195.1
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 609.3 and 195.1, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Guideline	Result
Transmission efficiency $\frac{Intensity\ for\ ion\ at\ m/z\ 195.1}{Intensity\ for\ ion\ at\ m/z\ 609.3\ (or\ as\ calibrated)} \times 100 \geq 10\%$	10.4%

Planned Maintenance

Mass Spectrometer Maintenance

Task	Complete	N/A
Shut down the system and then disconnect the mains supply power cable.	✓	—
If required, replace the roughing pump oil. The recommended interval is every 3 years. **Note:** If an oil change is not required, then inspect the oil level and top up the oil, if required. **CAUTION: Potential System Damage. Do not mix different types of oil. Mixing mineral oil with synthetic oil can cause pump failure.**	✓	—
If required, replace the roughing pump oil exhaust filter. The recommended interval is every 3 years.	○	◉
Confirm that there is no excessive roughing pump oil leakage. Clean up any oil.	✓	—
Make sure that the roughing pump exhaust is properly routed to the ventilation system.	✓	—

Task	Complete	N/A
Inspect the exhaust system: • Make sure that all of the gas fittings at the rear bulkhead are tight. • Make sure that all of the exhaust hoses are free of kinks. • Make sure that all of the hoses at the waste bottle are secure, and that there are no signs of leaks. • Make sure that the waste bottle is upright. • Make sure that the exhaust hose is securely connected to the lab ventilation system. • Make sure that no liquid is trapped in the exhaust lines.	✓	—
Clean or replace the four air filters in the base of the mass spectrometer chassis.	✓	—
(If applicable) Clean the turbo pump filter screen.	○	◉
(If applicable) Verify the operation of the SCIEX-supplied bench cooling fans.	◉	○
Clean the curtain plate.	✓	—
Clean the orifice plate.	✓	—
Clean the QJet Ion Guide and IQ0 lens.	✓	—
(If contamination is detected) Clean the Q0 region and the IQ1 lens.	◉	○
Inspect the cable connections: • Make sure that the power cables for the mass spectrometer, LC system, roughing pump, syringe pump, gas generator, and UPS are securely connected. • Make sure that the communications cables for the GPIB/Ethernet ports, LC connections, and roughing pump are securely connected.	✓	—

Task	Complete	N/A
Verify system support functions — gas: • Make sure that the input gas pressures at the regulators are within specifications. • Make sure that there is no liquid present in the gas lines.	✓	—
Examine the expiry date on the battery system for the UPS (sold by SCIEX), and then recommend replacement of the battery tray, if required.	○	◉
Start up the system.	✓	—

Turbo V Ion Source Maintenance

Task	Complete	N/A
If necessary, replace the electrode in the TurboIonSpray and APCI probes.	◉	○
With the TurboIonSpray probe installed, make sure that the temperature reaches the recommended set point of 500 °C.	✓	—
(If applicable) With the APCI probe installed, make sure that the temperature reaches the recommended set point of 400 °C.	○	◉
Examine the ion source and, if visible signs of contamination are present, clean the inner surfaces using lint-free wipes and a 50:50 methanol:water solution. **Note:** Remove the corona discharge needle before cleaning.	◉	○

Software Maintenance

Note: This task is not applicable to MD systems.

Task	Complete	N/A
(Obtain customer approval first) Install any applicable HotFixes for the control software. **Note:** Make sure that the compatible instrument firmware is installed.	○	◉
(Analyst software) (Obtain customer approval first) Install the Analyst Diagnostic Tool if it is not already installed.	○	◉

Post-Planned Maintenance

Voltage Tests

Task		Complete
Inspect the RF tuning voltages at the QPS amplifier module and then, if required, tune the coil boxes.		✓
Inspect the detector voltage. Optimize, if required.		✓
Detector voltage	+1900/-1900	

Post-PM Pressure Test

Post-PM Pressure Test is Complete	✓

Test	Specification	Result
Vacuum chamber pressure with CAD gas off	0.4×10^{-5} torr ≤ $P_{CAD\,0}$ ≤ 1.1×10^{-5} torr	0.5e-5
Pressure difference (CAD_{12} minus CAD_0)	1.8×10^{-5} torr ≤ ($P_{CAD\,12} - P_{CAD\,0}$) ≤ 2.8×10^{-5} torr	2.5e-5

Inspect for Contamination

Task	Complete	N/A
Inspect for front-end contamination. Refer to Inspect for Contamination.	✓	—

Post-PM System Tests

Q1 Positive MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
175.133	≥ 8.0×10^6	2.4e7	0.6 to 0.8	0.70
500.380	≥ 8.0×10^6	2.9e7	0.6 to 0.8	0.72
906.673	≥ 2.0×10^7	3.8e7	0.6 to 0.8	0.68
1,952.427	≥ 8.8×10^5	4.9e6	0.6 to 0.8	0.73

Q1 Positive MS Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1,000	50	0.6 to 0.8	
	2,000	100	0.6 to 0.8	

Q3 Positive MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
175.133	$\geq 8.0 \times 10^6$	3.5e7	0.6 to 0.8	0.66
500.380	$\geq 8.0 \times 10^6$	3.1e7	0.6 to 0.8	0.72
906.673	$\geq 2.0 \times 10^7$	5.4e7	0.6 to 0.8	0.72
1,952.427	$\geq 8.8 \times 10^5$	1.0e7	0.6 to 0.8	0.72

Q3 Positive MS Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
59.050, 175.133, 500.380, 616.464, 906.673, 1,254.925, 1,545.134, 1,952.427	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1,000	50	0.6 to 0.8	
	2,000	100	0.6 to 0.8	

Q1 Negative MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
933.636	$\geq 1.8 \times 10^7$	2.7e7	0.6 to 0.8	0.73
1,863.306	$\geq 1.4 \times 10^6$	4.6e6	0.6 to 0.8	0.71

Q1 Negative MS Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1,000	50	0.6 to 0.8	
	2,000	100	0.6 to 0.8	

Q3 Negative MS Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA.**

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
933.636	$\geq 1.8 \times 10^7$	2.0e7	0.6 to 0.8	0.68
1,863.306	$\geq 2.0 \times 10^6$	2.4e6	0.6 to 0.8	0.65

Q3 Negative MS Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
44.998, 411.259, 585.385, 933.636, 1,223.845, 1,572.097, 1,863.306, 1,979.389	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1,000	50	0.6 to 0.8	
	2,000	100	0.6 to 0.8	

Reserpine MS/MS Transmission Test is Complete	✓

- **Test solution:** Reserpine solution 0.167 pmol/µL
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s (both MS and MS/MS)
- **Scan mode:** Product Ion (MS2)
- **Product Of:** 609.3 (or as calibrated)
- **Product Ion:** 195.1
- **Cycles:** 10
- **MCA (Analyst software):** On

Note: SCIEX OS uses **Sum Of** 10 cycles instead of **MCA**.

- **Data required:** Spectra for masses 609.3 and 195.1, with peak intensities, peak width, and mass shift results, complete with method file information. Printouts can be provided if required.

Specification	Result
Transmission efficiency $\frac{Intensity\ for\ ion\ at\ m/z\ 195.1}{Intensity\ for\ ion\ at\ m/z\ 609.3\ (or\ as\ calibrated)} \times 100 \geq 10\%$	10%

Post-PM Tasks

Task	Complete	N/A
Delete any unnecessary files.	✓	—
Back up the Data folder for the control software.	✓	—
(If applicable) Defragment the hard drive.	○	◉
(Not applicable for MD instrument families) If the customer has a Software Support Plan, then perform the Software Health Check: • (Obtain customer approval first) Install any compatible HotFixes and updates for SCIEX add-on software.	○	◉

Restore Probe Position

Task	Complete	N/A
Restore vertical and horizontal probe positions to those recorded during Record Probe Position	✓	—

StatusScope Remote Monitoring Service Tasks

The StatusScope remote monitoring service is not applicable for MD systems.

Task	Complete	N/A
Note: Installation of the StatusScope remote monitoring service is available only to warranty and eligible contract customers. Refer to sciex.com/instrument-service-and-support/statusscope-remote-monitoring for a list of eligible contracts. If the StatusScope remote monitoring service is not installed, then perform these tasks: • If the customer does not want the StatusScope remote monitoring service installed, then skip the remaining steps in this section. • If the customer wants the StatusScope remote monitoring service installed, then complete the steps in this section.		—
Verify the connection to the server for the StatusScope remote monitoring service. **Note:** Use the **StatusScopePortCheck.exe**. The utility is included with the StatusScope installer.	○	◉
Install the agent for the StatusScope remote monitoring service.	○	◉
Ask the customer to log on to SCIEX Now to verify that the instrument is connected to the server for the StatusScope remote monitoring service. **Note:** The instrument is shown under the account of the **Primary Contact**.	○	◉

Wrap-up

Task	Complete	N/A
Review the work performed with the customer.	✓	—
Record the test results in this document and then attach all of the test data.	✓	—
Review the routine maintenance schedule and the procedures with the customer.	✓	—
Complete this document: • Review the test results with the customer. • (SCIEX OS) Create the folder D:/SCIEX OS Data/PM. Save reports and data in this folder. • Provide the customer with the completed document.	✓	—

Service Request Number 3

Service request number		5471360	
Organization		Pace South Carolina	
Mass spectrometer serial number		BJ29321608	
FSE name	Lynne Russell	Date (yyyy-mm-dd)	2022-05-20

Service Request Number

Comments and Exceptions

Inspect for Contamination A

Perform a Q1 and Q3 charging test to determine whether front end contamination is present.

1. Run the **Pos PPG** method for 10 minutes, monitoring the Total Ion Count (TIC) for degradation of the signal or a decrease in sensitivity.
2. Change the polarity to Negative, and then scan for one minute.
3. Change the polarity to Positive, and then make sure that the **IS** parameter returns to the original value.
4. Run the method.

   If the signal sensitivity is restored temporarily but the Total Ion Count (TIC) again degrades by more than 5% over a 10 minute run, then a possible front-end contamination is indicated.
5. Repeat the test in Negative polarity using the Q1 Neg PPG method.

Guidelines for Cleaning the Front End

If charging tests indicate that cleaning is necessary, then clean the front-end components, including the QJet Ion Guide, IQ0 lens, Q0 quadrupole, and IQ1 lens.

Removing the ion optics is considered a repair activity. FSEs must open a separate service repair call.

Note: This procedure does not provide troubleshooting for all technical root causes of signal degradation or charging effect. Signal degradation might also result from a contaminated TurboIonSpray probe or electrode, method parameters that are not optimized, or other factors.

Extract Dilution Preparations

DILUTION	1X	5X	10X	20X	50X	100X	200X
D8421-ID DILUTION PREP							
EXTRACT (µL)	ALIQUOT	200	100	50	100	50	25
SUR 1 (µL)	0	0	0	0	39.2	39.6	39.8
SUR 2 (µL)	0	0	0	0	39.2	39.6	39.8
1:1 H2O:MeOH w/ 0.1% Acetic Acid (µL)	0	800	900	950	4822	4871	4895
TOTAL (µL)	200	1000	1000	1000	5000	5000	5000
REFORTIFIED ID-AQ/ID-SOLID DILUTION PREP							
EXTRACT (µL)	ALIQUOT	200	100	50	20	10	5
ES-100ppb (µL)	0	16	18	19	19.6	19.8	19.9
MeOH (µL)	0	753	847	894	922	931	936
WATER (µL)	0	31	35	37	38.4	38.8	39
TOTAL (µL)	75	1000	1000	1000	1000	999.6	999.9
UNFORTIFIED ID-AQ/ID-SOLID DILUTION PREP							
EXTRACT (µL)	ALIQUOT	200	100	50	20	10	5
ES-100ppb (µL)	0	0	0	0	0	0	0
MeOH (µL)	0	768	864	912	941	950	955
WATER (µL)	0	32	36	38	39	40	40
TOTAL (µL)	75	1000	1000	1000	1000	1000	1000
In-vial 50X ID Screen							
In-vial 50X ID Screen		240µL 96%MeOH	+	5µL SUR 100ppb	+	5µL sample extract	
DAI DILUTION PREP							
SAMPLE (µL)	500	100	50	25	10	5	5
ES (µL)	25	25	25	25	25	25	50
MeOH (µL)	475	475	475	475	475	475	950
Water (µL)	0	400	450	475	490	495	995
TOTAL (µL)	1000	1000	1000	1000	1000	1000	2000
1633 DILUTION PREP							
EXTRACT (µL)	ALIQUOT	200	100	NA	NA	NA	NA
1% Amm.-MeOH (uL)	0	754	854	NA	NA	NA	NA
Water (µL)	0	40	40	NA	NA	NA	NA
Acetic Acid (µL)	0	6	6	NA	NA	NA	NA
TOTAL (µL)	75	1000	1000	NA	NA	NA	NA

NOTE: Serial dilution will be performed for dilutions higher than 200X.

Report Date: 22-Sep-2023 09:40:04 AIM Revision: 2.0.2023.0816

Pace Environmental Services, LLC

Batch Run Log Report

Batch: \\Organics\LL\LCMSMS01.i\092023A-DOD+ICAL.b

Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24

Instrument: LCMSMS01.i Integrator: picker

Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28

Method Lock: Unknown Lock Date:

Calib Method: PFAS-ID2 No.Compounds: 66

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
71	CCV 100_SVLC-3078	20-Sep-2023 17:45:42	092023A006.d	ICal					Analytes	L-2	1.00		
72	CCV 200_SVLC-3079	20-Sep-2023 17:56:11	092023A007.d	ICal					Analytes	L-3	1.00		
73	CCV 500_SVLC-3080	20-Sep-2023 18:06:40	092023A008.d	ICal					Analytes	L-4	1.00		
74	CCV 1000_SVLC-3076	20-Sep-2023 18:17:11	092023A009.d	ICal					Analytes	L-5	1.00		
75	CCV 2000_SVLC-3081	20-Sep-2023 18:27:49	092023A010.d	ICal					Analytes	L-6	1.00		
76	CCV 5000_SVLC-3082	20-Sep-2023 18:38:28	092023A011.d	ICal					Analytes	L-7	1.00		
77	CCV 10K_SVLC-3083	20-Sep-2023 18:49:08	092023A012.d	ICal					Analytes	L-8	1.00		
78	CCV 15K_SVLC-3084	20-Sep-2023 18:59:48	092023A013.d	ICal					Analytes	L-9	1.00		
79	CCV 20K_SVLC-3085	20-Sep-2023 19:10:28	092023A014.d	ICal					Analytes	L-10	1.00		
94	ID BLK B3	20-Sep-2023 19:21:07	092023A015.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
80	ICV_3035	20-Sep-2023 19:31:39	092023A016.d	ICV					Analytes	ICV-43	1.00		
81	ISOMER_3086	20-Sep-2023 19:42:20	092023A017.d	CheckStd					IsomerCheck	Smp	1.00		
82	ID IBLK A1	20-Sep-2023 19:52:49	092023A018.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
3	YQ85065-002	20-Sep-2023 20:13:49	092023A020.d	LCS		Soil	1	85065	Analytes	100x PDS	0.1000		
4	YQ84992-002	20-Sep-2023 20:24:24	092023A021.d	LCS		Aqueous	1	84992	Analytes	100x PDS	0.2000		
5	YI18013-005	20-Sep-2023 20:34:56	092023A022.d	Client	IDW02-00	Soil	1	85065	Surrogates	Smp	0.1000		
6	YH31010-001	20-Sep-2023 20:45:31	092023A023.d	Client	Cannon_IDW_WW_082923	Aqueous	1	84992	Surrogates	Smp	0.1000		NCM SUR RX CNF RO
7	YI07022-001	20-Sep-2023 20:56:06	092023A024.d	Client	NASA-TCGAC2-INF-20230906	Aqueous	10U	84992	Surrogates	Smp	0.1000		
8	YI07022-002	20-Sep-2023 21:06:42	092023A025.d	Client	NASA-TCGAC-EF3-20230906	Aqueous	1	84992	Surrogates	Smp	0.1000		
9	YI07022-002MS	20-Sep-2023 21:17:19	092023A026.d	MS		Aqueous	1	84992	Analytes	100x PDS	0.2000		
10	YI07022-002MD	20-Sep-2023 21:27:56	092023A027.d	MSD		Aqueous	1	84992	Analytes	100x PDS	0.2000		
11	YI07042-001	20-Sep-2023 21:38:35	092023A028.d	Client	IDW-2023Q3-AQ01	Aqueous	1	84992	Surrogates	Smp	0.1000		NCM SUR HI ND, RX 6:2
12	YI09009-002	20-Sep-2023 21:49:06	092023A029.d	Client	507-Train A Lag EFF	Aqueous	5U	84992	Surrogates	Smp	0.1000		
17	CCV 1000A_SVLC-3076	20-Sep-2023 22:42:03	092023A034.d	CCV					Analytes	L-5	1.00		
100	CCB C1	20-Sep-2023 22:52:39	092023A035.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
18	YQ85086-001	20-Sep-2023 23:03:21	092023A036.d	MBlk		Aqueous	1	85086	Surrogates	Smp	0.1000		
19	YQ85086-002	20-Sep-2023 23:13:56	092023A037.d	LCS		Aqueous	1	85086	Analytes	100x PDS	0.2000		
20	YI06019-003	20-Sep-2023 23:24:33	092023A038.d	Client	ESHEP03-GS01-001FD	Aqueous	1	85086	Surrogates	Smp	0.1000		NCM SUR HI ND
21	YI18013-002	20-Sep-2023 23:35:12	092023A039.d	Client	FB-091523	Aqueous	1	85086	Surrogates	Smp	0.1000		
22	YI18013-007	20-Sep-2023 23:45:45	092023A040.d	Client	FRB-091623	Aqueous	1	85086	Surrogates	Smp	0.1000		
23	YI09009-003	20-Sep-2023 23:56:18	092023A041.d	Client	507-Train B Lag EFF	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X
24	YI09009-004	21-Sep-2023 00:06:53	092023A042.d	Client	507-Train C Lag EFF	Aqueous	1	85086	Surrogates	Smp	0.1000		
25	YI09009-005	21-Sep-2023 00:17:29	092023A043.d	Client	507-Train A Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 10X, RX 4:2
26	YI09009-006	21-Sep-2023 00:28:05	092023A044.d	Client	507-Train B Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 10X, RX 4:2
27	YI09009-007	21-Sep-2023 00:38:41	092023A045.d	Client	507-Train C Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		NCM SUR HI ND, RR 5X
28	YI09009-008	21-Sep-2023 00:49:17	092023A046.d	Client	507-Raw	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 20X, RX BA, 4:2
29	YI09009-010	21-Sep-2023 00:59:54	092023A047.d	Client	001-A	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X, NCM SUR HI ND, RX 6:2, BA
30	CCV 1000B_SVLC-3076	21-Sep-2023 01:10:30	092023A048.d	CCV					Analytes	L-5	1.00		
100	CCB C2	21-Sep-2023 01:21:09	092023A049.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
31	YI09009-011	21-Sep-2023 01:31:50	092023A050.d	Client	001-A-D	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X, NCM SUR HI ND, RX 6:2
32	YI09011-001	21-Sep-2023 01:42:23	092023A051.d	Client	508-Treated	Aqueous	1	85086	Surrogates	Smp	0.1000		
33	YI09011-001MS	21-Sep-2023 01:52:56	092023A052.d	MS		Aqueous	1	85086	Analytes	100x PDS	0.2000		
34	YI09011-001MD	21-Sep-2023 02:03:33	092023A053.d	MSD		Aqueous	1	85086	Analytes	100x PDS	0.2000		
35	YI09011-002	21-Sep-2023 02:14:08	092023A054.d	Client	508- Train A Lag Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
36	YI09011-003	21-Sep-2023 02:24:43	092023A055.d	Client	508- Train B Lag Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		
37	YI09011-004	21-Sep-2023 02:35:19	092023A056.d	Client	508- Train C Lag Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		
38	YI09011-005	21-Sep-2023 02:45:57	092023A057.d	Client	508- Train A Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X
39	YI09011-006	21-Sep-2023 02:56:33	092023A058.d	Client	508- Train B Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		
40	YI09011-007	21-Sep-2023 03:07:10	092023A059.d	Client	508- Train C Lead Eff	Aqueous	1	85086	Surrogates	Smp	0.1000		
41	YI09011-008	21-Sep-2023 03:17:50	092023A060.d	Client	508-Raw	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X, NCM SUR HI ND
42	YI09011-010	21-Sep-2023 03:28:24	092023A061.d	Client	002-A	Aqueous	1	85086	Surrogates	Smp	0.1000		RR 5X, NCM SUR HI ND
43	CCV 1000C_SVLC-3076	21-Sep-2023 03:38:58	092023A062.d	CCV					Analytes	L-5	1.00		
100	CCB C3	21-Sep-2023 03:49:35	092023A063.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
44	YI09009-001	21-Sep-2023 04:00:17	092023A064.d	Client	507-Treated	Aqueous	1	84992	Surrogates	Smp	0.1000		RR 5X
45	YI09009-001MS	21-Sep-2023 04:10:51	092023A065.d	MS		Aqueous	1	84992	Analytes	100x PDS	0.2000		
46	YI09009-001MD	21-Sep-2023 04:21:27	092023A066.d	MSD		Aqueous	1	84992	Analytes	100x PDS	0.2000		
47	CCV 1000D_SVLC-3076	21-Sep-2023 04:32:03	092023A067.d	CCV					Analytes	L-5	1.00		
100	CCB C4	21-Sep-2023 04:42:41	092023A068.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		

Report Date: 29-Sep-2023 17:47:21 AIM Revision: 2.0.2023.0922

Pace Environmental Services, LLC

Batch Run Log Report

Batch: \\organics\LL\LCMSMS01.i\092823A-DOD.b

Method: LCMSMS01_PFAS-ID2.M Version: V16 30-Jun-2022 10:54:24

Instrument: LCMSMS01.i Integrator: picker

Cal Start Date: 20-Sep-2023 17:45:42 Cal End Date: 20-Sep-2023 19:10:28

Method Lock: Unknown Lock Date:

Calib Method: PFAS-ID2 No.Compounds: 66

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
97	CCV 200A_SVLC-3079	29-Sep-2023 02:27:48	092823A001.d	CCV					Analytes	L-3	1.00		
98	ID IBLK A1	29-Sep-2023 02:38:22	092823A002.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
62	YQ85972-001	29-Sep-2023 02:48:57	092823A003.d	MBlk		Aqueous	1	85972	Surrogates	Smp	0.1000		
63	YQ85972-002	29-Sep-2023 02:59:33	092823A004.d	LCS		Aqueous	1	85972	Analytes	100x PDS	0.2000		
64	YI14063-002	29-Sep-2023 03:10:10	092823A005.d	Client	OU2-EFF-0923B	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
65	YI14063-002MS	29-Sep-2023 03:20:47	092823A006.d	MS		Aqueous	1	85972	Analytes	100x PDS	0.2000		
66	YI14063-002MD	29-Sep-2023 03:31:27	092823A007.d	MSD		Aqueous	1	85972	Analytes	100x PDS	0.2000		
67	YI15020-001	29-Sep-2023 03:42:05	092823A008.d	Client	SAN-MH03_091323	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
68	YI15020-002	29-Sep-2023 03:52:44	092823A009.d	Client	TripBlank_091323	Aqueous	1	85972	Surrogates	Smp	0.1000		
69	YI15022-001	29-Sep-2023 04:03:24	092823A010.d	Client	TOC03A-20230914	Aqueous	1	85972	Surrogates	Smp	0.1000		
70	YI15022-001MS	29-Sep-2023 04:14:03	092823A011.d	MS		Aqueous	1	85972	Analytes	100x PDS	0.2000		
71	YI15022-001MD	29-Sep-2023 04:24:41	092823A012.d	MSD		Aqueous	1	85972	Analytes	100x PDS	0.2000		
72	YI15022-002	29-Sep-2023 04:35:10	092823A013.d	Client	TOC-DUP01-20230914	Aqueous	1	85972	Surrogates	Smp	0.1000		
73	YI15022-003	29-Sep-2023 04:45:39	092823A014.d	Client	TOC03B-20230914	Aqueous	1	85972	Surrogates	Smp	0.1000		RR-10X
74	YI15022-004	29-Sep-2023 04:56:11	092823A015.d	Client	TOC03C-20230914	Aqueous	1	85972	Surrogates	Smp	0.1000		RR-10X
75	YI15029-001	29-Sep-2023 05:06:49	092823A016.d	Client	WSTF-A03-100-001-GW-240-	Aqueous	1	85972	Surrogates	Smp	0.1000		
76	YI15029-002	29-Sep-2023 05:17:27	092823A017.d	Client	WSTF-A11-600C-005-GW-402	Aqueous	1	85972	Surrogates	Smp	0.1000		
77	YI15029-003	29-Sep-2023 05:28:06	092823A018.d	Client	WSTF-A08-INF0001-2023091	Aqueous	1	85972	Surrogates	Smp	0.1000		
78	CCV 1000A_SVLC-3076	29-Sep-2023 05:38:47	092823A019.d	CCV					Analytes	L-5	1.00		
99	CCB C1	29-Sep-2023 05:49:26	092823A020.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		
79	YI15029-004	29-Sep-2023 06:00:06	092823A021.d	Client	WSTF-A08-EFF0001-2023091	Aqueous	1	85972	Surrogates	Smp	0.1000		
80	YI15029-005	29-Sep-2023 06:10:45	092823A022.d	Client	WSTF-A08-INF0002-2023091	Aqueous	1	85972	Surrogates	Smp	0.1000		
81	YI15029-006	29-Sep-2023 06:21:26	092823A023.d	Client	WSTF-A08-EFF0002-2023091	Aqueous	1	85972	Surrogates	Smp	0.1000		
82	YI15029-007	29-Sep-2023 06:31:57	092823A024.d	Client	WSTF-EB-20230913-07	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
83	YI15029-008	29-Sep-2023 06:42:24	092823A025.d	Client	WSTF-FB-20230913-08	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
84	YI15029-009	29-Sep-2023 06:52:55	092823A026.d	Client	WSTF-FB-20230914-09	Aqueous	1	85972	Surrogates	Smp	0.1000		SURR HI-NCM/ND
85	YI18040-002	29-Sep-2023 07:03:26	092823A027.d	Client	IDW03-00	Aqueous	1	85972	Surrogates	Smp	0.1000		RR-50X
86	YI18040-003	29-Sep-2023 07:14:00	092823A028.d	Client	IDW04-00	Aqueous	1	85972	Surrogates	Smp	0.1000		RR-CO DNR
87	CCV 1000B_SVLC-3076	29-Sep-2023 07:24:33	092823A029.d	CCV					Analytes	L-5	1.00		
99	CCB C2	29-Sep-2023 07:35:07	092823A030.d	InstBlk		Aqueous	1		Surrogates	Smp	0.0200		

Analyst: MVP2 **Level 2 Analyst:** ERL

Status: Level 2 review released

Matrix: Aqueous

Printed: 10/02/23 1720

Prep Batch: 85972

PFAS Prep by ID SOP QSMB-15 - PFAS Aqueous Preparation

Start Date: 09/27/2023 2024
End Date: 09/27/2023 2346

Conc Analyst: MVP2
Conc Start Date: 09/27/2023 2301
Conc End Date: 09/27/2023 2332

Surrogate: SVLC3050
Surrogate Vol. (mL): 0.100

Ext Solvent: MECH>96%MECH/4%H2O
Reagents Vol. (mL): 10
Chem ID: 23-1612>23-1612/PFAS-23-059

Balance ID: Balance # 20-1123

Sample ID	QC Code	Client Sample ID	Run	Analysis Method	Container + Sample (g)	Container Empty (g)	Initial Vol. (mL)	Spike ID	Spike Vol. (mL)	Final Vol. (mL)	Comments
YQ85972-001	MB		1	PFAS by ID SOP QSMB-15	250		250.000		0.000	5.0	Init: 284.59 g Fin: 31.11 g
YQ85972-002	LCS		1	PFAS by ID SOP QSMB-15	250		250.000	SVLC3054	0.200	5.0	Init: 277.70 g Fin: 32.59 g
YI14063-002	Sample	CU2-EFF-0923B	2	PFAS by ID SOP QSMB-15	324.65	32.34	292.310		0.000	5.0	
YI14063-002MS	MS		2	PFAS by ID SOP QSMB-15	326.15	31.46	294.690	SVLC3054	0.200	5.0	Witness: ERL; Turbo Vap LV#1, 66°C
YI14063-002MD	MSD		2	PFAS by ID SOP QSMB-15	320.12	32.13	287.990	SVLC3054	0.200	5.0	Sorbent dry start/end:1st: 2137/2142 :2nd: 2211/2216;
YI15020-001	Sample	SAN-MH03_091323	1	PFAS by ID SOP QSMB-15	321.37	32.54	288.830		0.000	5.0	Buffer:LCMS23-738; Amm+MeOHLCMS23-737(4mL); QC Water: PFAS-23-060
YI15020-002	Sample	TripBlank_091323	1	PFAS by ID SOP QSMB-15	306.26	31.36	274.900		0.000	5.0	Bottletop: 21-2031; Pipettes: 21-1600, 23-1762;
YI15022-001	Sample	TOC03A-20230914	1	PFAS by ID SOP QSMB-15	299.98	31.97	268.010		0.000	5.0	QC Bottles: M3-180-01BB; Falcon tubes: 23-1748;
YI15022-001MS	MS		1	PFAS by ID SOP QSMB-15	296.13	31.88	264.250	SVLC3054	0.200	5.0	MeOH Ext: 4mL, Filt: 2mL;
YI15022-001MD	MSD		1	PFAS by ID SOP QSMB-15	303.65	32.34	271.310	SVLC3054	0.200	5.0	Reservoirs: 23-1537; GCB/WAX 500/50: 23-1618, 23-1710;
YI15022-002	Sample	TOC-DUP01-20230914	1	PFAS by ID SOP QSMB-15	295.64	31.64	264.000		0.000	5.0	
YI15022-003	Sample	TOC03B-20230914	1	PFAS by ID SOP QSMB-15	290.06	32.21	257.850		0.000	5.0	
YI15022-004	Sample	TOC03C-20230914	1	PFAS by ID SOP QSMB-15	293.31	31.61	261.700		0.000	5.0	
YI15029-001	Sample	WSTF-A03-100-001-GW-240-20230913	1	PFAS by ID SOP QSMB-15	314.87	32.37	282.500		0.000	5.0	
YI15029-002	Sample	WSTF-A11-600C-005-GW-402-20230913	1	PFAS by ID SOP QSMB-15	319.15	33.75	285.400		0.000	5.0	

Analyst: MVP2 **Level 2 Analyst:** ERL

Status: Level 2 review released

Matrix: Aqueous

Printed: 10/02/23 1720

Prep Batch: 85972

PFAS Prep by ID SOP QSMB-15 - PFAS Aqueous Preparation

Start Date: 09/27/2023 2024
End Date: 09/27/2023 2346

Conc Analyst: MVP2
Conc Start Date: 09/27/2023 2301
Conc End Date: 09/27/2023 2332

Surrogate: SVLC3050
Surrogate Vol. (mL): 0.100

Ext Solvent: MECH+96%MECH/4%H2O
Reagents Vol. (mL): 10
Chem ID: 23-1612>23-1612/PFAS-23-059

Balance ID: Balance # 20-1123

Sample ID	QC Code	Client Sample ID	Run	Analysis Method	Container + Sample (g)	Container Empty (g)	Initial Vol. (mL)	Spike ID	Spike Vol. (mL)	Final Vol. (mL)	Comments
YI15029-003	Sample	WSTF-A08-INF0001-20230914	1	PFAS by ID SOP QSMB-15	311.3	31.5	279.800		0.000	5.0	
YI15029-004	Sample	WSTF-A08-EFF0001-20230914	1	PFAS by ID SOP QSMB-15	309.58	32	277.580		0.000	5.0	
YI15029-005	Sample	WSTF-A08-INF0002-20230914	1	PFAS by ID SOP QSMB-15	305.12	32	273.120		0.000	5.0	
YI15029-006	Sample	WSTF-A08-EFF0002-20230914	1	PFAS by ID SOP QSMB-15	319.33	32.59	286.740		0.000	5.0	
YI15029-007	Sample	WSTF-EB-20230913-07	1	PFAS by ID SOP QSMB-15	310	31.31	278.690		0.000	5.0	
YI15029-008	Sample	WSTF-FB-20230913-08	1	PFAS by ID SOP QSMB-15	302.2	33.43	268.770		0.000	5.0	
YI15029-009	Sample	WSTF-FB-20230914-09	1	PFAS by ID SOP QSMB-15	301.61	31.71	269.900		0.000	5.0	
YI18040-002	Sample	IDW03-00	1	PFAS by ID SOP QSMB-15	327.33	31.92	295.410		0.000	5.0	
YI18040-003	Sample	IDW04-00	1	PFAS by ID SOP QSMB-15	322.38	33.05	289.330		0.000	5.0	

(end of report) **Total Samples: 18**

Appendix C
Surveyor's Report

LIBBIN UNDERWOOD ENGINEERING & SURVEYING
OFFICE: 1430 WEST AMADOR, LAS CRUCES, NM 88005
MAILING ADDRESS: 1121 BIRCH DR., LAS CRUCES, NM 88001
OFFICE PHONE: (575) 647-4329 FAX: (575) 523-5286
ZACK@LUENGINEERING.NET | LARRY@LUENGINEERING.NET

Monitoring Well Surveying Report

Project: WSTF Monitoring Well Survey
Project #: 2394

Prepared for: Tetra Tech, Inc.
201 East Pine Street, Suite 1000
Orlando, FL 32804
Phone: 407-480-3982
Fax: 407-839-2066
C/O Sarah Damphousse
e-mail: sarah.damphousse@tetratech.com

Report Prepared by: Joel Engel
Senior Survey Technician

Zack Libbin, PE
Principal Engineer

Under direction of: Larry O Underwood, PE/PLS
Principal Surveyor
NM PE/PLS 5983

Libbin Underwood Engineering & Surveying
Office Address: 1430 West Amador, Las Cruces, New Mexico
Mailing Address: 1121 Birch Dr., Las Cruces, NM 88001
Office Phone: 575-647-4329
zack@luengineering.net
larry@luengineering.net

Field Surveying date: September 15, 2023
Report Submittal date: November 21, 2023

1.0 Introduction

Tetra Tech Inc. (Tetra Tech) contracted Libbin Underwood Engineering & Surveying (Subcontractor, LU Engineering) to provide surveying services at National Aeronautics and Space Administration (NASA) White Sands Test Facility (WSTF) located in Doña Ana County, New Mexico. Professional Surveying was needed to support an Environmental Site Inspection in the eastern and western portions of the WSTF Facility.

2.0 Scope of Work

The scope of work performed at NASA WSTF for the Environmental Remediation Project was the point survey of two permanent monitoring wells contracted by Tetra Tech. Surveying Services provided by Libbin Underwood Engineering & Surveying included data collection on two different ground water monitoring wells, in Doña Ana County, NM. The point survey was completed using accurate and precise Trimble GNSS equipment, and technology.

Surveying services were required for two wells. The survey at each location was performed to obtain precise horizontal location and vertical elevation. Tetra Tech identified and provided access to the points to be surveyed in the field on September 15, 2023.

One horizontal measurement and two vertical measurements were required per well. The two vertical measurements are (1) the top of the polyvinyl chloride (PVC) riser pipe top of casing (TOC) and (2) the top of ground immediately adjacent to the outer casing. All the vertical measurements were taken from marked positions on each well or, if missing a mark, in a north direction.

There was no facility benchmark data provided, nor any access given to any benchmarks during escorted controlled access. The survey data shall be referenced to set benchmarks which place the project on: New Mexico State Plane Coordinate System, North American Datum 1983 (NAD83) and North American Vertical Datum 1988 (NAVD88).

The base unit for surveying all horizontal coordinates is reported in meters. The base unit for surveying all vertical elevations is reported in feet. All survey data is presented to the nearest 0.03 meter horizontally (equivalent of 0.1 ft) and the nearest 0.003 meter vertically (equivalent of 0.01 ft).

3.0 Site Background

(Provided by Tetra Tech)
NASA WSTF is located in Doña Ana County, 18 miles northeast of Las Cruces, New Mexico and 65 miles north of El Paso, Texas. Access to the site is provided via a paved road (NASA Road) that intersects U.S. Highway 70 one mile west of Organ, New Mexico. The installation occupies approximately 60,500 acres. WSTF administrative and testing facilities are located on the White Sands Missile Range (WSMR), owned by the Department of Defense, Department of the Army. NASA is the operator of the facility under an inter-agency agreement with the U.S.

Army. Tetra Tech is conducting a Site Inspection, which consists of sampling soil and groundwater for laboratory analysis of various contaminants of concern. Installation of two new monitoring wells is proposed to access site groundwater for investigation purposes. Once well installation is complete, a top-of-well casing and ground-surface survey at each well location is required to generate data for measuring groundwater level elevations.

4.0 Monitoring Well Survey

Surveying measurements were made by Libbin Underwood Engineering & Surveying using GNSS technology and equipment. Survey observations were made in the field using a Trimble R8-3 as the base with a R10 rover. The base made static observations and data collection which was post processed using the National Geodetic Survey (NGS) Online Position User Service (OPUS). The corrections near each well site and RTK measurements on each well were used to determine horizontal and vertical locations/coordinates.

A two-man surveying field crew from Libbin Underwood Engineering & Surveying completed a static observation of at least two hours at the two well sites on September 15, 2023. OPUS post processing was performed following the static observations greater than two hours to allow for OPUS adjustments. Each observation lasted for a duration of two hours of static observation with GNSS RTK shots around said site.

For well #600C-005-GW, located on the WSTF, the GNSS Static observation on the base point #200 (a 5/8-inch rebar) began at approximately 9:00 am MST and lasted until 11:00 am. An “X” was chiseled in the concrete footing of the well and was used as the benchmark for vertical data. RTK observations were then taken on the concrete footing next to well casing (chiseled “X”), on top of casing (top of the pipe) on the north side, and on the natural ground next to the concrete footing (see 5.0 Results and Survey Data and Exhibit A for horizontal and vertical data).

For well #100-001-GW, the GNSS Static observation on base point#100 (a 5/8-inch rebar), began at approximately 11:30am MST, and lasted until 1:30 pm. An “X” was chiseled in the concrete footing of the well, used as the benchmark vertical data. GNSS RTK observations were then taken on the concrete footing next to well casing (chiseled “X”), on top of casing (top of the pipe) on the north side, and on the natural ground next to the concrete footing (see 5.0 Results and Survey Data and Exhibit B for horizontal and vertical data).

5.0 Results and Survey Data

Coordinates for well locations are referenced to the New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983 (NAD83). Vertical data for well elevations are referenced the North American Vertical Datum 1988 (NAVD88).

The units of measurements for all reported horizontal coordinate data are expressed in meters to the nearest 0.03 meters (equivalent to 0.1 ft). The units of measurement for all reported vertical data are expressed in feet to the nearest 0.01 ft.

Table 1. Summary of monitoring well location New Mexico State Plane coordinates

Well Number	Point	Northing (meters)	Easting (meters)	Elevation (feet)
#600C-005-GW	Base Pt #200	168079.11	460173.62	4417.03
	Chiseled "X"	168060.35	460152.70	4416.30
	Top of Casing	168059.66	460152.37	4419.03
#100-001-GW	Base Pt #100	167162.80	466410.47	4811.95
	Chiseled "X"	167181.18	466408.26	4810.83
	Top of Casing	167180.70	466407.77	4813.86

Attached:
Exhibit A (Map and table of coordinates for well #100-001-GW)
Exhibit B (Map and table of coordinates for well #600C-005-GW)

Provided Digitally:
.csv file coordinates #600C-005-GW
.csv file coordinates #100-001-GW
NGS OPUS Solution Report Base Point 200
NGS OPUS Solution Report Base Point 100

6.0 Surveyor Certification

Surveying measurements and this report were prepared by Libbin Underwood Engineering & Surveying on behalf of Tetra Tech.

The survey measurements performed, and preparation of this report were performed under the direction of Larry O. Underwood, a Registered Professional Engineer and Land Surveyor in the State of New Mexico.

Measurements and coordinates reported are of precision and accuracy exceeding minimum requirements of the scope of work for this project (to 0.03 meter horizontally (equivalent of 0.1 ft) and 0.003 meter vertically (equivalent of 0.01 ft)) and standard of practice for this project.

I hereby certify that I am a Registered Professional Surveyor Under the Laws of the State of New Mexico, that surveying measurements and this report was prepared under my direction, that it is true and correct to the best of my knowledge and belief, meeting or exceeding the minimum requirements of the standards for land surveys in the State of New Mexico.

Larry O. Underwood

Larry O. Underwood, NMPLS #5983

11/21/23

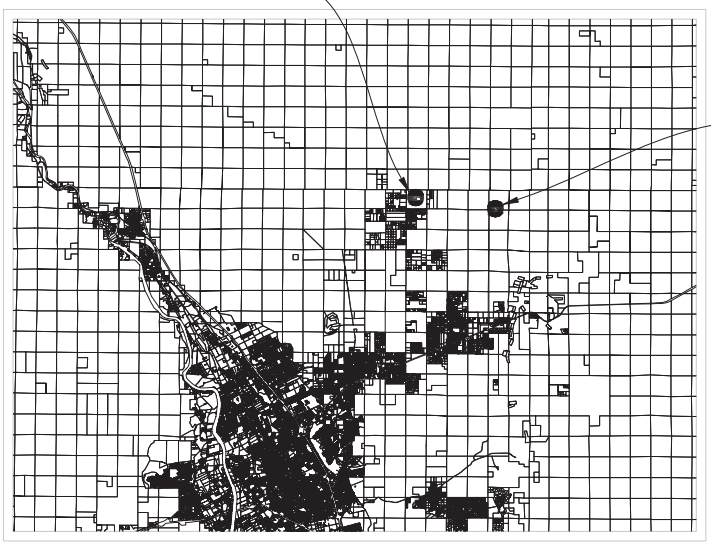


EXHIBIT A

EAST WELL

WELL No.100-001-GW

SCALE: 1 MM = 10 M NOVEMBER 20, 2023



VICINITY MAP
NTS

N

#100-001-GW				
POINT	ELEV (ft)	NORTHING (m)	EASTING (m)	DESCRIPTION
605	4813.86	167180.70	466407.77	WELL



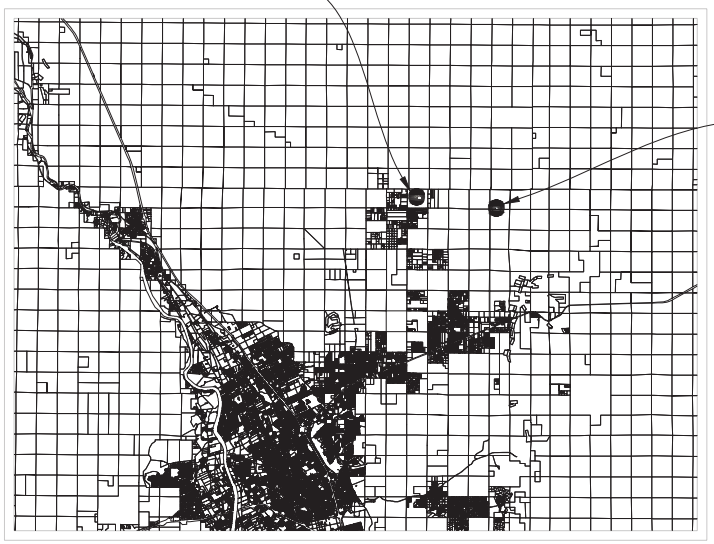
LIBBIN UNDERWOOD
ENGINEERING & SURVEYING
1430 W. AMADOR AVE, LAS CRUCES, NM | (575) 647-4329

PROJECT: 2394 | DRAWN BY: JME/CRF | SHEET 1 OF 1

EXHIBIT B

WEST WELL
WELL No.600C-005-GW

SCALE: 1 MM = 10 M NOVEMBER 20, 2023



VICINITY MAP
NTS

N

#600C-005-GW				
POINT	ELEV (ft)	NORTHING (m)	EASTING (m)	DESCRIPTION
500	4419.03	168059.66	460152.37	N RIM TOP CASING



LIBBIN UNDERWOOD
ENGINEERING & SURVEYING
1430 W. AMADOR AVE, LAS CRUCES, NM | (575) 647-4329

PROJECT: 2394 | DRAWN BY: JME/CRF | SHEET 1 OF 1

Appendix D
Investigation-Derived Waste Documentation

APPENDIX D

IDW MANAGEMENT DOCUMENTATION

Work Order

NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Waste Tracking Number
NMV8QG	1	888-785-7225	D572431

GENERATOR

5. Generator's Name and Mailing Address
Tetra Tech NASA
12600 Nasa Road
Las Cruces, NM 88012
Generator's Phone: 915-282-9243

Generator's Site Address (if different than mailing address)
same

6. Transporter 1 Company Name
dba AC Enviro
Advanced Chemical Transport, Inc. 511 Hwy 213 Chaparral NM 88061
U.S. EPA ID Number
ODL060760

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
Rhino Environmental Services, Inc.
1.7 Miles North of TX/NM Stateline
Otero County, NM
Facility's Phone:
U.S. EPA ID Number
DP1051

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	
1.	Non-DOT Regulated Material Solid (Oil, Dirt, Sand, Absorbents and or Diesel Fuel)	1	CM	20	YD	
2.						
3.						
4.						

13. Special Handling Instructions and Additional Information
Project Number 469400 Document #: D572431
1) TER-
Bin # 24387
Cell O

14. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name | Signature | Month | Day | Year

INT'L

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

TRANSPORTER

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name	Signature	Month	Day	Year
Adrian Villalpando		10	10	23
Transporter 2 Printed/Typed Name	**Signature**	**Month**	**Day**	**Year**

DESIGNATED FACILITY

17. Discrepancy

17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator) U.S. EPA ID Number
Facility's Phone:

17c. Signature of Alternate Facility (or Generator) Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name	Signature	Month	Day	Year
Erick Perez	Erick Perez	10	13	23

TRANSPORTER #1

NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Waste Tracking Number
NMVSOG	1	888-785-7225	D572422

GENERATOR

5. Generator's Name and Mailing Address
Texas Tech NASA
12600 Nasa Road
Las Cruces, NM 88012
Generator's Phone: 915-282-9243

Generator's Site Address (if different than mailing address)
Same

6. Transporter 1 Company Name
Advanced Chemical Transport, Inc. dba ACTenviro 5111 Hwy 213 Chaparral NM 88081
U.S. EPA ID Number: 006065102

7. Transporter 2 Company Name
U.S. EPA ID Number:

8. Designated Facility Name and Site Address
Rhino Environmental Services, Inc.
1.7 Miles North of TX/NM Stateline
Otero County, NM
Facility's Phone:
U.S. EPA ID Number: DP1051

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	
1.	Non-DOT Regulated Material Solid (Oil, Dirt, Sand, Absorbents and or Diesel Fuel)	1	CM	20	YD	
2.						
3.						
4.						

10/13/23 11:05 AM @ SAFETY CLEAN

13. Special Handling Instructions and Additional Information
Project Number 459400 Document #: D572422
1) TER: _____
Rhino Approval # _____ Bin #24310 cell 0

14. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Albert Soto | Signature | Month 10 | Day 13 | Year 23

INT'L

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

TRANSPORTER

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Adrian Villapando | Signature | Month | Day | Year

Transporter 2 Printed/Typed Name | Signature | Month | Day | Year

DESIGNATED FACILITY

17. Discrepancy

17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator) | U.S. EPA ID Number
Facility's Phone:

17c. Signature of Alternate Facility (or Generator) | Month | Day | Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name: Erick Perez | Signature | Month 10 | Day 13 | Year 23

169-BLC-O 5 11977 (Rev. 9/09)

TRANSPORTER #1

EPS SK SHIP# 241114944

Please print or type. Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: NMCESQG
2. Page 1 of: 1
3. Emergency Response Phone: 1-800-468-1760
4. Manifest Tracking Number: 008896610 SKS

5. Generator's Name and Mailing Address
Tetra Tech NASA
12600 NASA RD.
LAS CRUCES NM 88012-0000
Generator's Phone: 407-808-1414

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name: SAFETY-KLEEN SYSTEMS INC
U.S. EPA ID Number: TXR000081205

7. Transporter 2 Company Name: CLEAN HARBORS ENV SERVICES INC
U.S. EPA ID Number: MAD039322250

8. Designated Facility Name and Site Address
CLEAN HARBORS LAPORTE
500 INDEPENDENCE PARKWAY SOUTH
LA PORTE, TX 77571
Facility's Phone: 281-884-5500
U.S. EPA ID Number: TXD982290140

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
	1. NONE, NON HAZARDOUS, NON D.O.T. REGULATED, (GROUND WATER), N/A	5	~~BM~~ DF	1650	P	OUTS 6091
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
TSD:LT 92998034 TE336169 CSG:

24H EMERGENCY#800-468-1760-CH/SK/TFI-Contract retained by generator confers agency authority

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Robert Siegel
Signature:
Month: 10 Day: 10 Year: 23

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: David Pinoda
Signature:
Month: 10 Day: 10 Year: 2023

Transporter 2 Printed/Typed Name:
Signature:
Month: Day: Year:

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator)
U.S. EPA ID Number:
Facility's Phone:

18c. Signature of Alternate Facility (or Generator)
Month: Day: Year:

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1. 2. 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name:
Signature:
Month: Day: Year:

EPA Form 8700-22 (Rev. 12-17) Previous editions are obsolete.

DESIGNATED FACILITY TO GENERATOR

1) 9855811 /2654270

EPS SK SHIP# [illegible]14944

0088966105KS

Please print or type. Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	NMCESQG	1	1-800-468-1760	008896610 SKS

GENERATOR

5. Generator's Name and Mailing Address
Tetra Tech NASA
12600 NASA RD
LAS CRUCES NM 88012-0000
Generator's Phone: 407-808-1414

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name: SAFETY-KLEEN SYSTEMS INC — U.S. EPA ID Number: TXR000081205

7. Transporter 2 Company Name: CLEAN HARBORS ENV SERVICES INC — U.S. EPA ID Number: MAD039322250

8. Designated Facility Name and Site Address
CLEAN HARBORS LAPORTE
500 INDEPENDENCE PARKWAY SOUTH
LA PORTE, TX 77571
Facility's Phone: 281-884-5500
U.S. EPA ID Number: TXD982290140

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
	1. NONE, NON HAZARDOUS, NON D.O.T. REGULATED, (GROUND WATER), N/A	5	~~DM~~ TF BK	12,100 BK	P	OUTS 6091
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
TSD:LT 92998034 TE336169 CSG:

24H EMERGENCY#800-468-1760-CH/SK/TFI-Contract retained by generator confers agency authority on initial transporter to add or substitute additional transporters on generator's behalf.

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Robert Siegel — Signature: [signature] — Month: 10 Day: 10 Year: 23

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: David Pineda — Signature: [signature] — Month: 10 Day: 10 Year: 2023

Transporter 2 Printed/Typed Name: Brandon Kiamar — Signature: Brandon Kiamar — Month: 10 Day: 12 Year: 23

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name: Vanessa Arandaverde — Signature: [signature] — Month: 10 Day: 10 Year: 23

EPA Form 8700-22 (Rev. 12-17) Previous editions are obsolete. DESIGNATED FACILITY TO EPA's e-MANIFEST SYSTEM

1) 9855811/2654270

Clean Harbors LaPorte, LLC
500 Independence Parkway South
La Porte TX, 77571
TXD982290140
(281) 884-5500

CERTIFICATE OF DISPOSAL

Manifest Mailing Name :	Tetra Tech NASA		
Manifest Mailing Address:	12600 NASA RD Las Cruces, NM 88012	Job Address:	12600 NASA RD LAS CRUCES, NM 88012
Customer Contact Name:	Mrs Sarah Damphousse	Generator Contact Name:	
Sales Order #:	2305446137	Date Received:	10/16/2023
Generator EPA ID:	NMCESQG	Manifest #:	008896610SKS

Line #	Profile/Description	Disposal Date	Method of Disposal	Disposal Facility
1	2654270 Ground Water	10/29/2023	Incineration	Deer Park, TX Facility

Under Civil and Criminal Penalties of Law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.

Name: Nicole McClish

Title: Dir Environmental Application

Date: Saturday, January 06, 2024

Location WSTF New Mex Date 10 10 23

Project / Client NASA

212ig 06 01344

Cloudy Cold 65°

Robert Singer

5 45 TT

6 30 onsite meet with Robert Walker and Mike Flora gen review of testing and Maps

7 15 meet Trent Maz escort

7 30 drive for meet at Gate

7 45 at Gate with out Trent update from Sarah new ESD meet Time

7 55 TT update review with Sarah about meet

8 10 meet with Robert W and Mike P

8 25 at Gate with Trent

Rite in the Rain

Project / Client WSTF NASA

212.4 Pb 01344

Some Clouds Owind 75°

Robert Siegel / CH Hector B

RYR Adam R + Martin EF / SK Jamie P + Ryan C

8:45 crews onsite Pickup F150 Vac Truck Flat bed and Two Cabs 4 man crew 45 Box Truck and 5th person

9:30 All loaded Clean Harbor and Safety Clean

945 at First location Frac Tank # 265 890 Roll off # CHRT 24367

1015 First location completed

1030 at 2nd location gen Tank # 205 560 Roll off # CHRT 24310 Trent at Gate

1040 vac started Trent onsite

Project / Client WSTF NASA

212.4 Pb 01344

Some Clouds 70's Sunny

Robert Siegel 85° CH Hector B

RYR Adam R + Martin EF / SK Jaime M + Ryan C

1145 Tank empty start Transfer from vac Truck To Tote

1150 Tank # offsite TT

1220 Water in Totes completed

1240 Box Truck and Vac Truck offsite TT

1250 Transport at location load roll off

1310 Roll off offsite

1320 meet with Mike Flora gen review

1345 TT

Rite in the Rain

30

Location New Mex Date 10-10-23

Project / Client WSTF NASA

212.9 06 01344

Some Clouds 0 To Sky 90°

Robert Siegel ATC Admin V

CH Hector B/RYR Adam R + Martin E F/SK Tyler H James M Ryan C

1350 2nd frac Tank pickup outside gate

1400 2nd Frac Tank loaded and Traveling

1430 Break