Maryland Department of the Environment (MDE) Per-and Polyfluoroalkyl Substances (PFAS) in Surface Waters and Fish Tissue in Piscataway Creek

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Maryland Department of the Environment
Water and Science Administration

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2.0 ACRONYM LIST

COC	Chain of Custody
DNR	Maryland Department of Natural Resources
EPA	United States Environmental Protection Agency
ESI	Expanded Site Inspection
JBA	Joint Base Andrews
LRP	Land Restoration Program
MDE	Maryland Department of the Environment
M	Meter(s)
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MPH	miles per hour
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
ng/L	nanograms per liter
NIST	National Institute of Standards and Technology
pps	practical salinity
ppt	parts per trillion
PFAS	Per- and polyfluoroalkyl substances
PFBS	Perfluorobutanesulfonic Acid
PFOS	Perfluorooctanesulfonic Acid
RI	Remedial Investigation
µg/kg	micrograms per kilogram
uS/cm	microSiemens
USGS	United States Geological Survey
WSA	Water and Sciences Administration
°C	degrees Celsius

3.0 EXECUTIVE SUMMARY

Per- and Polyfluoroalkyl Substances (PFAS) are a family of thousands of human-made chemicals that are found in a wide range of products used by consumers and industry since the 1940's. PFAS have been used in a variety of applications including in stain- and water-resistant fabrics and carpeting, cleaning products, paints, and fire-fighting foams due to their resistance to grease, oil, water and heat. Because of the strength of the carbon-fluorine bond, many PFAS are persistent in the environment. Available data on the bioaccumulation potential of certain PFAS indicate that certain PFAS compounds are highly bioaccumulative. The widespread use of PFAS in a variety of products and their ability to remain intact in the environment means that over time PFAS levels from past and current uses can result in increasing levels of environmental contamination which may bioaccumulate throughout the food chain. Understanding the occurrence of PFAS compounds in various environmental compartments (e.g., air, surface water, groundwater, and land) and the routes of human exposure (e.g., in drinking water or in foods such as seafood) is a growing area of science, as environmental and public health professionals seek to better understand the risks to human health posed by PFAS.

In fall 2020, MDE began its effort to sample fish tissue for PFAS by including PFAS analytes in its fish tissue sampling program, which in the fall of 2020, was focused on sampling of fish tissue in the Eastern Shore Region. In late 2020 and early 2021, the Maryland Department of the Environment (MDE) also initiated a targeted study of the occurrence of PFAS compounds in surface water and fish tissue in the Piscataway Creek area. MDE added two fish tissue sample locations in Piscataway Creek for two reasons: there is a known source PFAS at Joint Base Andrews which is located adjacent to the upper reaches of Piscataway Creek, and the area near the mouth of the Piscataway, where it meets the Potomac River, is popular for recreational fishing. MDE was also aware of a discharge of firefighting foam and the resulting fish kill investigation (on July 31, 2020, from Joint Base Andrews) and data concerning PFAS releases to surface water discussed in the 2018 Site Inspection Report of the Fire Fighting Foam usage at Joint Base Andrews, Prince George's County, Maryland.

The Piscataway Creek PFAS study included monitoring for PFAS in surface waters and fish tissue in the tidal and non-tidal waters of Piscataway Creek, and Nanjemoy Creek (a reference site with tidal and non-tidal sampling locations similar to and south of Piscataway Creek with no known PFAS sources). MDE determined that it would be beneficial to sample PFAS levels in surface water and fish tissue in Piscataway Creek to better understand human health risk and potential sources of PFAS. The Department contracted the services of Alpha Analytical Mansfield Laboratory, 320 Forbes Boulevard, Mansfield, MA 02048 for sample analysis of fish tissue and surface water.

The results from the regular fall fish collection in the Eastern Shore Region showed no levels of concern. However, the sampling of fish tissue in Piscataway Creek indicated highly elevated levels of PFAS in fish tissue, in redbreast sunfish.

The non-tidal portion of Piscataway Creek off Commo Road was sampled in the fall of 2020 for a primary trophic level species, yellow- bullhead catfish, and a secondary trophic level species, redbreast sunfish. Both species were collected via electroshock and put into composites of five same-species fish within a 75% weight gradient. A field blank of non-PFAS water was collected

at the time to ensure sampling compliance. The results from the 2020 Fall fish tissue collection in Piscataway Creek identified elevated concentrations of PFOS in sunfish collected west of Rt. 210 in the non-tidal portion of Piscataway Creek off Commo Road. Yellow-bullhead catfish were also collected at the same location and while the results are not as elevated as redbreast sunfish, they are still higher than all other fish tissue results from the fall collection at other sampling stations across the state. The elevated levels of PFOS in redbreast sunfish suggested that further investigation was warranted.

MDE returned to the field in spring 2021 to obtain additional fish tissue and water samples in Piscataway Creek in part to verify/validate the fall 2020 results. Results of the May 2021 PFAS Piscataway Creek sampling were used to assess potential PFAS public health risks from recreational swimming in and consumption of fish from Piscataway Creek. MDE developed risk-based swimming criteria for Perfluorooctanoic Acid (PFOA), Perfluorooctanesulfonic Acid (PFOS) and Perfluorobutanesulfonic Acid (PFBS) and risk-based fish tissue screening criteria for PFOA and PFOS to interpret the sampling results from the perspective of potential risk to human health. Both PFOA and PFOS have EPA-established reference doses (i.e., toxicity values) which were used by EPA to develop EPA's 2016 PFAS Health Advisory for PFOA and PFOS in drinking water. PFOA and PFOS currently have the same EPA reference doses and MDE used these reference doses and the EPA PFBS reference dose to develop its risk-based screening criteria for use in interpreting surface water and fish tissue sampling results.

The tables below summarize the MDE-calculated risk-based screening criteria for PFOA, PFOS and PFBS for both recreational swimming and fish consumption. For fish consumption, human health-based screening concentrations derived for PFOA and PFOS assume individual fish species have uniform fish tissue concentrations throughout the study area. PFOA and PFBS were not detected in any fish tissue samples, therefore MDE's assessment of whether fish tissue levels exceed human health-based screening values is based on a comparison of measured levels of PFOS in fish tissue to human health-based screening values for PFOS in fish.

MDE-calculated risk-based screening criteria for PFOA, PFOS, and PFBS for recreational swimming

Recreational Scenario (All Populations)	**Exposure duration (yrs.)**	**Exposure frequency (days/yr.)**	**Exposure time (hrs. day)**	**Recreational Swimming Screening Concentration PFOA+PFOS/(PFBS) (ng/L)**
Swimming in surface water **moderate**	26	26 (2 days a week, 13 weeks)	2	**17,500/(26,200)**
Swimming in surface water **intensive**	26	52 (2 days a week, 26 weeks)	2	**8,770/(13,100)**

MDE-calculated risk-based screening concentration for PFOS for fish consumption

Population	Consumption Rate (mg-day)	Approximate Meals per Month (8-ounce meal adult, 3-ounce child)	Approximate Meals/Year	Fish Tissue (cooked) Screening Concentration (ug/kg) for PFOS
General Population (76 kg)	29,825	4	48	**73**
Women Child Bearing Age (67 kg)	29,825	4	48	**64**
Children (14.5 kg)	11,185	4	48	**37**

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Summary of Total PFAS and PFOS Sampling Results for Surface Water

Location	Media	Concentration Range (PFAS) (ng/L)	Maximum Concentration PFAS (ng/L)	Maximum Concentration PFOS (ng/L)
Nanjemoy Creek non-tidal	surface water	ND	ND	ND
Nanjemoy Creek tidal	surface water	7	7	3
Piscataway Creek non-tidal	surface water	310 - 3,193	3,193	1,100
Piscataway Creek tidal	surface water	207	207	74

Summary of Total PFAS and PFOS Sampling Results for Fish Tissue

Location	Media	Concentration Range (PFAS) (ug/kg)	Maximum Concentration PFAS (ug/kg)	Maximum Concentration PFOS (ug/kg)
Nanjemoy Creek non-tidal	fish tissue	4 - 10	10	5
Nanjemoy Creek tidal	fish tissue	1 - 6	6	5
Piscataway Creek non-tidal	fish tissue	29 - 247	247	231
Piscataway Creek tidal	fish tissue	4 - 101	101	94

Surface water concentrations of PFAS ranged from not detected in Nanjemoy Creek to 3,193 ng/L (parts per trillion (ppt)) in Piscataway Creek. PFOA plus PFOS and PFBS surface water concentrations were below recreational swimming screening criteria (based on incidental ingestion). PFAS surface water concentrations in Piscataway Creek dissipated with distance as the creek progressed downstream of potential sources at Joint Base Andrews. The concentration of PFAS in the tidal headwaters of Piscataway Creek was 207 ng/L and the dominant PFAS compound throughout Piscataway Creek was PFOS, one of the most persistent, bioaccumulative PFAS compounds. In addition to potential PFAS sources emanating from Joint Base Andrews the Department continues to track down potential sources in the watershed and is working with the Prince George's Fire Department Fire/EMS Training Academy, which is present along Commo Road adjacent to Piscataway Creek, to determine if there are PFAS sources associated with the facility or others in the watershed. Concentrations of PFAS compounds in the nontidal headwaters and tidal headwaters of Piscataway Creek were significantly greater than PFAS surface water concentrations in comparable locations in the Nanjemoy Creek reference site. PFAS surface water concentrations in Piscataway Creek and comparisons to a similar reference site, Nanjemoy Creek, indicate significant likely ongoing sources of PFAS and PFOS exist within the Piscataway Creek watershed.

MDE's evaluation of the fish tissue samples from Piscataway Creek includes a comparison of measured PFOS fish tissue concentrations to measured concentrations at the reference site and to a range of MDE-calculated risk-based site-specific fish consumption screening concentrations. PFBS was not detected in any of the fish tissue samples throughout the study area. These human health-based screening concentrations for PFOS assume that all fish are consumed from the same harvesting location. MDE found that fish tissue concentrations in redbreast sunfish in the non-tidal portion of Piscataway Creek off Commo Road were in excess of the PFOS screening criteria and that fish tissue PFOS concentrations in largemouth bass were in excess of screening criteria in the tidal portion of Piscataway Creek. Fish tissue PFOS concentrations from fish sampled from the Nanjemoy Creek control sites were significantly lower than fish tissue PFOS concentrations in fish sampled from Piscataway Creek. Results of the fish tissue consumption evaluation for PFOS indicated consumption of fish tissue within non-tidal and tidal portions of the Piscataway Creek study area are in excess of the MDE site-specific fish consumption screening criteria. Fish tissue collection and assessment activities in and around Piscataway Creek are ongoing and additional information regarding advisories or assessment activities based on the results will be provided as they become available.

The study concludes that PFOA, PFOS and PFBS are present in the non-tidal and tidal waters of Piscataway Creek at concentrations below risk-based recreational use swimming screening criteria, but PFAS surface water concentrations in both the non-tidal and tidal portions of Piscataway Creek are significantly greater than PFAS concentrations when compared to the Nanjemoy Creek reference sites. Moreover, PFOS are present in fish tissue at levels that exceed human consumption-based screening criteria and fish consumption advisories and additional assessment may be warranted in both the tidal and non-tidal waters of Piscataway Creek.
The results and conclusions from this study will be used by MDE to determine the need for more immediate risk reduction actions, such as the issuance of fish advisories. In addition, the study results will be used by MDE in PFAS source tracking efforts and associated risk management actions to address uncontrolled releases.

[1] *Fish consumption screening concentration derivations within the MDE Fish and Shellfish Program include a 30 % reduction in contaminant concentration in the fish due to trimming and cooking losses.*

4.0 INTRODUCTION

The Maryland Department of the Environment's (MDE) Water and Sciences Administration (WSA) conducted this monitoring effort to assess the occurrence of Per- and Polyfluoroalkyl Substances (PFAS) in surface water and fish tissue in and around Piscataway Creek, Prince George's County, to assess any potential human health risks. The Department collected samples from surface water and fish tissue in and around the tidal and non-tidal waters of Piscataway Creek and within control reference sites in tidal and non-tidal waters of Nanjemoy Creek. Sampling locations were targeted to focus on primary potential source areas and potential areas of concern (AOC) associated with Joint Base Andrews (JBA) and the Prince George's County Multi Agency Training Center (including fire fighters). Results and evaluations of the sample data collected during this investigation were compared to applicable state and federal risk-based concentration levels or site and media specific risk-based screening levels derived for the protection of human health are presented below.

5.0 STUDY AREA AND BACKGROUND

MDE initiated the 2021 study of PFAS levels in surface water and fish tissue from fish in Piscataway Creek for two reasons: (1) there is a known source of PFAS at Joint Base Andrews which is located adjacent to the upper reaches of the Piscataway Creek watershed and (2) this area is a popular area for recreational fishing. Following a discharge of firefighting foam and the resulting fish kill investigation on July 31, 2020, from Joint Base Andrews and a review of the 2018 Site Inspections Report of the Fire Fighting Foam usage at Joint Base Andrews, Prince George's County, Maryland, MDE decided to focus on an assessment of the human health risks associated with PFAS in Piscataway Creek.

The results from the fall fish tissue collection in Piscataway Creek (Table 2) show elevated concentrations of PFAS in sunfish collected west of Rt. 210 in the non-tidal portion of Piscataway Creek. Yellow-bullhead catfish were also collected at the same location and while the results were not as elevated as redbreast sunfish, they are still higher than all other fish tissue results from the fall collection at other sampling stations across the state. This suggested that further investigation was warranted. The Piscataway Creek collection in the fall was repeated in Spring 2021 to confirm the elevated PFAS in sunfish and catfish tissue and explore PFAS occurrence in other species found in the area but not previously collected in the fall.

Piscataway Creek is a small tributary of the Potomac River located in Prince George's County. The potential sources of PFAS to the creek include JBA and a multi-agency training center (including fire fighters). The 2018 Site Inspections Report of Fire Fighting Foam Usage at Joint Base Andrews shows relatively high levels of PFOA and PFOS in surface waters and storm water near or on the base. An assessment of pollution sources provided by MDE Water Supply Program directed the placement of sampling stations based on discharge from previously listed areas of concern; no other major sources of PFAS were identified (Figure 1 and 2).

Recreational fishing is most popular within the tidal portion of Piscataway Creek where it meets the Potomac River. There is little access to deep pools in the non-tidal portions of the creek and the upstream portions are quite shallow in most places. After consulting with the Maryland

Department of Natural Resources (DNR), MDE determined that the 8.5 mile stretch of the tidal portion is popular for yellow perch, particularly in the Spring. According to the DNR, other popular species include largemouth bass and sunfish from the deep pools. There is limited public access to these areas of Piscataway Creek from the shoreline, as they are bordered by private property. The communities in this area were evaluated using the draft MDE EJ Screening Tool (Appendix 6) and MDE found that there were no environmental justice implications.

5.1 PFAS Basic Information and Study Target Analyte List

PFAS refers to a large group of human-made chemicals that for decades were used in a range of products, including stain- and water-resistant fabrics and carpeting, cleaning products, paints, cookware, food packaging and fire-fighting foams. Because of the strength of the carbon-fluorine bond, some PFAS can last a long time in the natural environment and can potentially accumulate in the food chain. Scientific studies suggest that certain PFAS may have adverse impacts on human health. Measuring PFAS concentrations in drinking water and food, estimating dietary exposure and completing quantitative risk assessments to estimate human health risk is a relatively new area of science. For example, EPA used quantitative risk assessments to develop its 2016 health advisory levels for PFOA and PFOS in drinking water. For additional information provided by the federal government on PFAS, see the following links:

- EPA Website for PFAS
- https://www.atsdr.cdc.gov/pfas/docs/pfas_fact_sheet.pdf
- https://www.fda.gov/food/chemicals/questions-and-answers-and-polyfluoroalkyl-substances-pfas-food

MDE is putting a priority on better understanding, communicating, and reducing unacceptable risks to human health related to PFAS. This includes identifying and investigating PFAS occurrence in areas with the potential for the highest relative risk such as public drinking water treatment facilities that may be more vulnerable to contamination, in locations where there may be more than one source of PFAS releases. The focus of this study is to quantify and assess the presence of PFAS in surface water and fish tissue and throughout the study area. The Target Analyte List (TAL) of PFAS compounds utilized in this study included 14 PFAS analytes (Table 1).

6.0 SAMPLING PROCEDURE AND ANALYTICAL METHODOLOGY

6.1 Surface Water Sample Collection

6.1.1 Surface Water Sampling

Surface water samples were collected on May 14th and 18th of 2021 in and around the non-tidal and tidal waters of Piscataway creek and the reference sites in the tidal and non-tidal waters of Nanjemoy Creek south of Piscataway Creek. Figures 1 and 2 show the sampling locations for surface water and fish tissue sample stations throughout the tidal and non-tidal waters of Piscataway Creek and the tidal and non-tidal waters of Nanjemoy Creek. The Nanjemoy Creek sites were used as a reference site or control throughout the study.

Each of four teams was provided with a trip blank that was stored in their vehicle in a cooler on ice the day of sampling. Trip blanks were inserted in the cooler at the beginning of the day and traveled to the boat launch location and back to the Annapolis Field Office for courier pickup. A total of 10 field blanks containing PFAS-free water supplied by the contract laboratory were utilized during sampling using the same methodology detailed in previous studies (provide reference to previous studies). The number of samples, sample locations and quality control samples are detailed in Table 4. The samples were shipped to the laboratory following approved sample handling and storage methods. Chain of custody forms were utilized to properly track sample handling, requested analytical tests and sample transfer (Appendix 1).

6.2 Fish Tissue Sample Collection- Piscataway Creek and Nanjemoy Creek

The Department collected fish tissue samples at two locations in the tidal and non-tidal waters of Piscataway Creek (Figure 1). Additionally, fish tissue samples were collected from two locations in the tidal and non-tidal waters of the Nanjemoy Creek (Figure 2) reference site. All samples collected were submitted for analysis to determine the levels of 14 PFAS. Corresponding analytical methodologies and quality control procedures are detailed and provided in Appendix 3.

On May 14, 2021, May 17, 2021, May 20, 2021, and May 26, 2021, the Department collected fish tissue samples at four sampling locations: the tidal headwaters of Piscataway Creek (5/14/2021), the non-tidal waters of Piscataway Creek at Commo Road (05/17/2021), the tidal headwaters of Nanjemoy Creek (05/20/2021), and the non-tidal waters of Nanjemoy Creek (05/26/2021). Collections are usually accomplished using a boat-mounted electrofisher powered by a 3.5- or 5.0-Kilowatt generator. Fillet composite samples consist of one fillet from each of five fish of the same species. The minimum wet weight composite necessary for analyses is 10 grams. The minimum number of fish comprising a composite sample is five fish. For all samples, the smallest fish in the sample must be within seventy-five percent of the total length of the largest fish in the composite sample.

Filet knives used for cleaning fish were rinsed with PFAS-free water each time before fileting the next sample. Filets were placed directly in the laboratory supplied containers, bagged, and placed on ice. Each of the four teams was provided a trip blank by the laboratory containing PFAS free water and a field blank for each of the collection sites. Methodology and rationale behind the use of trip and field blanks was the same as mentioned previously. Once complete, all trip and field blanks were bagged and placed in their designated cooler for shipment and analysis by Alpha Analytical Laboratory. Fish tissue samples were transported to and homogenized at the contract laboratory. At each station, environmental conditions and water quality parameters were collected and recorded on field data sheets. These data for this sampling event can be found in Appendix 1 and Appendix 2.

6.3 Analytical Methodology

The TAL suite consists of 14 PFAS analytes (See Table 1 identifying the PFAS TALs and Appendix 3 for approximate method detection limits for water and fish tissue). A brief narrative of the sample preparation and analytical methodology for both surface water and fish tissue analysis are presented in Appendix 3. Given the lack of standardized, published analytical methods for non-drinking water sample media, and the fact that EPA 500 series methods are not allowed to be modified, an alternative method based on principles detailed in the EPA 500 series method was utilized by the contract laboratory. The Alpha Analytical method was a liquid chromatography tandem mass spectrometry method (LC/MS/MS) with solid phase extraction, and it is most similar to Method 533 in that it utilizes the weak anion exchange (WAX) SPE cartridge, and the method calibration employs the isotope dilution technique. This method incorporates the maximum number of commercially available extracted internal standards, consisting of (18) 13C-enriched and (2) 2H-enriched compounds. Up to 36 PFAS compounds, or any subset, can be quantified using this approach. The method can analyze a wide range of sample matrices in addition to aqueous samples including soils/sediments, biosolids, and tissues. Although similar methods are used, there is currently no standard analytical method, from EPA or any voluntary consensus standard body, for PFAS analysis in fish tissue. Few laboratories advertise fish tissue analysis for PFAS.

7.0 PFAS "STANDARDS", TOXICITY VALUES AND UNCERTAINTY ANALYSES

Health-based guidance values in specific environmental media for some PFAS have been developed by federal, state, and international agencies using a variety of critical studies, endpoints, methods, and policy choices. This study focuses specifically on assessing human health risk associated with measured levels of PFOA, PFOS and PFBS in surface water, and PFOS in fish taken from Piscataway Creek. PFOS was the predominant PFAS detected in fish tissue and the only detected PFAS with peer reviewed toxicity values, therefore, fish tissue consumption risks were evaluated only for PFOS. MDE used peer reviewed reference doses (RfDs) for PFOA and PFOS which were developed by EPA (and used by EPA in developing its 2016 Drinking Water Health Advisory Levels) and an MDE estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime (with uncertainty factors generally applied to reflect limitations of the data used). The PFBS RfD was a Provisional Peer-Reviewed Toxicity Value (PPRTV) primarily derived for use in EPA's Superfund Program. RfDs are generally used in noncancer health assessments and the RfDs utilized in this assessment are approved by EPA and detailed within the Regional Screening Level User's Guide, (May, 2021), https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide. The MDE-developed health-based guidance values for swimming and for fish consumption are estimates of a daily exposure dose that is not expected to lead to a non-cancer health risk over a set period. These guidance values are used to identify exposures (and levels in surface water and fish) that could potentially pose an unacceptable risk to human health. However, exposure above a guidance value does not mean that health problems will occur. MDEs quantitative assessment addresses only Perfluorooctanoic acid (PFOA) Perfluorooctanesulfonic acid (PFOS) and Perfluorobutanesulfonic Acid (PFBS), three of the most studied PFAS which both have RfDs.

The MDE risk threshold for noncarcinogens is set at a hazard quotient of 1 which is the ratio of the potential exposure to a substance and the level at which **no** adverse effects are expected (calculated as the exposure divided by the appropriate chronic or acute value) which means adverse noncancer effects are unlikely at this level, and thus can be considered to have negligible risk. For hazard quotients greater than 1, the potential for adverse effects increases, but we do not know by how much. For toxics that affect the same target organ or organ systems that can cause similar adverse health effects, combining hazard quotients from different toxics is often appropriate. The sum of hazard quotients is a hazard index (HI) which was utilized for PFOA, PFOS and PFBS in this evaluation. An HI of 1 or lower means toxics are unlikely to cause adverse noncancer health effects over a lifetime of exposure. However, an HI greater than 1 doesn't necessarily mean adverse effects are likely.

As stated previously PFAS compounds have been in use since the 1940s and PFAS are found in a wide array of consumer and industrial products. Other than for PFOA, PFOS and PFBS, the vast majority of PFAS compounds in the marketplace have little to no toxicity information or RfDs. As greater knowledge of the toxicity of other PFAS compounds advances, MDE will re-visit prior assessments to ensure that appropriate actions are taken to address any unacceptable human health risk. Currently, the MDE, EPA and other organizations are collaborating to generate and review research and consider new scientific information as it becomes available on the bioaccumulation potential and toxicity of additional PFAS. Developing toxicity values or oral reference doses, RfDs, for other PFAS, including GenX chemicals are a priority for EPA and will be considered by MDE as the research becomes available. Accordingly, the uncertainty concerning the human health risks associated with other PFAS detected in this study is discussed qualitatively.

7.1 Surface Water Data

Surface water sample results are presented in Table 5 and corresponding sample locations are identified in Figures 1 and 2. The surface water PFAS concentrations from the reference sites in Nanjemoy Creek (Figure 2) ranged from not detected in the non-tidal headwaters to 6.77 ng/L in the tidal headwaters. The results within Piscataway Creek ranged from 207 ng/L in the tidal headwaters prior to its discharge into the Potomac River to as high as 3,193 ng/L total PFAS in the non-tidal headwaters along Colonial Lane just south of Joint Base Andrews. PFAS concentrations exhibited a dilution attenuation pattern dissipating with distance as the creek progressed downstream of potential sources originating from Joint Base Andrews. In addition to potential PFAS sources at Joint Base Andrews the Prince George's Fire Department Fire/EMS Training Academy is present along Commo Road adjacent to Piscataway Creek, however, the presence of PFAS sources associated with the facility is not known. All surface water samples taken from Piscataway Creek had PFAS levels greater than samples taken from comparable reference sites in Nanjemoy Creek.

7.1.1 Recreational Surface Water Risk-Based Screening Evaluation

MDE calculated the levels of PFOA plus PFOS and PFBS in Piscataway Creek which would pose an unacceptable level of risk to recreational swimmers (through accidental ingestion of water while swimming) to compare these levels to measured levels of PFOA plus PFOS and

PFBS in Piscataway Creek. If measured levels of PFOA plus PFOS or PFBS are in excess of MDE's calculated human health recreational swimming screening values, MDE would find that swimming in Piscataway Creek would pose unacceptable risks to human health. Recreator surface water exposure supporting calculations, equations and exposure variables are presented in detail in Appendix 4 and Appendix 5. Surface water exposure was evaluated for all potential populations including children at all stages of development from birth on. Recreational use surface water exposures were evaluated using a conservative range of exposure times within the study area as presented in Table 1 below.

Table 1: Site-specific Surface Water Exposure Variables

Recreational Scenario (All Populations)	**Exposure duration (yrs.)**	**Exposure frequency (days/yr.)**	**Exposure time (hrs. day)**	**Recreational Swimming Screening Concentration PFOA+PFOS/(PFBS) (ng/L)**
Swimming in surface water **moderate**	26	26 (2 days a week, 13 weeks)	2	**17,500/(26,200)**
Swimming in surface water **intensive**	26	52 (2 days a week, 26 weeks)	2	**8,770/(13,100)**

The recreational exposure pathway MDE assessed is incidental ingestion of water while swimming, wading, or recreating in surface water. Water intake rates varied with age and exposure time and were estimated to be as high 125 milliliters per hour for children. Dermal contact with surface water was not quantitatively evaluated as a pathway of exposure due to the expected low dermal permeability of PFOA, PFOS and PFBS. Inhalation of PFOA, PFOS and PFBS was also not considered as an important pathway of exposure for swimmers.
Surface water concentrations of PFAS are presented in Table 5. Calculations of site-specific surface water risk-based swimming screening values are presented in Appendix 4 and Appendix 5. Risk-based surface water screening concentrations for swimming are greater than EPA recommended health advisory levels for PFAS in drinking water because people accidently ingest much less water per day while swimming or recreating as compared to the amount of water people purposefully ingest in drinking water throughout the day. Comparisons of surface water concentrations to the EPA recommended Health Advisory Level (or any other drinking water criteria) are not appropriate for assessing swimming risk. MDE conservatively derived surface water recreational screening criteria for the Piscataway Creek study area utilizing screening criteria that may not be applicable for certain portions of Piscataway Creek due to limiting factors like water depth and the low probability of swimming within the upper reaches of the creek closer to potential sources.

As presented in Table 7 the maximum detected surface water concentration of 3,193 ng/L was significantly below the risk-based recreator screening concentrations for moderate (17,500 ng/L) and intensive (8,770 ng/L) surface water recreator exposures for the sum of PFOA and PFOS and the risk-based recreator screening concentrations for PFBS moderate (26,200 ng/L) and intensive (13,100 ng/L) recreator exposure to surface waters throughout the Piscataway Creek study area. The maximum PFAS concentration for the reference site in the tidal and non-tidal portions of

Nanjemoy Creek was 6.77 ng/L which is significantly lower than the risk-based recreator screening criteria and the PFOA plus PFOS and PFBS results for the Piscataway Creek study area. PFAS compounds, including PFOA and PFOS, were only intermittently detected at or near the analytical detection limits in the Nanjemoy Creek reference sites. The concentration of PFAS in the tidal headwaters of Piscataway Creek was 207 ng/L and the dominant PFAS compound throughout Piscataway Creek was PFOS, one of the most persistent, bioaccumulative PFAS compounds. In addition to potential PFAS sources emanating from Joint Base Andrews the Department continues to track down potential sources in the watershed and is working with the Prince George's Fire Department Fire/EMS Training Academy which is present along Commo Road adjacent to Piscataway Creek to determine if PFAS sources associated with the facility or others in the watershed are known.

Based upon the results of the recreational swimming exposure evaluation, surface water recreational exposure risk estimates based on measured values in Piscataway Creek are below MDE site-specific recreational use (swimming) screening criteria.

7.2 Fish Tissue Data

Fish tissue results are presented in Table 6 and corresponding sample locations are identified in Figures 1 and 2. PFOS as well as other PFAS compounds were detected above the reported detection limits in all samples from Piscataway Creek as well as the Nanjemoy Creek reference sites. PFOA and PFBS were not detected in any of the fish tissue samples analyzed in this study, therefore, human health risks from consumption of fish with detected concentrations of PFOS was the only PFAS compound evaluated quantitatively.

7.3 Fish Consumption Screening Evaluation

MDE evaluated detected concentrations of PFOS in fish tissue to determine whether measured values exceed human health risk screening levels based on fish consumption as the pathway of exposure. Fish consumption supporting calculations, equations and exposure variables are presented in detail in Appendix 4 and Appendix 5. MDE quantitatively evaluated human health risk through fish consumption using EPA and MDE recommended fish consumption exposure variables. These include the use of a range for the number of fish meals per year and an assumption that each meal consists of an 8-ounce serving for adults and 3-ounce servings for children. The assessment quantitatively evaluated exposure assuming fish consumed were all from the same location and the same species within the study area. These assumptions likely over-estimate potential health risk.

MDE included derivation of fish consumption advisories for the general adult population, children, and child-bearing women in this assessment. EPA CERCLA guidance may not include these sub-populations in site-specific assessments. The inclusion of children and child-bearing women follows guidelines for recreationally caught fish in Maryland utilized in the MDE Fish and Shellfish Monitoring Program (https://mde.maryland.gov/programs/marylander/fishandshellfish/pages/fishconsumptionadvisory.aspx). The screening criteria are site-specific and should not be considered as screening criteria for commercially harvested fish. Commercially available fish often come from a range of

locations and suppliers and this study was not intended to specifically provide guidance on commercially harvested fish.

Site-Specific Fish Consumption Screening Concentrations

Population	Consumption Rate (mg-day)	Approximate Meals per Month (8-ounce meal adult, 3-ounce child)	Approximate Meals Per Year	Fish Tissue (cooked) Screening Concentration (ug/kg) for PFOS
General Population (76 kg)	59,650	8	96	37
Women Child Bearing Age (67 kg)	59,650	8	96	33
Children (14.5 kg)	22,370	8	96	19
General Population (76 kg)	29,825	4	48	73
Women Child Bearing Age (67 kg)	29,825	4	48	64
Children (14.5 kg)	11,185	4	48	37
General Population (76 kg)	7,456	1	12	291
Women Child Bearing Age (67 kg)	7,456	1	12	257
Children (14.5 kg)	2,796	1	12	149

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Derivation of site-specific fish tissue risk-based screening values are presented above and detailed in Appendix 4 and Appendix 5. As presented in Table 6, PFAS was detected in fish tissue and the comparisons to the risk-based site-specific screening criteria for PFOS were in excess of risk-based fish consumption screening concentrations for PFOS for multiple potential exposure scenarios and consumption rates for the largemouth bass and most exposure scenarios for redbreast sunfish in the Piscataway Creek Study area. Consumption of yellow bullhead catfish exceeded high intensity (96 meals per year) fish consumption rates for children in the upper reaches of Piscataway Creek, however, fish size, habitat, and probability of catching and consuming yellow bullhead catfish at the consumption rates utilized to derive fish tissue screening concentrations is low within this portion of Piscataway Creek. Fish tissue concentrations of PFOS were less than the site-specific health-based consumption screening criteria for all exposure scenarios for the blue catfish in the tidal headwaters of Piscataway Creek. Although concentrations of PFOS were detected in all fish species tested within the Nanjemoy Creek reference sites the concentrations were below all the site-specific health-based consumption screening criteria. PFOS fish tissue concentrations in the Nanjemoy Creek reference site were less than the PFOS fish tissue concentrations for the equivalent species within the Piscataway Creek study area.

[1] *Fish consumption screening concentration derivations within the MDE Fish and Shellfish Program include a 30 % reduction in contaminant concentration in the fish due to trimming and cooking losses.*

7.4 Ecological Screening Evaluation

The primary objectives of this pilot study were to evaluate human health-related risks associated with PFAS in the surface water and fish within Piscataway Creek. The EPA has not issued Clean Water Act (CWA) 304(a) recommended ambient water quality criteria for any PFAS compounds (including PFOA, PFOS and PFBS), although work is underway to develop values to protect ecological health. In this study total PFAS concentrations ranged from not detected to 3,193 ng/L which is approaching some of the limited published ecological aquatic life screening criteria. A white paper published by the Florida Department of Environmental Protection in 2020 has a reported freshwater chronic ecological surface water screening concentration of 37,000 ug/L and the State of Michigan published aquatic life water quality value is 140,000 ng/L for PFOS. The acute and chronic impacts to aquatic life and the ability of certain PFAS compounds to accumulate up the food chain are important factors that are being assessed as recommended aquatic life water quality criteria are being developed by EPA. MDE will revisit the issue of ecological impacts associated with these measured levels in Piscataway Creek when EPA completes its work and issues CWA 304(a) ambient water quality criteria for aquatic life protection.

8.0 CONCLUSIONS

The MDE WSA in cooperation with Maryland's DNR conducted this study to assess the occurrence of Per- and Polyfluoroalkyl Substances (PFAS) in surface water and fish tissue in and around Piscataway Creek and a reference site in the tidal and non-tidal portions of Nanjemoy Creek along the Potomac River. Sampling locations were targeted to focus sampling in potential areas of concern associated with known or highly likely sources of PFAS release.
Results of MDE's public health risk evaluation for recreational swimming indicate that measured concentrations of PFOA, PFOS and PFBS in Piscataway Creek (and the Nanjemoy reference site) are below the risk-based screening concentrations for both moderate and intensive swimming. Surface water concentrations of PFAS ranged from non-detect to 7 ug/L in the Nanjemoy Creek reference stations and from 207 to 3,193 ng/L in the Piscataway Creek study area. The screening values are 17,500 ng/L for PFOA+PFOS and 26,200 ng/L for PFBS for moderate use swimming and 8,770 ng/L for PFOA+PFOS and 13,100 ng/L for PFBS for intensive use swimming. Concentrations of PFAS were significantly greater in the Piscataway Creek area relative to the Nanjemoy Creek reference stations indicating the presence of sources of PFAS within the Piscataway Creek study area.

PFAS surface water concentrations in Piscataway Creek dissipated with distance as the creek progressed downstream of potential sources at Joint Base Andrews. The concentration of PFAS in the tidal headwaters of Piscataway Creek was 207 ng/L and the dominant PFAS compound throughout Piscataway Creek was PFOS, one of the most persistent, bioaccumulative PFAS compounds. In addition to potential PFAS sources emanating from Joint Base Andrews the Department continues to track down potential sources in the watershed and is working with the Prince George's Fire Department Fire/EMS Training Academy, which is present along Commo Road adjacent to Piscataway Creek, to determine if there are other PFAS sources associated with the facility or others in the watershed.

Results of the PFAS public health risk evaluation for fish consumption identified fish tissue concentrations of PFOS in excess of risk-based fish consumption screening concentrations for multiple potential exposure scenarios and consumption rates for the largemouth bass and most exposure scenarios for redbreast sunfish in the Piscataway Creek Study area. Consumption of yellow bullhead catfish exceeded high intensity (96 meals per year) fish consumption rates for children in the upper reaches of Piscataway Creek, however, fish size, habitat, and probability of catching and consuming yellow bullhead catfish at the consumption rates utilized to derive fish tissue screening concentrations is low within this portion of Piscataway Creek. Fish tissue concentrations of PFOS were less than the site-specific health-based consumption screening criteria for all exposure scenarios for blue catfish in the tidal headwaters of Piscataway Creek. PFAS was detected in all fish species tested within the Nanjemoy Creek reference sites; however, the concentrations were below all the site-specific health-based consumption screening criteria and the PFOS fish tissue concentrations in the Nanjemoy Creek reference site were significantly less than the PFOS fish tissue concentrations for the equivalent species within the Piscataway Creek study area.

Given the use of PFAS compounds throughout the marketplace, their bioaccumulative properties and the uncertainty associated with their potential presence in environmental media throughout Maryland, MDE efforts regarding PFAS compounds impacts to human health and the environment are ongoing and evolving rapidly. Actions are underway at both the federal level (EPA, DOD, USGS) and the state level to better understand PFAS risk and exposure pathways and to reduce as needed the presence and potential exposure to PFAS compounds both environmentally and within the marketplace. Investigative efforts at Department of Defense Facilities, including Joint Base Andrews, as well as other public and private potential sources of interest in and around Piscataway Creek and the Potomac River are ongoing. As additional environmental and human health assessment information is derived regarding PFAS compounds, MDE will pursue updates to its strategy and action plan to ensure protection of public health and natural resources in Maryland. Updates regarding fish consumption advisories and investigations in the Piscataway Creek area of the Potomac watershed may be found at the MDE PFAS Landing Page (https://mde.maryland.gov/PublicHealth/Pages/PFAS-Landing-Page.aspx).

At the time of this publication MDE is collecting additional fish tissue samples within the Potomac River to assess potential health risks associated with PFAS in areas of concern where Piscataway Creek discharges to the Potomac. Known PFAS current and potential historic users within the Piscataway Creek drainage basin have been contacted and efforts to characterize, assess and mitigate identified releases that may be impacting public health and the waters of the state are ongoing.

9.0 REFERENCES

EPA, Regional Screening Levels (RSLs) User's Guide, May 2020, https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide.

EPA (2000a). Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories. Volume 1. Fish Sampling and Analysis. In (doi: EPA 823-B-00-0073rd ed.

EPA (2000b). Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories. Volume 2. Risk Assessment and Fish Consumption Limits. In (doi: EPA 823- B-00-0083rd ed.

https://floridadep.gov/sites/default/files/Draft-PFOA-PFOS-Eco-White-Paper.pdf

https://www.michigan.gov/documents/mdhhs/PFAS_-_Overview_of_Michigan_Values_FINAL_675761_7.pdf

10.0 TABLES AND FIGURES

Table 1: Target Analyte List

Parameter	Acronym	CAS Number
Perfluorobutanesulfonic Acid	PFBS	375-73-5
Perfluorohexanoic Acid	PFHx A	307-24-4
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluorodecanoic Acid	PFDA	335-76-2
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	31506-32-8
PerfluorouND1ecanoic Acid	PFUnA	2058-94-8
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	1691-99-2
Perfluorododecanoic Acid	PFDoA	16517-11-6
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorotetradecanoic Acid	PFTA	376-06-7

Table 2: PFAS Samples in Fall 2020 Piscataway Creek (ug/kg)

Location	Position	Collection Reference	Site Reference	Sample ID	Sample Type	Field Blanks	Avg Length (cm)	Avg Weight (g/lbs.)	Collection Date
Commo Road - Non Tidal	38.74776, -76.84507	Composite Species 1 - Yellow Bullhead Catfish	PIS0134	2020FTC_PISC_A	Tissue	FB_2020FTC_PISC	20.2	102.2	10/26/2020
Commo Road - Non Tidal	38.74776, -76.84507	Composite Species 2 - Redbreast Sunfish	PIS0134	2020FTC_PISC_B	Tissue	FB_2020FTC_PISC	15.16	54.4	10/26/2020

Lab Sample ID		L2047407-06	L2047407-12	L2047407-12
Sample Station		2020FTC_PISC_A	2020FTC_PISC_B	2020FTC_PISC_B
Collection Date		10/26/2020	10/26/2020	10/26/2020
Site Description		Piscataway - Commo Road	Piscataway - Commo Road	Piscataway - Commo Road
Species Common Name		Yellow Bullhead Catfish	Redbreast Sunfish	Redbreast Sunfish
Units	Footnote	ug/kg	ug/kg	ug/kg
Perfluorobutanesulfonic Acid (PFBS)	4	ND	ND	•
Perfluorohexanoic Acid (PFHx A)	3	ND	ND	•
Perfluoroheptanoic Acid (PFHpA)	3	ND	ND	•
Perfluorohexanesulfonic Acid (PFHxS)	3	1.06	2.44	• 2.44
Perfluorooctanoic Acid (PFOA)	3	ND	ND	•
Perfluorononanoic Acid (PFNA)	3	ND	ND	•
Perfluorooctanesulfonic Acid (PFOS)	5	20.00	417.00	**233.00**
Perfluorodecanoic Acid (PFDA)	3	ND	1.86	• 1.86
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	4	ND	ND	•
PerfluorouND1ecanoic Acid (PFUnA)	4	ND	2.71	• 2.71
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	4	ND	ND	•
Perfluorododecanoic Acid (PFDoA)	4	ND	3.65	• 3.65
Perfluorotridecanoic Acid (PFTrDA)	4	1.05	3.30	• 3.30
Perfluorotetradecanoic Acid (PFTA)	4	1.04	ND	•
Total PFAS		23.15	430.96	246.96
Data Qualifiers			E	Replicate

ND - Non Detect
• - Not Analyzed or quanitifed in replicate run.
3 - Reporting limits ranging from lowest 0.221 to highest 0.244
4 - Reporting limits ranging from lowest 0.442 to highest 0.488
5 - Reporting limits ranging from lowest 0.221 to highest 2.210
Data Qualifiers
E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

Table 3: PFASs measured in Field Blanks and Trip Blanks (ng/l)

Lab Sample ID		L2127169-01	L2127169-02	L2127169-03	L2127169-10	L2127169-11	L2127169-12	L2127169-13	L2127169-14	L2127213-13	L2127213-27	L2127213-42	L2127213-43	L2128737-13	L2128737-14		
Sample Station		S1-TB5	S5-FB1	S6-FB1	S1-TB6	S7-FB1	S8-FB1	S9-FB1	S10-FB1	S3-FB1	S6-FB1	S1-FB1	TB-1	S7-FB1	TB-4	LCMSMS-ID	LCMSMS-ID
Collection Date		5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/17/2021	5/20/2021	5/14/2021	5/14/2021	5/26/2021	5/26/2021	6/2/2021	6/16/2021
Site Description	Footnote	Trip Blank for S5-FB1, S6-FB1, S6-W1, and S7-W1	Tidal Headwaters of Nanjemoy Creek	Non-Tidal Headwaters of Nanjemoy Creek	Trip Blank for S2-W1, S3-W1, S4-W1, S5-W1, S7-FB1, S8-FB1, S9-FB1, and S10-FB1	Windbrook Road Crossing	Commo Road - Non-Tidal	Woodyard Road Crossing	Colonial Lane	Commo Road - Non-Tidal	Tidal headwaters of Nanjemoy Creek	Tidal headwaters of Piscataway Creek	Trip Blank for S1-T1, S1-T2, S1-W1, and S1-FB1	Non Tidal waters of Nanjemoy Creek	Trip Blank for S7-T1, S7-T2, and S7-FB1	Method Blank Analysis	Method Blank Analysis
Units		ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l
Perfluorobutanesulfinic Acid (PFBS)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanoic Acid (PFHx A)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroheptanoic Acid (PFHpA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanesulfinic Acid (PFHxS)	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanoic Acid (PFOA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorononanoic Acid (PFNA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanesulfinic Acid (PFOS)	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorodecanoic Acid (PFDA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Methyl Perfluorooctanesulfinamidoacetic Acid (NMeFOSAA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PerfluorouNDlecanoic Acid (PFUnA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Ethyl Perfluorooctanesulfinamidoacetic Acid (NEtFOSAA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotridecanoic Acid (PFTrDA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotetradecanoic Acid (PFTA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PFAS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND - Non Detect
1 - Reporting limits ranging from lowest 1.77 to highest 2.05
2 - Reporting limits ranging from lowest 1.770 to highest 50.000

Table 4: Sample Location Summary Table

Location	Position	Collection Reference	Site Reference	Sample ID	Sample Type	Field Blanks	Avg Length (cm)	Avg Weight (g/lbs.)	Collection Date	Deliver to Lab
Tidal headwaters of Piscataway Creek	38.69522, -77.00623	Water Sample		S1-W1	Water	S1-FB1			5/14/2021	5/21/2021
Tidal headwaters of Piscataway Creek	38.69522, -77.00623	Composite Species 1 - Largemouth Bass		S1-T1	Tissue	S1-FB1	39.9	910.8	5/14/2021	5/21/2021
Tidal headwaters of Piscataway Creek	38.69522, -77.00623	Composite Species 2 - Blue Catfish		S1-T2	Tissue	S1-FB1	47.38	1081	5/14/2021	5/21/2021
Windbrook Road Crossing	38.70933, -76.93954	Water Sample		S2-W1	Water	S2-FB1				5/21/2021
Commo Road - Non Tidal	38.74618, -76.84636	Composite Species 1 - Redbreast Sunfish		S3-T1	Tissue	S3-FB1	15.5	72.8	5/17/2021	5/21/2021
Commo Road - Non Tidal	38.74618, -76.84636	Composite Species 2 - Yellow Bullhead Catfish		S3-T2	Tissue	S3-FB1	17.7	75.8	5/17/2021	5/21/2021
Commo Road - Non Tidal	38.74618, -76.84636	Water Sample		S3-W1	Water	S3-FB1			5/17/2021	5/21/2021
Woodyard Road Crossing	38.78536, -76.84388	Water Sample		S4-W1	Water	S4-FB1			5/18/2021	5/21/2021
Colonial Lane	38.78866, -76.86529	Water Sample		S5-W1	Water	S5-FB1			5/18/2021	5/21/2021
Tidal headwaters of Nanjemoy Creek	38.44992, -77.15417	Water Sample	Control	S6-W1	Water	S6-FB1			5/20/2021	5/21/2021
Tidal headwaters of Nanjemoy Creek	38.44992, -77.15417	Composite Species 1 - Bluegill	Control	S6-T1	Tissue	S6-FB1	16.7	107.4	5/20/2021	5/21/2021
Tidal headwaters of Nanjemoy Creek	38.44992, -77.15417	Composite Species 2 - Blue Catfish	Control	S6-T2	Tissue	S6-FB1	48.4	1073.2	5/20/2021	5/21/2021
Non Tidal waters of Nanjemoy Creek	38.42201, -77.21040	Water Sample	Control	S7-W1	Water	S7-FB1			5/26/2021	5/28/2021
Non Tidal waters of Nanjemoy Creek	38.42201, -77.21040	Composite Species 1 - Redbreast Sunfish	Control	S7-T1	Tissue	S7-FB1	14.9	60.2	5/26/2021	5/28/2021
Non Tidal waters of Nanjemoy Creek	38.42201, -77.21040	Composite Species 2 - Yellow Bullhead Catfish	Control	S7-T2	Tissue	S7-FB1	21.1	142.2	5/26/2021	5/28/2021

Field Blanks	One with each site collected	S1-FB1,S2-FB1,S3-FB1,S4-FB1,S5-FB1,S6-FB1,S7-FB1			Water	7
Trip Blanks	One with each "trip"	TB-1,TB-2,TB-3,TB-4			Water	4
Replicates	Done in Lab	Water Sample	Lab Sample		Water	1
Replicates	Done in Lab	Tissue Replicate	Lab Sample		Tissue	1
NIST Water Sample	Done in Lab	Water Sample	Lab Sample		Water	1
NIST Tissue Sample	Done in Lab	Tissue Replicate	Lab Sample		Tissue	1

Media	Count
Tissue	10
Water	20

Table 5: PFASs measured in surface water (ng/l)

Lab Sample ID		L2127169-04	L2127169-05	L2127169-06	L2127169-07	L2127169-08	L2127169-08 RE	L2127169-09	L2127169-09 RE	L2127213-41
Sample Station		S6-W1	S7-W1	S2-W1	S3-W1	S4-W1	S4-W1 RE	S5-W1	S5-W1 RE	S1-W1
Collection Date		5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/18/2021	5/14/2021
Site Description	Footnote	Tidal Headwaters of Nanjemoy Creek	Non-Tidal Headwaters of Nanjemoy Creek	Windbrook Road Crossing	Commo Road - Non-Tidal	Woodyard Road Crossing	Woodyard Road Crossing	Colonial Lane	Colonial Lane	Tidal headwaters of Piscataway Creek
Units		ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l
Perfluorobutanesulfonic Acid (PFBS)	1	ND	ND	10.6	39.4	80.8	80.8	108	108	6.89
Perfluorohexanoic Acid (PFHx A)	1	2.24	ND	38.4	133	276	276	353	353	24
Perfluoroheptanoic Acid (PFHpA)	1	ND	ND	17.3	40.2	75.5	75.5	89.7	89.7	10.4
Perfluorohexanesulfonic Acid (PFHxS)	2	ND	ND	93.9	424	889	**827**	1200	**1120**	62.4
Perfluorooctanoic Acid (PFOA)	1	1.97	ND	50.8	147	298	298	404	404	27.1
Perfluorononanoic Acid (PFNA)	1	ND	ND	3.39	10.1	20.4	20.4	17.8	17.8	2.7
Perfluorooctanesulfonic Acid (PFOS)	2	2.56	ND	96.1	478	1120	**988**	1280	**1100**	73.6
Perfluorodecanoic Acid (PFDA)	1	ND	ND	ND	ND	2.67	2.67	ND	ND	ND
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
PerfluorouND1ecanoic Acid (PFUnA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotridecanoic Acid (PFTrDA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotetradecanoic Acid (PFTA)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PFAS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Data Qualifiers		F				E	Replicate	E	Replicate	
PFOA + PFOS	ng/L	4.53	ND	146.9	625	1418	1286	1684	1504	100.7
Risk Based Recreational Swimming Screening Concentration PFOA + PFOS (Moderate Risk/Intensive Risk	ng/L	17,500 8,770	17,500 8,770	17,500 8,770	17,500 8,770	17,500 8,770	17,500 8,770	17,500 8,770	17,500 8,770	17,500 8,770
PFBS	ng/L	ND	ND	10.6	39.4	80.8	80.8	108	108	6.89
Risk Based Recreational Swimming Screening Concentration PFBS (Moderate Risk/Intensive Risk)	ng/L	26,200 13,100	26,200 13,100	26,200 13,100	26,200 13,100	26,200 13,100	26,200 13,100	26,200 13,100	26,200 13,100	26,200 13,100

ND - Non Detect
1 - Reporting limits ranging from lowest 1.77 to highest 2.05
2 - Reporting limits ranging from lowest 1.770 to highest 50.000
• - Not Analyzed

Data Qualifiers
E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
F - The ration of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

Table 6: PFASs measured in fish tissue (ug/kg)

		L2127213-06	L2127213-06 D	L2127213-12	L2127213-20	L2127213-26	L2127213-34	L2127213-40	L2128737-06	L2128737-12
Sample Station		S3-T1	S3-T1	S3-T2	S6-T1	S6-T2	S1-T1	S1-T2	S7-T1	S7-T2
Collection Date		5/17/2021	5/17/2021	5/17/2021	5/20/2021	5/20/2021	5/14/2021	5/14/2021	5/26/2021	5/26/2021
Site Description	Footnote	Commo Road - Non Tidal	Commo Road - Non Tidal	Commo Road - Non Tidal	Tidal headwaters of Nanjemoy Creek	Tidal headwaters of Nanjemoy Creek	Tidal headwaters of Piscataway Creek	Tidal headwaters of Piscataway Creek	Non tidal waters of Nanjemoy Creek	Non tidal waters of Nanjemoy Creek
Species Common Name		Redbreast Sunfish	Redbreast Sunfish	Yellow Bullhead Catfish	Bluegill	Blue Catfish	Largemouth Bass	Blue Catfish	Redbreast Sunfish	Yellow Bullhead Catfish
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Perfluorobutanesulfonic Acid (PFBS)	4	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanoic Acid (PFHx A)	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroheptanoic Acid (PFHpA)	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanesulfonic Acid (PFHxS)	3	0.822	0.822	0.762	ND	ND	0.512	ND	ND	ND
Perfluorooctanoic Acid (PFOA)	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorononanoic Acid (PFNA)	3	0.374	0.374	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanesulfonic Acid (PFOS)	5	359.00	**231.00**	24.7	5.21	1.35	94.2	2.52	5.20	3.30
Perfluorodecanoic Acid (PFDA)	3	1.57	1.57	0.282	0.360	ND	1.75	0.403	0.504	0.360
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	4	ND	ND	ND	ND	ND	ND	ND	ND	ND
PerfluorouND1ecanoic Acid (PFUnA)	4	2.58	2.58	0.509	0.604	ND	1.69	0.590	1.10	ND
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	4	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA)	4	3.97	3.97	0.898	ND	ND	1.26	ND	0.706	ND
Perfluorotridecanoic Acid (PFTrDA)	4	3.45	3.45	1.04	ND	ND	0.77	ND	1.43	0.472
Perfluorotetradecanoic Acid (PFTA)	4	3.08	3.08	0.987	ND	ND	0.502	ND	0.653	ND
Total PFAS		374.85	246.85	29.18	6.17	1.35	100.69	3.51	9.59	4.13
Data Qualifiers		E	Replicate	F		F	F	F	F	F
Fish Tissue Screening Concentration for PFOS General Population (76 kg) - 4 Meals/month	ug/kg	73	73	73	73	73	73	73	73	73
Fish Tissue Screening Concentration for PFOS Women Child Bearing Age (67 kg) - 4 Meals/month	ug/kg	64	64	64	64	64	64	64	64	64
Fish Tissue Screening Concentration for PFOS Children (14.5 kg) - 4 Meals/month	ug/kg	37	37	37	37	37	37	37	37	37

Note: All Screening Concentration values are for cooked fish tissue
ND - Non Detect
• - Not Analyzed
3 - Reporting limits ranging from lowest 0.221 to highest 0.244
4 - Reporting limits ranging from lowest 0.442 to highest 0.488
5 - Reporting limits ranging from lowest 0.221 to highest 2.210

Data Qualifiers
E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
F - The ration of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

Table 7: Surface Water PFOA + PFOS Screening Concentrations

Recreational Scenario (All Populations)	**Exposure duration (yrs.)**	**Exposure frequency (days/yr.)**	**Exposure time (hrs. day)**	**Recreational Swimming Screening Concentration PFOA+PFOS/(PFBS) (ng/L)**
Swimming in surface water **moderate**	26	26 (2 days a week, 13 weeks)	2	**17,500/(26,200)**
Swimming in surface water **intensive**	26	52 (2 days a week, 26 weeks)	2	**8,770/(13,100)**

Table 8: Fish Tissue (Cooked Meat Only) Screening Concentrations

Site-Specific Fish Consumption Screening Concentrations

Population	Consumption Rate (mg-day)	Approximate Meals per Month (8-ounce meal adult, 3-ounce child)	Approximate Meals Per Year	Fish Tissue (cooked) Screening Concentration (ug/kg) for PFOS
General Population (76 kg)	59,650	8	96	37
Women Child Bearing Age (67 kg)	59,650	8	96	33
Children (14.5 kg)	22,370	8	96	19
General Population (76 kg)	29,825	4	48	73
Women Child Bearing Age (67 kg)	29,825	4	48	64
Children (14.5 kg)	11,185	4	48	37
General Population (76 kg)	7,456	1	12	291
Women Child Bearing Age (67 kg)	7,456	1	12	257
Children (14.5 kg)	2,796	1	12	149

i

[1] *Fish consumption screening concentration derivations within the MDE Fish and Shellfish Program include a 30 % reduction in contaminant concentration in the fish due to trimming and cooking losses.*

Figure 1: Site Map – Piscataway Creek Overview

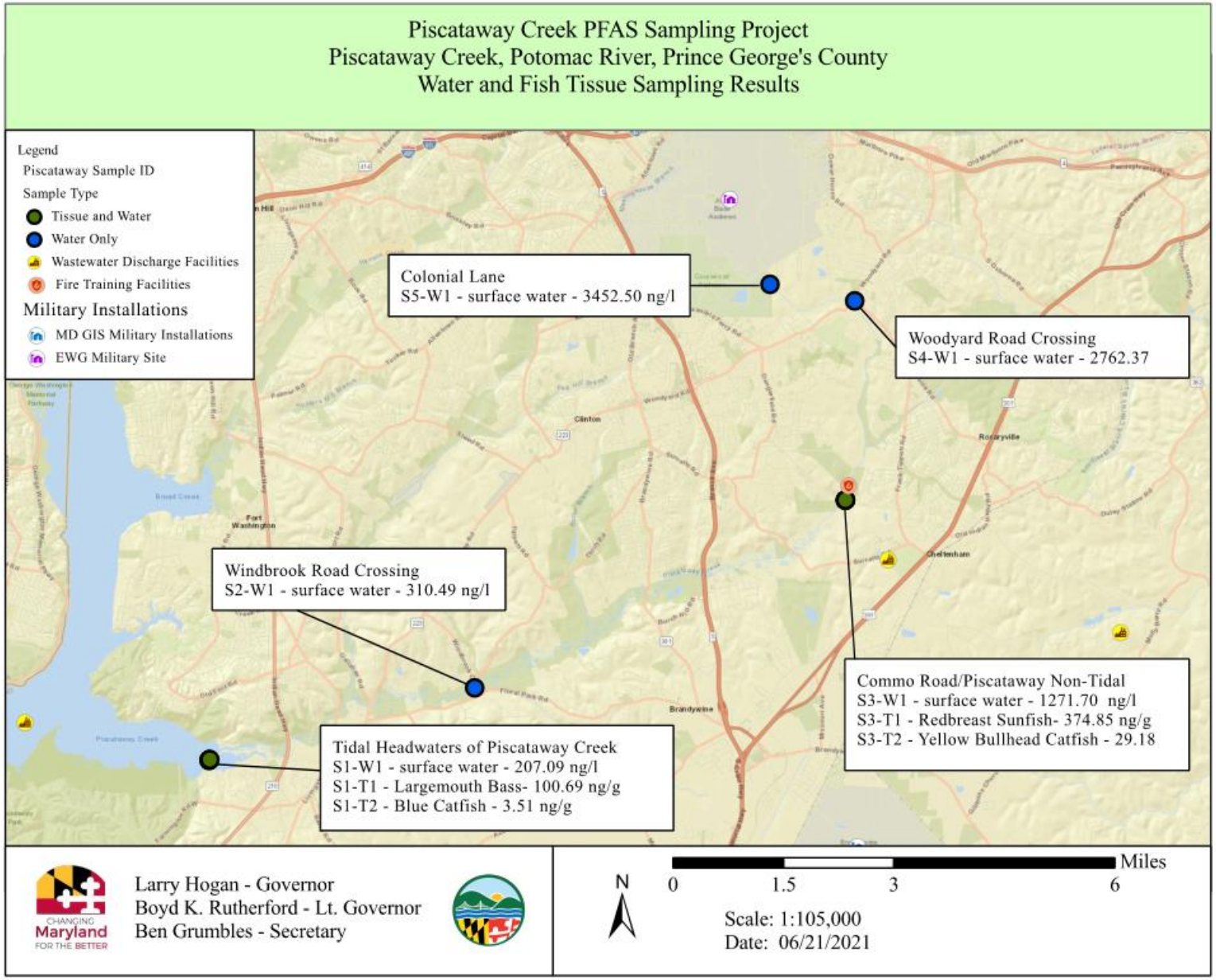
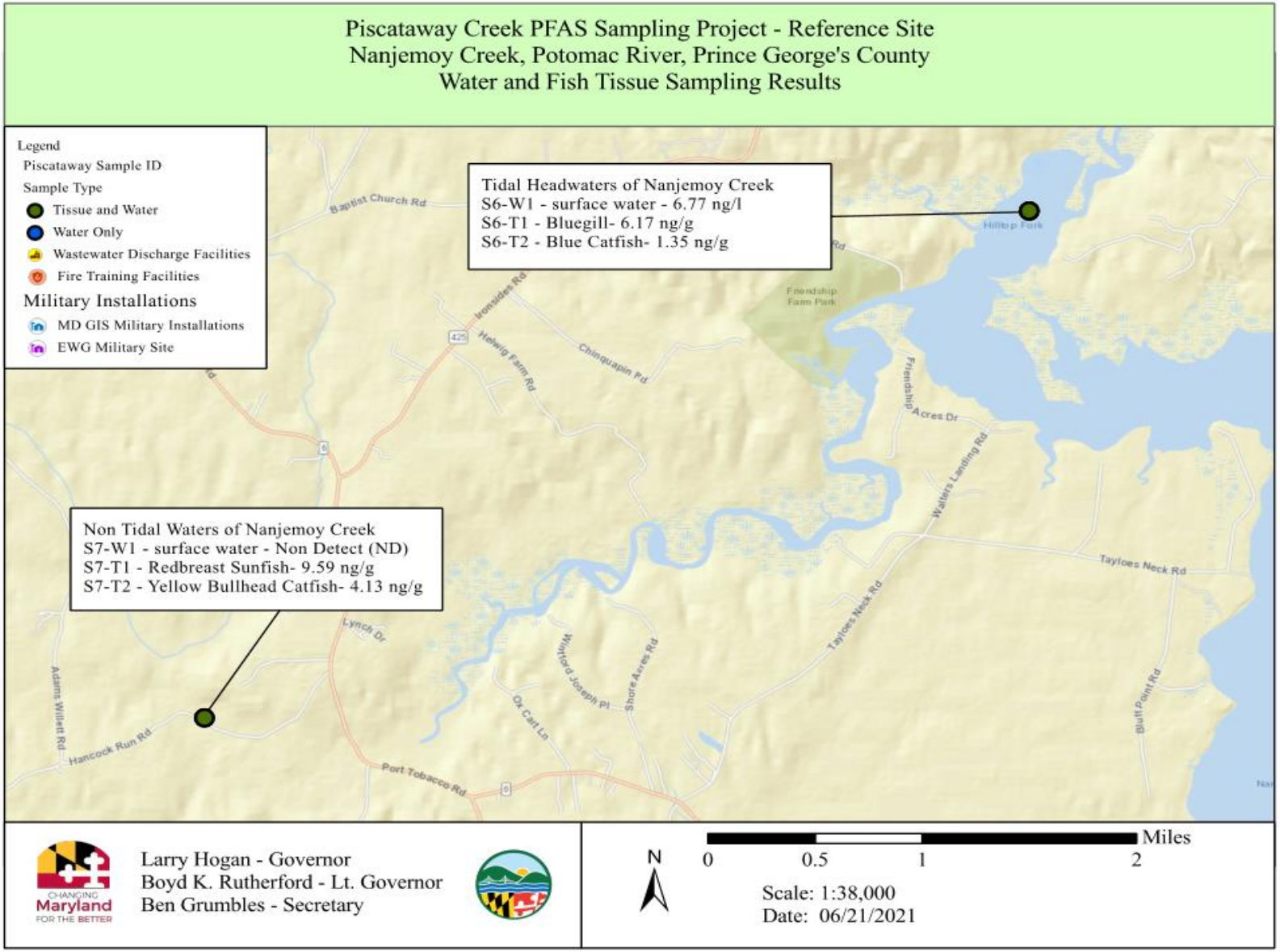


Figure 2: Site Map – Nanjemoy Creek – Reference Site



APPENDICES

APPENDIX 1: CHAIN OF CUSTODIES

L2128737 Page 1 of 1 Serial_No:06172112:54 5/29/21

Chain-of-Custody

Project Name: 2021 Piscataway PFAS Sampling

Station No. & FTC yr./Description		Coordinates:		Collecting Agency:	Samplers Initials:
S7	2021	N	38.42201 °	MDE	CNL, CAP
Site Description Nanjemoy Creek, NON tidal		W	77.21040 °		

Composite ID Number	Sample Matrix	Individual Fish Field ID Number	Length (cm)	Weight (g/lbs.)	Requested Contaminants	Species	Collection Date
-01	T	0526_S7_01	16.5	79	PFAS - 14 Compounds	Redbreast Sunfish--Lepomis auritus	
-02	T	0526_S7_02	14.0	54			
S7-T1 -03	T	0526_S7_03	14.5	53			
-04	T	0526_S7_04	15.0	58			
-05	T	0526_S7_05	14.5	57			
Summary Information	5		14.9	60.2	Lepomis auritus		5/26/2021
-06	T	0526_S7_06	24.0	209	PFAS - 14 Compounds	Yellow Bullhead Catfish--Ameiurus natalis	
-08	T	0526_S7_07	22.0	137			
S7-T2 -09	T	0526_S7_08	20.0	135			
-10	T	0526_S7_09	19.5	121			
-11	T	0526_S7_10	20.0	109			
Summary Information	5		21.1	142.2	Ameiurus natalis		5/26/2021
Surface Water Samples							
	RS				PFAS - 14 Compounds		
	RS				PFAS - 14 Compounds		
Blank ID							
S7-FB1 -12	RS	Site 7 Field Blank (S7-FB1)			PFAS - 14 Compounds		5/26/2021
TB-4 -14	RS	Trip Blank 4			PFAS - 14 Compounds		5/26/2021

LABORATORY INFORMATION

Client Information:	MDE	1800 Washington Blvd.	Baltimore, MD 21230	410-537-3614	Amy.Laliberte@maryland.gov
Project Information:	2021 Fish Tissue PFAS				
Report Information:	Email: Amy.Laliberte@maryland.gov				
Alpha Job #			**Billing Info:**	Same as Client Info.	

Analytical Method: LCMSMS - Isotope Dilution

Delivery Shipment Record:		Deliver/Ship to: (Name, address and phone)		Date/Time Shipped from Collecting Agency:	
Delivery Method:		Alpha Analytical		5-28-2021 1000	
☑ Hand Carried					
Relinquished by: (signature)	Date/ Time 5-28 1001	Received by: (signature)	Relinquished by: (signature)	Date/Time 5/28/21 1800	Received by: (signature)
Relinquished by: (signature)	Date/ Time	Received by Central Processing Laboratory by: (signature)	Date/Time	Remarks:	

Laboratory Custody:

Released Name/Date	Received Name/Date	Purpose	To Location
	5/28/21	Alpha	
	5/28/21	1800	
	5/28/21 0130	AAC	5/28/21 0200
AAC 5/29/21 0250			5/29/21 0250

5/22/21 Page ____ of 2

Serial_No:06112117:30

Chain-of-Custody

Project Name: 2021 Piscataway PFAS Sampling

Station No. & FTC yr./Description		Coordinates:		Collecting Agency:	Samplers Initials:
S3	2021	N	38.74618 °	MDE	CNL, CAP, NWK
Site Description Piscataway Creek at Commo Road and upstream		W	76.84636 °		

Composite ID Number	Sample Matrix	Individual Fish Field ID Number	Length (cm)	Weight (g/lbs.)	Requested Contaminants	Species	Collection Date
S3-T1 -01	T	0517_S3_01	16.0	75	PFAS - 14 Compounds	Redbreast Sunfish--Lepomis auritus	
-02	T	0517_S3_02	15.0	70			
-03	T	0517_S3_03	15.5	70			
-04	T	0517_S3_04	16.0	80			
-05	T	0517_S3_05	14.8	69			
Summary Information	5		15.5	72.8	**Lepomis auritus**		5/17/2021
S3-T2 -07	T	0517_S3_06	19.5	99	PFAS - 14 Compounds	Yellow Bullhead Catfish--Ameiurus natalis	
-08	T	0517_S3_07	18.5	89			
-09	T	0517_S3_08	18.0	80			
-10	T	0517_S3_09	17.0	66			
-11	T	0517_S3_10	15.5	45			
Summary Information	5		17.7	75.8	**Ameiurus natalis**		5/17/2021
Surface Water Samples							
	RS						
	RS				**PFAS - 14 Compounds**		
Blank ID							
S3-FB1 -13	RS	Site 3 Field Blank (S3-FB1)			**PFAS - 14 Compounds**		5/17/2021
TB-2 - 14	RS	Trip Blank 2			**PFAS - 14 Compounds**		5/17/2021

LABORATORY INFORMATION

Client Information:	MDE	1800 Washington Blvd.	Baltimore, MD 21230	410-537-3614	Amy.Laliberte@maryland.gov
Project Information:	2021 Fish Tissue PFAS				
Report Information:	Email: Amy.Laliberte@maryland.gov				
Alpha Job #			**Billing Info:**	Same as Client Info.	

Analytical Method: LCMSMS - Isotope Dilution

Delivery Shipment Record:	Deliver/Ship to: (Name, address and phone)	Date/Time Shipped from Collecting Agency:
Delivery Method: ☑ Hand Carried	Alpha Analytical	

Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Received by: (signature)
	5/21/21	5/21/21 11:30	AAL	5/21/21 17:02	5/21/21 17:02
Relinquished by: (signature)	Date/Time 5/21/21 1A	Received by Central Processing Laboratory: (signature) 5/21/21 2300	Date/Time	Remarks: 5/22/21 0315	

Laboratory Custody:

Released Name/Date	Received Name/Date	Purpose	To Location

5221321 Page ____ of 5221321 Serial No:06112117:30

Chain-of-Custody

Project Name: 2021 Piscataway PFAS Sampling

Station No. & FTC yr./Description		Coordinates:		Collecting Agency:	Samplers Initials:
S6	2021	N	38.44992 °	MDE	CNL, CAP, NWK
Site Description Nanjemoy Creek at tidal headwaters		W	77.15417 °		

Composite ID Number	Sample Matrix	Individual Fish Field ID Number	Length (cm)	Weight (g/lbs.)	Requested Contaminants	Species	Collection Date
S6-T1 -15 -16 -17 -18 -19	T	0520_S6_01	19.0	178	PFAS - 14 Compounds	Bluegill--Lepomis macrochirus	
	T	0520_S6_02	14.5	65			
	T	0520_S6_03	16.0	87			
	T	0520_S6_04	17.0	100			
	T	0520_S6_05	16.75	107			
Summary Information	5		**16.7**	**107.4**	**Lepomis macrochirus**		5/20/2021
S6-T2 -20 -21 -22 -23 -24 -25	T	0520_S6_06	48.0	1127	PFAS - 14 Compounds	Blue Catfish--Ictalurus furcatus	
	T	0520_S6_07	47.0	890			
	T	0520_S6_08	52.0	1292			
	T	0520_S6_09	44.0	791			
	T	0520_S6_10	51.0	1266			
Summary Information	5		**48.4**	**1073.2**	**Ictalurus furcatus**		5/20/2021
Surface Water Samples							
	RS				**PFAS - 14 Compounds**		
	RS				**PFAS - 14 Compounds**		
Blank ID							
S6-FB1 -27	RS	Site 1 Field Blank (S6-FB1)			**PFAS - 14 Compounds**		5/20/2021
TB-3 -28	RS	Trip Blank 3			**PFAS - 14 Compounds**		5/20/2021

LABORATORY INFORMATION

Client Information:	MDE	1800 Washington Blvd.	Baltimore, MD 21230	410-537-3614	Amy.Laliberte@maryland.gov
Project Information:	2021 Fish Tissue PFAS				
Report Information:	Email: Amy.Laliberte@maryland.gov				
Alpha Job #			**Billing Info:**	Same as Client Info.	

Analytical Method: LCMSMS - Isotope Dilution

Delivery Shipment Record:	Deliver/Ship to: (Name, address and phone)	Date/Time Shipped from Collecting Agency:
Delivery Method:	Alpha Analytical	
☑ Hand Carried		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Received by: (signature)
	5/21/21	5/21/21 11:30		5/21/21 17:02	5/21/21 17:02
Relinquished by: (signature)	Date/Time 5/21/21	Received by Central Processing Laboratory by: (signature)	Date/Time 5/22/21 7:30	Remarks: AAL 5/22/21 0315	

Laboratory Custody:

Released Name/Date	Received Name/Date	Purpose	To Location

Chris Johnson 5/22/21 0830

5/22/21

Page ______ of ______ Serial_No:06112117:30

Chain-of-Custody

Project Name: 2021 Piscataway PFAS Sampling

Station No. & FTC yr./Description		Coordinates:		Collecting Agency:	Samplers Initials:
S1	2021	N	38.69522 °	MDE	CNL, CAP, NWK
Site Description Piscataway Creek at tidal headwaters		W	77.00623 °		

Composite ID Number	Sample Matrix	Individual Fish Field ID Number	Length (cm)	863	Requested Contaminants	Species	Collection Date
S1-T1 -29	T	0514_S1_01	41.25	863	PFAS - 14 Compounds	Largemouth Bass--Micropterus salmoides	
-30	T	0514_S1_02	41.25	1028			
-31	T	0514_S1_03	39.4	884			
-32	T	0514_S1_04	39.4	956			
-33	T	0514_S1_05	38.1	823			
Summary Information	5		39.9	910.8		Micropterus salmoides	5/14/2021
S1-T2 -35	T	0514_S1_06	54.6	1772	PFAS - 14 Compounds	Blue Catfish--Ictalurus furcatus	
-36	T	0514_S1_07	49.5	1199			
-37	T	0514_S1_08	46.4	1055			
-38	T	0514_S1_09	45.1	827			
-39	T	0514_S1_10	41.3	552			
Summary Information	5		47.38	1081		Ictalurus furcatus	5/14/2021
Surface Water Samples							
S1-W1 -41	RS	Piscataway Creek - Tidal Water Sample				PFAS - 14 Compounds	5/14/2021
	RS					PFAS - 14 Compounds	5/14/2021
Blank ID							
S1-FB1 -42	RS	Site 1 Field Blank (S1-FB1)				PFAS - 14 Compounds	5/14/2021
TB-1 -43	RS	Trip Blank 1				PFAS - 14 Compounds	5/14/2021

LABORATORY INFORMATION

Client Information:	MDE	1800 Washington Blvd.	Baltimore, MD 21230	410-537-3614	Amy.Laliberte@maryland.gov
Project Information:	2021 Fish Tissue PFAS				
Report Information:	Email: Amy.Laliberte@maryland.gov				
Alpha Job #				**Billing Info:**	Same as Client Info.

Analytical Method: LCMSMS - Isotope Dilution

Delivery Shipment Record:		Deliver/Ship to: (Name, address and phone)		Date/Time Shipped from Collecting Agency:	
Delivery Method: ☑ Hand Carried		Alpha Analytical			
Relinquished by: (signature) [signature]	Date/Time 5/21/21	Received by: (signature) [signature] AAL 5/21/21 1130	Relinquished by: (signature) [signature] AAL	Date/Time 5/21/21 17:02	Received by: (signature) [signature] 5/21/21 17:02
Relinquished by: (signature) [signature]	Date/Time 5/21/21	Received by Central Processing Laboratory by: (signature) [signature]	Date/Time 5/21/21 2300	Remarks: [signature] AAL 5/22/21 0315; [signature] 5/22/21 0315	

Laboratory Custody:			
Released Name/Date	Received Name/Date	Purpose	To Location

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5:05 (0) 5/22/21 -AAL [signature] 5/22/21 6:30 [signature] 5/27/21 0830 [signature]

Serial_No:06082111:50

CHAIN OF CUSTODY

PAGE 1 OF 2

ALPHA

WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193

MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 5/22/21

ALPHA Job #: L2127169

Client Information

Client: MDE

Address: 1800 Washington Blvd. Baltimore, MD 21230

Phone: 410-537-3614

Fax:

Email: amy.laliberte@maryland.gov

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: PFAS Study

Project Location: Nanjemoy / Piscataway

Project #:

Project Manager: Amy Laliberte

ALPHA Quote #:

Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☑ EMAIL

☐ ADEx ☐ Add'l Deliverables

Regulatory Requirements/Report Limits

State /Fed Program Criteria

Billing Information

☑ Same as Client info PO #:

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: PFAS LC/MS/MS Isotope Dilution

SAMPLE HANDLING
Filtration
☐ Done
☑ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	PFAS LC/MS/MS Isotope Dilution	Sample Specific Comments	Total # Bottles
27169-01	S1-TBS	5/18	7:00	TB	RS	✓	14 Analytes	1
-02	S5-FB1	5/18	11:30	FB	RS	✓	14 Analytes	1
-03	S6-FB1	5/18	12:45	FB	RS	✓	14 Analytes	1
-04	S6-W1	5/18	11:30	SW	RS	✓	14 Analytes	2
-05	S7-W1	5/18	12:45	SW	RS	✓	14 Analytes	2

Container Type: P
Preservative: A

Relinquished By:	Date/Time	Received By:	Date/Time
R. Snyder Ryan Snyder	5/18/21 2:00	Field Office	5/18 2:00
[illegible] AAL	5/21/21 11:30	[illegible] AAL	5/21/21 11:30
[illegible] AAL	5/21/21 1700	[illegible]	5/21/21 1700

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

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ALPHA

WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

CHAIN OF CUSTODY

PAGE 2 OF 2

Date Rec'd in Lab: 5/22/21

ALPHA Job #: L2127169

Client Information

Client: MDE
Address: 1800 Washington Blvd
Baltimore, MD 21230
Phone: 410-537-3614
Fax:
Email: amy.laliberte@maryland.gov

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: PFAS Study
Project Location: Piscataway
Project #:
Project Manager: Amy Laliberte
ALPHA Quote #:

Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☑ EMAIL
☐ ADEx ☐ Add'l Deliverables

Regulatory Requirements/Report Limits

State /Fed Program Criteria

Billing Information

☑ Same as Client info PO #:

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: PFAA LCMSMS Iso-tope Dilution

SAMPLE HANDLING
Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	PFAA LCMSMS	Sample Specific Comments	TOTAL # BOTTLES
-06	S2-W1	5/18/21	0940	SW	WNE	✓	14 Analytes	2
-07	S3-W1	5/18/21	1045	SW	WNE	✓	14 Analytes	2
-08	S4-W1	5/18/21	1125	SW	WNE	✓	14 Analytes	2
-09	S5-W1	5/18/21	1205	SW	WNE	✓	14 Analytes	2
-10	S1-TB6	5/18/21	0800	TB	WNE	✓	14 Analytes	2
-11	S7-FB1	5/18/21	0940	FB	JRM	✓	14 Analytes	1
-12	S8-FB1	5/18/21	1045	FB	JRM	✓	14 Analytes	1
-13	S9-FB1	5/18/21	1125	FB	JRM	✓	14 Analytes	1
-14	S10-FB1	5/18/21	1205	FB	JRM	✓	14 Analytes	1

AAL 5/22/21 10:05

Container Type: P
Preservative: A

Relinquished By:	Date/Time	Received By:	Date/Time
J. McKay	5/18/21	Field Office	5/18 2:30
Ryan Snader	5/21/21 11:30	M. [illegible] AAL	5/21/21 11:30
[illegible] AAL	5/21/21 17:02	[illegible]	5/21/21 17:02

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

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APPENDIX 2: LABORATORY RESULTS

Serial_No:06082111:50

ANALYTICAL REPORT

Lab Number:	L2127169
Client:	Maryland Department of the Environment 1800 Washington Boulevard Baltimore, MD 21230
ATTN:	Amy Laliberte
Phone:	(410) 537-3614
Project Name:	PFAS STUDY
Project Number:	Not Specified
Report Date:	06/08/21

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127169
Report Date: 06/08/21

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2127169-01	S1-TB5	WATER	NANJEMOY/PISCATAWAY	05/18/21 07:00	05/21/21
L2127169-02	S5-FB1	WATER	NANJEMOY/PISCATAWAY	05/18/21 11:30	05/21/21
L2127169-03	S6-FB1	WATER	NANJEMOY/PISCATAWAY	05/18/21 12:45	05/21/21
L2127169-04	S6-W1	WATER	NANJEMOY/PISCATAWAY	05/18/21 11:30	05/21/21
L2127169-05	S7-W1	WATER	NANJEMOY/PISCATAWAY	05/18/21 12:45	05/21/21
L2127169-06	S2-W1	WATER	NANJEMOY/PISCATAWAY	05/18/21 09:40	05/21/21
L2127169-07	S3-W1	WATER	NANJEMOY/PISCATAWAY	05/18/21 10:45	05/21/21
L2127169-08	S4-W1	WATER	NANJEMOY/PISCATAWAY	05/18/21 11:25	05/21/21
L2127169-09	S5-W1	WATER	NANJEMOY/PISCATAWAY	05/18/21 12:05	05/21/21
L2127169-10	S1-TB6	WATER	NANJEMOY/PISCATAWAY	05/18/21 08:00	05/21/21
L2127169-11	S7-FB1	WATER	NANJEMOY/PISCATAWAY	05/18/21 09:40	05/21/21
L2127169-12	S8-FB1	WATER	NANJEMOY/PISCATAWAY	05/18/21 10:45	05/21/21
L2127169-13	S9-FB1	WATER	NANJEMOY/PISCATAWAY	05/18/21 11:25	05/21/21
L2127169-14	S10-FB1	WATER	NANJEMOY/PISCATAWAY	05/18/21 12:05	05/21/21

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Project Name:	PFAS STUDY	**Lab Number:**	L2127169
Project Number:	Not Specified	**Report Date:**	06/08/21

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

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Project Name:	PFAS STUDY	**Lab Number:**	L2127169
Project Number:	Not Specified	**Report Date:**	06/08/21

Case Narrative (continued)

Perfluorinated Alkyl Acids by Isotope Dilution

L2127169-04, -08 and -09: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

L2127169-08 and -09: The sample was re-extracted on dilution with the method required holding time exceeded in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-extraction was performed only for the compound(s) that exceeded the calibration range.

WG1504631-3: The MS recovery, performed on L2127169-07, is outside the acceptance criteria for perfluorooctanesulfonic acid (pfos) (371%).

WG1504631-4: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Alycia Mogayzel

Title: Technical Director/Representative Date: 06/08/21

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ORGANICS

Serial_No:06082111:50

SEMIVOLATILES

Serial_No:06082111:50

Project Name: PFAS STUDY
Lab Number: L2127169
Project Number: Not Specified
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-01
Client ID: S1-TB5
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 07:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 16:03
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.78	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.78	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.78	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.78	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.78	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.78	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.78	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.78	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.78	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.78	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.78	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.78	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.78	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.78	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-01 Date Collected: 05/18/21 07:00

Client ID: S1-TB5 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	103		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	106		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	90		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	84		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	96		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	86		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	91		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	83		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	75		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	85		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	86		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	72		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	83		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	85		22-136

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Project Name: PFAS STUDY
Lab Number: L2127169
Project Number: Not Specified
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-02
Client ID: S5-FB1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 11:30
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 16:19
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.82	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.82	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.82	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.82	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.82	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.82	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.82	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.82	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.82	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.82	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.82	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.82	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.82	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.82	--	1

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Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-02 Date Collected: 05/18/21 11:30

Client ID: S5-FB1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	103		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	90		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	86		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	93		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	85		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	99		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	86		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	96		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	96		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	77		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	97		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	92		22-136

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Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-03
Client ID: S6-FB1
Sample Location: NANJEMOY/PISCATAWAY

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 16:36
Analyst: MP

Date Collected: 05/18/21 12:45
Date Received: 05/21/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.83	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.83	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.83	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.83	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.83	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.83	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.83	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.83	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.83	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.83	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.83	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.83	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.83	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.83	--	1

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Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-03 Date Collected: 05/18/21 12:45

Client ID: S6-FB1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	104		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	108		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	94		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	88		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	99		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	91		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	101		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	97		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	86		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	93		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	105		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	83		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	98		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	96		22-136

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Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-04
Client ID: S6-W1
Sample Location: NANJEMOY/PISCATAWAY

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 16:52
Analyst: MP

Date Collected: 05/18/21 11:30
Date Received: 05/21/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.83	--	1
Perfluorohexanoic Acid (PFHxA)	2.24		ng/l	1.83	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.83	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.83	--	1
Perfluorooctanoic Acid (PFOA)	1.97		ng/l	1.83	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.83	--	1
Perfluorooctanesulfonic Acid (PFOS)	2.56	F	ng/l	1.83	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.83	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.83	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.83	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.83	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.83	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.83	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.83	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-04 Date Collected: 05/18/21 11:30

Client ID: S6-W1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	100		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**143**	Q	12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	83		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	80		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	100		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	86		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	96		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	83		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	85		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	94		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	69		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	93		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	91		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Lab Number: L2127169
Project Number: Not Specified
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-05
Client ID: S7-W1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 12:45
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 17:09
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.83	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.83	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.83	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.83	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.83	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.83	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.83	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.83	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.83	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.83	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.83	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.83	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.83	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.83	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-05 Date Collected: 05/18/21 12:45

Client ID: S7-W1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	84		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	139		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	78		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	74		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	86		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	82		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	92		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	89		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	79		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	76		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	93		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	59		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	85		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	89		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Lab Number: L2127169
Project Number: Not Specified
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-06
Client ID: S2-W1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 09:40
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 17:42
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	10.6		ng/l	1.96	--	1
Perfluorohexanoic Acid (PFHxA)	38.4		ng/l	1.96	--	1
Perfluoroheptanoic Acid (PFHpA)	17.3		ng/l	1.96	--	1
Perfluorohexanesulfonic Acid (PFHxS)	93.9		ng/l	1.96	--	1
Perfluorooctanoic Acid (PFOA)	50.8		ng/l	1.96	--	1
Perfluorononanoic Acid (PFNA)	3.39		ng/l	1.96	--	1
Perfluorooctanesulfonic Acid (PFOS)	96.1		ng/l	1.96	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.96	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.96	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.96	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.96	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.96	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.96	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.96	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-06 Date Collected: 05/18/21 09:40

Client ID: S2-W1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	97		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	117		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	76		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	72		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	93		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	75		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	89		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	81		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	75		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	90		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	59		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	89		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	81		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Lab Number: L2127169
Project Number: Not Specified
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-07
Client ID: S3-W1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 10:45
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 17:59
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	39.4		ng/l	2.03	--	1
Perfluorohexanoic Acid (PFHxA)	133		ng/l	2.03	--	1
Perfluoroheptanoic Acid (PFHpA)	40.2		ng/l	2.03	--	1
Perfluorohexanesulfonic Acid (PFHxS)	424		ng/l	2.03	--	1
Perfluorooctanoic Acid (PFOA)	147		ng/l	2.03	--	1
Perfluorononanoic Acid (PFNA)	10.1		ng/l	2.03	--	1
Perfluorooctanesulfonic Acid (PFOS)	478		ng/l	2.03	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.03	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.03	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.03	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.03	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.03	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.03	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.03	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-07 Date Collected: 05/18/21 10:45

Client ID: S3-W1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	108		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	138		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	74		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	71		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	95		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	73		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	85		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	96		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	78		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	69		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	90		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	59		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	93		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	86		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-08
Client ID: S4-W1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 11:25
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 18:32
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	80.8		ng/l	2.01	--	1
Perfluorohexanoic Acid (PFHxA)	276		ng/l	2.01	--	1
Perfluoroheptanoic Acid (PFHpA)	75.5		ng/l	2.01	--	1
Perfluorohexanesulfonic Acid (PFHxS)	889	E	ng/l	2.01	--	1
Perfluorooctanoic Acid (PFOA)	298		ng/l	2.01	--	1
Perfluorononanoic Acid (PFNA)	20.4		ng/l	2.01	--	1
Perfluorooctanesulfonic Acid (PFOS)	1120	E	ng/l	2.01	--	1
Perfluorodecanoic Acid (PFDA)	2.67		ng/l	2.01	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.01	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.01	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.01	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.01	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.01	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.01	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-08 Date Collected: 05/18/21 11:25

Client ID: S4-W1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	111		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**143**	Q	12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	70		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	70		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	87		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	66		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	73		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	74		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**60**	Q	62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	45		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	68		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	37		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	57		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	67		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Lab Number: L2127169
Project Number: Not Specified
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-08 RE
Client ID: S4-W1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 11:25
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/08/21 02:16
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 06/07/21 05:40

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorohexanesulfonic Acid (PFHxS)	827		ng/l	50.0	--	1
Perfluorooctanesulfonic Acid (PFOS)	988		ng/l	50.0	--	1

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	102		71-134
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	107		69-131

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-09
Client ID: S5-W1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 12:05
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 19:05
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	108		ng/l	2.05	--	1
Perfluorohexanoic Acid (PFHxA)	353		ng/l	2.05	--	1
Perfluoroheptanoic Acid (PFHpA)	89.7		ng/l	2.05	--	1
Perfluorohexanesulfonic Acid (PFHxS)	1200	E	ng/l	2.05	--	1
Perfluorooctanoic Acid (PFOA)	404		ng/l	2.05	--	1
Perfluorononanoic Acid (PFNA)	17.8		ng/l	2.05	--	1
Perfluorooctanesulfonic Acid (PFOS)	1280	E	ng/l	2.05	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.05	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.05	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.05	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.05	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.05	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.05	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.05	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-09 Date Collected: 05/18/21 12:05

Client ID: S5-W1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	111		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	140		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	72		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	76		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	84		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	71		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	82		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	76		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**59**	Q	62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	46		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	57		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	39		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	58		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	75		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Lab Number: L2127169
Project Number: Not Specified
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-09 RE
Client ID: S5-W1
Sample Location: NANJEMOY/PISCATAWAY

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/08/21 02:33
Analyst: HT

Date Collected: 05/18/21 12:05
Date Received: 05/21/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 06/07/21 05:40

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorohexanesulfonic Acid (PFHxS)	1120		ng/l	10.0	--	1
Perfluorooctanesulfonic Acid (PFOS)	1100		ng/l	10.0	--	1

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	99		71-134
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	98		69-131

Serial_No:06082111:50

Project Name: PFAS STUDY
Lab Number: L2127169
Project Number: Not Specified
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-10
Client ID: S1-TB6
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 08:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 19:21
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.77	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.77	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.77	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.77	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.77	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.77	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.77	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.77	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.77	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.77	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.77	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.77	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.77	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.77	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-10 Date Collected: 05/18/21 08:00

Client ID: S1-TB6 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	96		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	87		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	88		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	82		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	85		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	81		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	77		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	70		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	67		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	76		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	82		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	63		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	76		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	80		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-11
Client ID: S7-FB1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 09:40
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 19:38
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.86	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.86	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.86	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.86	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.86	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.86	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.86	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.86	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.86	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.86	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.86	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.86	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.86	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.86	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-11 Date Collected: 05/18/21 09:40

Client ID: S7-FB1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	94		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	96		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	86		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	83		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	93		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	84		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	96		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	92		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	87		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	93		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	102		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	74		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	90		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	95		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-12
Client ID: S8-FB1
Sample Location: NANJEMOY/PISCATAWAY

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 19:55
Analyst: MP

Date Collected: 05/18/21 10:45
Date Received: 05/21/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.86	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.86	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.86	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.86	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.86	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.86	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.86	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.86	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.86	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.86	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.86	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.86	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.86	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.86	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-12 Date Collected: 05/18/21 10:45

Client ID: S8-FB1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	100		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	101		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	91		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	85		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	96		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	89		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	100		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	85		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	90		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	104		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	78		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	97		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	102		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Lab Number: L2127169
Project Number: Not Specified
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-13
Client ID: S9-FB1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/18/21 11:25
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 20:11
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.79	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.79	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.79	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.79	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.79	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.79	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.79	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.79	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.79	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.79	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.79	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.79	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.79	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.79	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-13 Date Collected: 05/18/21 11:25
Client ID: S9-FB1 Date Received: 05/21/21
Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	97		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	101		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	90		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	84		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	94		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	87		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	100		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	94		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	91		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	89		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	109		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	76		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	97		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	94		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-14
Client ID: S10-FB1
Sample Location: NANJEMOY/PISCATAWAY

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 20:28
Analyst: MP

Date Collected: 05/18/21 12:05
Date Received: 05/21/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.86	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.86	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.86	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.86	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.86	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.86	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.86	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.86	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.86	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.86	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.86	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.86	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.86	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.86	--	1

Serial_No:06082111:50

Project Name: PFAS STUDY **Lab Number:** L2127169

Project Number: Not Specified **Report Date:** 06/08/21

SAMPLE RESULTS

Lab ID: L2127169-14 Date Collected: 05/18/21 12:05

Client ID: S10-FB1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	99		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	102		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	87		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	83		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	97		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	83		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	90		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	96		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	87		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	96		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	107		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	80		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	104		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	104		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127169
Report Date: 06/08/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 15:29
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:13

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-14 Batch: WG1504631-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127169
Report Date: 06/08/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 15:29
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 16:13

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-14 Batch: WG1504631-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	93		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	97		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	86		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	81		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	90		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	81		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	95		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	93		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	87		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	98		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	108		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	84		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	101		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	95		22-136

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127169
Report Date: 06/08/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/08/21 00:54
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 06/07/21 05:40

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 08-09 Batch: WG1508311-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--

Serial_No:06082111:50

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127169
Report Date: 06/08/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/08/21 00:54
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 06/07/21 05:40

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 08-09 Batch: WG1508311-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	101		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	135		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	105		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	87		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	99		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	93		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	100		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	96		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	99		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	99		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	105		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	98		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	121		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	107		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	119		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	18		10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	89		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	114		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	112		22-136

Serial_No:06082111:50

Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-14 Batch: WG1504631-2								
Perfluorobutanesulfonic Acid (PFBS)	102		-		65-157	-		30
Perfluorohexanoic Acid (PFHxA)	100		-		69-168	-		30
Perfluoroheptanoic Acid (PFHpA)	99		-		58-159	-		30
Perfluorohexanesulfonic Acid (PFHxS)	103		-		69-177	-		30
Perfluorooctanoic Acid (PFOA)	106		-		63-159	-		30
Perfluorononanoic Acid (PFNA)	104		-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	101		-		52-151	-		30
Perfluorodecanoic Acid (PFDA)	95		-		63-171	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	94		-		60-166	-		30
Perfluoroundecanoic Acid (PFUnA)	111		-		60-153	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	98		-		45-170	-		30
Perfluorododecanoic Acid (PFDoA)	103		-		67-153	-		30
Perfluorotridecanoic Acid (PFTrDA)	127		-		48-158	-		30
Perfluorotetradecanoic Acid (PFTA)	111		-		59-182	-		30

Serial_No:06082111:50

Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-14 Batch: WG1504631-2								

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	101				70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	113				12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	91				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	85				60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	95				71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	87				62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	102				59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	99				69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	94				62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	109				24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	112				55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	92				27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	113				48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	104				22-136

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Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 08-09 Batch: WG1508311-2								
Perfluorobutanesulfonic Acid (PFBS)	102		-		65-157	-		30
Perfluorohexanoic Acid (PFHxA)	99		-		69-168	-		30
Perfluoroheptanoic Acid (PFHpA)	100		-		58-159	-		30
Perfluorohexanesulfonic Acid (PFHxS)	102		-		69-177	-		30
Perfluorooctanoic Acid (PFOA)	108		-		63-159	-		30
Perfluorononanoic Acid (PFNA)	108		-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	100		-		52-151	-		30
Perfluorodecanoic Acid (PFDA)	97		-		63-171	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	93		-		60-166	-		30
Perfluoroundecanoic Acid (PFUnA)	101		-		60-153	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	96		-		45-170	-		30
Perfluorododecanoic Acid (PFDoA)	99		-		67-153	-		30
Perfluorotridecanoic Acid (PFTrDA)	118		-		48-158	-		30
Perfluorotetradecanoic Acid (PFTA)	118		-		59-182	-		30

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Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 08-09 Batch: WG1508311-2								

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	105				58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	140				62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	110				70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	96				12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	103				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	97				60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	104				71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	96				62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	113				14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	107				59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	111				69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	103				62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	127				10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	112				24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	123				55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	18				10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	104				27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	127				48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	108				22-136

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Matrix Spike Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-14 QC Batch ID: WG1504631-3 QC Sample: L2127169-07 Client ID: S3-W1												
Perfluorobutanesulfonic Acid (PFBS)	39.4	36.1	74.5	97		-	-		65-157	-		30
Perfluorohexanoic Acid (PFHxA)	133	40.6	172	96		-	-		69-168	-		30
Perfluoroheptanoic Acid (PFHpA)	40.2	40.6	78.2	94		-	-		58-159	-		30
Perfluorohexanesulfonic Acid (PFHxS)	424	37.2	462	102		-	-		69-177	-		30
Perfluorooctanoic Acid (PFOA)	147	40.6	190	106		-	-		63-159	-		30
Perfluorononanoic Acid (PFNA)	10.1	40.6	52.5	104		-	-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	478	37.7	618	**371**	Q	-	-		52-151	-		30
Perfluorodecanoic Acid (PFDA)	ND	40.6	39.1	93		-	-		63-171	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	40.6	35.5	87		-	-		60-166	-		30
Perfluoroundecanoic Acid (PFUnA)	ND	40.6	44.8	110		-	-		60-153	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	40.6	43.1	106		-	-		45-170	-		30
Perfluorododecanoic Acid (PFDoA)	ND	40.6	40.0	98		-	-		67-153	-		30
Perfluorotridecanoic Acid (PFTrDA)	ND	40.6	48.1	118		-	-		48-158	-		30
Perfluorotetradecanoic Acid (PFTA)	ND	40.6	46.7	115		-	-		59-182	-		30

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	135				12-142
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	44				27-126
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	58				24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	76				55-137
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	64				62-124

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Matrix Spike Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127169
Report Date: 06/08/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-14 QC Batch ID: WG1504631-3 QC Sample: L2127169-07 Client ID: S3-W1												

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	68				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	67				60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	90				71-134
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	72				48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	71				22-136
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	85				69-131
Perfluoro[13C8]Octanoic Acid (M8PFOA)	65				62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	73				59-139
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	102				70-131

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Lab Duplicate Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127169
Report Date: 06/08/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-14 QC Batch ID: WG1504631-4 QC Sample: L2127169-08 Client ID: S4-W1						
Perfluorobutanesulfonic Acid (PFBS)	80.8	81.2	ng/l	0		30
Perfluorohexanoic Acid (PFHxA)	276	286	ng/l	4		30
Perfluoroheptanoic Acid (PFHpA)	75.5	78.0	ng/l	3		30
Perfluorohexanesulfonic Acid (PFHxS)	889	903	ng/l	2		30
Perfluorooctanoic Acid (PFOA)	298	307	ng/l	3		30
Perfluorononanoic Acid (PFNA)	20.4	22.5	ng/l	10		30
Perfluorooctanesulfonic Acid (PFOS)	1120E	1210E	ng/l	8		30
Perfluorodecanoic Acid (PFDA)	2.67	3.19	ng/l	18		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	ND	ng/l	NC		30
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ng/l	NC		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	ND	ng/l	NC		30
Perfluorododecanoic Acid (PFDoA)	ND	ND	ng/l	NC		30
Perfluorotridecanoic Acid (PFTrDA)	ND	ND	ng/l	NC		30
Perfluorotetradecanoic Acid (PFTA)	ND	ND	ng/l	NC		30

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	111		113		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	143	Q	137		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	70		68		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	70		67		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	87		90		71-134

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Lab Duplicate Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127169
Report Date: 06/08/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-14 QC Batch ID: WG1504631-4 QC Sample: L2127169-08 Client ID: S4-W1

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C8]Octanoic Acid (M8PFOA)	66		67		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	73		75		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	74		80		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	**60**	Q	**60**	Q	62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	45		45		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	68		67		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	37		32		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	57		56		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	67		62		22-136

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Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127169
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Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	*Custody Seal*
B	Absent

Container Information

Container ID	*Container Type*	*Cooler*	*Initial pH*	*Final pH*	*Temp deg C*	*Pres*	*Seal*	*Frozen Date/Time*	*Analysis(*)*
L2127169-01A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-02A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-03A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-04A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-04B	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-05A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-05B	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-06A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-06B	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-07A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-07B	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-08A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-08B	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-09A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-09B	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-10A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-11A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-12A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-13A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127169-14A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)

*Values in parentheses indicate holding time in days

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Project Name: PFAS STUDY
Lab Number: L2127169
Project Number:
Report Date: 06/08/21

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

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Project Number:	Not Specified	**Report Date:**	06/08/21

GLOSSARY

Acronyms

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: Data Usability Report

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Project Name:	PFAS STUDY	**Lab Number:**	L2127169
Project Number:	Not Specified	**Report Date:**	06/08/21

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. (Note: 'PFAS, Total (6)' is applicable to MassDEP DW compliance analysis only.). If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

Report Format: Data Usability Report

Serial_No:06082111:50

Project Name:	PFAS STUDY	**Lab Number:**	L2127169
Project Number:	Not Specified	**Report Date:**	06/08/21

Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

Report Format: Data Usability Report

Serial_No:06082111:50

Project Name:	PFAS STUDY	**Lab Number:**	L2127169
Project Number:	Not Specified	**Report Date:**	06/08/21

REFERENCES

134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

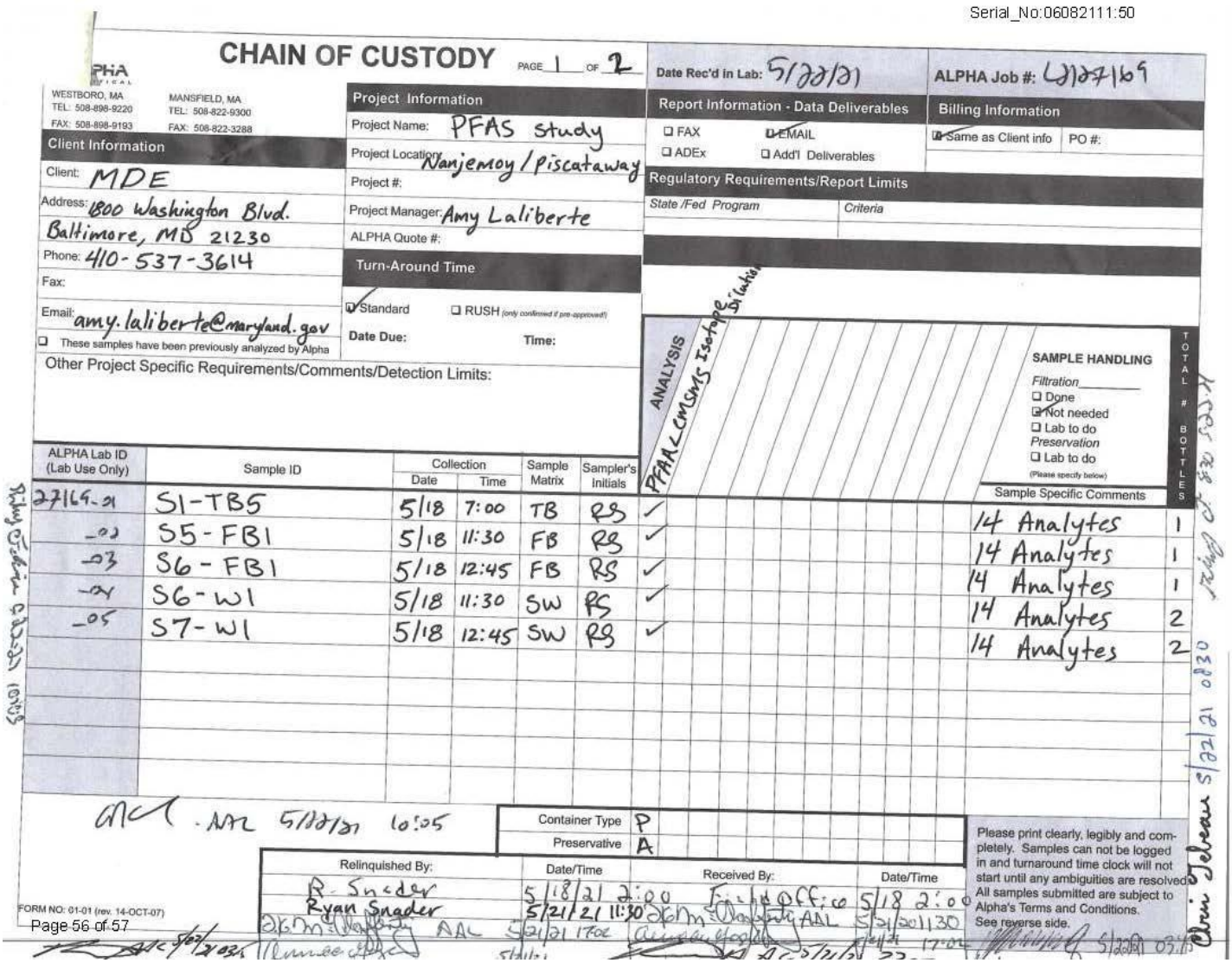
Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



Serial_No:06082111:50

CHAIN OF CUSTODY PAGE 1 OF 2

PHA MEDICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 5/22/21 ALPHA Job #: L2127169

Client Information
Client: MDE
Address: 1800 Washington Blvd. Baltimore, MD 21230
Phone: 410-537-3614
Fax:
Email: amy.laliberte@maryland.gov
☐ These samples have been previously analyzed by Alpha

Project Information
Project Name: PFAS study
Project Location: Nanjemoy / Piscataway
Project #:
Project Manager: Amy Laliberte
ALPHA Quote #:

Turn-Around Time
☑ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

Report Information - Data Deliverables
☐ FAX ☑ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information
☑ Same as Client info PO #:

Regulatory Requirements/Report Limits
State /Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: PFAA LCMSMS Isotope Dilution

SAMPLE HANDLING
Filtration
☐ Done
☑ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Sample Specific Comments	TOTAL # BOTTLES
27169-01	S1-TB5	5/18	7:00	TB	RS	14 Analytes	1
-02	S5-FB1	5/18	11:30	FB	RS	14 Analytes	1
-03	S6-FB1	5/18	12:45	FB	RS	14 Analytes	1
-04	S6-W1	5/18	11:30	SW	RS	14 Analytes	2
-05	S7-W1	5/18	12:45	SW	RS	14 Analytes	2

ACT - NYL 5/22/21 10:05

Container Type: P
Preservative: A

Relinquished By:	Date/Time	Received By:	Date/Time
R. Snader	5/18/21 2:00	Fed Ex	5/18 2:00
Ryan Snader	5/21/21 11:30	[illegible] AAL	5/21/2011:30
[illegible] AAL	5/21/21 17:02	[illegible]	5/21/21 17:02

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

Serial_No:06082111:50

ALPHA ANALYTICAL

CHAIN OF CUSTODY

PAGE 2 OF 2

Date Rec'd in Lab: 5/22/21

ALPHA Job #: L2127169

WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193

MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: MDE

Address: 1800 Washington Blvd Baltimore, MD 21230

Phone: 410-537-3614

Fax:

Email: amy.laliberte@maryland.gov

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: PFAS Study

Project Location: Piscataway

Project #:

Project Manager: Amy Laliberte

ALPHA Quote #:

Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☑ EMAIL

☐ ADEx ☐ Add'l Deliverables

Regulatory Requirements/Report Limits

State /Fed Program Criteria

Billing Information

☑ Same as Client info PO #:

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: PFAA LCMSMS, FS-Isotope Dilution

SAMPLE HANDLING

Filtration: ☐ Done ☐ Not needed ☐ Lab to do

Preservation: ☐ Lab to do (Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	PFAA LCMSMS	Sample Specific Comments	TOTAL # BOTTLES
-06	S2-W1	5/18/21	0940	SW	WNE	✓	14 Analytes	2
-07	S3-W1	5/18/21	1045	SW	WNE	✓	14 Analytes	2
-08	S4-W1	5/18/21	1125	SW	WNE	✓	14 Analytes	2
-09	S5-W1	5/18/21	1205	SW	WNE	✓	14 Analytes	2
-10	S1-TB6	5/18/21	0800	TB	WNE	✓	14 Analytes	1
-11	S7-FB1	5/18/21	0940	FB	JRM	✓	14 Analytes	1
-12	S8-FB1	5/18/21	1045	FB	JRM	✓	14 Analytes	1
-13	S9-FB1	5/18/21	1125	FB	JRM	✓	14 Analytes	1
-14	S10-FB1	5/18/21	1205	FB	JRM	✓	14 Analytes	1

AAL 5/22/21 10:05

Container Type: P

Preservative: A

Relinquished By:	Date/Time	Received By:	Date/Time
J. McKay	5/18/21	Field Office	5/18 2:30
Ryan Snader	5/21/21 11:30	AAL	5/21/20 11:30
AAL	5/21/21 17:02	[illegible]	5/21/21 17:02
[illegible] 5/22/21		[illegible]	5/22/21 05:45

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

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ANALYTICAL REPORT

Lab Number:	L2127213
Client:	Maryland Department of the Environment 1800 Washington Boulevard Baltimore, MD 21230
ATTN:	Amy Laliberte
Phone:	(410) 537-3614
Project Name:	PFAS STUDY
Project Number:	Not Specified
Report Date:	06/11/21

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127213
Report Date: 06/11/21

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2127213-01	0517_S3_01		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-02	0517_S3_02		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-03	0517_S3_03		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-04	0517_S3_04		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-05	0517_S3_05		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-06	S3-T1	TISSUE	NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-07	0517_S3_06		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-08	0517_S3_07		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-09	0517_S3_08		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-10	0517_S3_09		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-11	0517_S3_10		NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-12	S3-T2	TISSUE	NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-13	S3-FB1	WATER	NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-14	TB-2	WATER	NANJEMOY/PISCATAWAY	05/17/21 00:00	05/21/21
L2127213-15	0520_S6_01		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-16	0520_S6_02		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-17	0520_S6_03		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-18	0520_S6_04		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-19	0520_S6_05		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-20	S6-T1	TISSUE	NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-21	0520_S6_06		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-22	0520_S6_07		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-23	0520_S6_08		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-24	0520_S6_09		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21

Serial_No:06112117:30

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2127213-25	0520_S6_010		NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-26	S6-T2	TISSUE	NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-27	S6-FB1	WATER	NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-28	TB-3	WATER	NANJEMOY/PISCATAWAY	05/20/21 00:00	05/21/21
L2127213-29	0514_S1_01		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-30	0514_S1_02		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-31	0514_S1_03		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-32	0514_S1_04		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-33	0514_S1_05		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-34	S1-T1	TISSUE	NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-35	0514_S1_06		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-36	0514_S1_07		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-37	0514_S1_08		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-38	0514_S1_09		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-39	0514_S1_10		NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-40	S1-T2	TISSUE	NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-41	S1-W1	WATER	NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-42	S1-FB1	WATER	NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21
L2127213-43	TB-1	WATER	NANJEMOY/PISCATAWAY	05/14/21 00:00	05/21/21

Serial_No:06112117:30

Project Name:	PFAS STUDY	**Lab Number:**	L2127213
Project Number:	Not Specified	**Report Date:**	06/11/21

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Serial_No:06112117:30

Project Name:	PFAS STUDY	**Lab Number:**	L2127213
Project Number:	Not Specified	**Report Date:**	06/11/21

Case Narrative (continued)

Sample Receipt

L2127213-14 and -28: The sample was received in an inappropriate container.

Perfluorinated Alkyl Acids by Isotope Dilution

L2127213-06: The sample was re-analyzed on dilution in order to quantiitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range.

L2127213-06: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

WG1503141-1R: The sample was re-analyzed due to QC failures in the original analysis. The results of the re-analysis are reported.

WG1504298-1 and WG1504298-2: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:  Alycia Mogayzel

Title: Technical Director/Representative Date: 06/11/21

Serial_No:06112117:30

ORGANICS

Serial_No:06112117:30

SEMIVOLATILES

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-06
Client ID: S3-T1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/17/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Tissue
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/04/21 02:36
Analyst: HT
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 08:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.221	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.442	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.221	--	1
Perfluorohexanesulfonic Acid (PFHxS)	0.822		ng/g	0.221	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.221	--	1
Perfluorononanoic Acid (PFNA)	0.374		ng/g	0.221	--	1
Perfluorooctanesulfonic Acid (PFOS)	359	E	ng/g	0.221	--	1
Perfluorodecanoic Acid (PFDA)	1.57		ng/g	0.221	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.442	--	1
Perfluoroundecanoic Acid (PFUnA)	2.58		ng/g	0.442	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.442	--	1
Perfluorododecanoic Acid (PFDoA)	3.97		ng/g	0.442	--	1
Perfluorotridecanoic Acid (PFTrDA)	3.45		ng/g	0.442	--	1
Perfluorotetradecanoic Acid (PFTA)	3.08		ng/g	0.442	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-06 Date Collected: 05/17/21 00:00

Client ID: S3-T1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	84		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	90		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	**148**	Q	74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	161		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	77		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	74		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	**145**	Q	78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	82		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	**192**	Q	20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	83		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	88		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	85		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	82		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	92		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	81		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	81		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	95		24-159

Serial_No:06112117:30

Project Name: PFAS STUDY
Lab Number: L2127213
Project Number: Not Specified
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-06 D
Client ID: S3-T1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/17/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Tissue
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/06/21 10:26
Analyst: SG
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 08:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorooctanesulfonic Acid (PFOS)	231		ng/g	2.21	--	10

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	106		79-136

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-12
Client ID: S3-T2
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/17/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Tissue
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/04/21 02:52
Analyst: HT
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 08:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.226	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.452	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.226	--	1
Perfluorohexanesulfonic Acid (PFHxS)	0.762		ng/g	0.226	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.226	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.226	--	1
Perfluorooctanesulfonic Acid (PFOS)	24.7	F	ng/g	0.226	--	1
Perfluorodecanoic Acid (PFDA)	0.282		ng/g	0.226	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.452	--	1
Perfluoroundecanoic Acid (PFUnA)	0.509		ng/g	0.452	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.452	--	1
Perfluorododecanoic Acid (PFDoA)	0.898		ng/g	0.452	--	1
Perfluorotridecanoic Acid (PFTrDA)	1.04		ng/g	0.452	--	1
Perfluorotetradecanoic Acid (PFTA)	0.987		ng/g	0.452	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-12 Date Collected: 05/17/21 00:00

Client ID: S3-T2 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	87		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	95		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	97		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	106		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	80		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	78		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	92		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	82		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	117		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	86		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	92		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	87		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	88		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	103		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	79		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	98		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	97		24-159

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-13
Client ID: S3-FB1
Sample Location: NANJEMOY/PISCATAWAY

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/02/21 12:45
Analyst: HT

Date Collected: 05/17/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 04:35

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.82	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.82	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.82	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.82	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.82	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.82	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.82	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.82	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.82	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.82	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.82	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.82	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.82	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.82	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-13 Date Collected: 05/17/21 00:00

Client ID: S3-FB1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	66		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	91		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	90		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	90		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	92		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	87		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	88		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	84		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	65		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	88		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	60		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	82		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	62		22-136

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-20
Client ID: S6-T1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/20/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Tissue
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/04/21 03:09
Analyst: HT
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 08:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.244	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.488	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.244	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.244	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.244	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.244	--	1
Perfluorooctanesulfonic Acid (PFOS)	5.21		ng/g	0.244	--	1
Perfluorodecanoic Acid (PFDA)	0.360		ng/g	0.244	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.488	--	1
Perfluoroundecanoic Acid (PFUnA)	0.604		ng/g	0.488	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.488	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.488	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.488	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.488	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-20 Date Collected: 05/20/21 00:00

Client ID: S6-T1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	89		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	97		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	97		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	109		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	86		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	82		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	94		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	84		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	108		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	91		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	98		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	93		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	89		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	109		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	78		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	114		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	129		24-159

Serial_No:06112117:30

Project Name: PFAS STUDY
Lab Number: L2127213
Project Number: Not Specified
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-26
Client ID: S6-T2
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/20/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Tissue
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/04/21 03:42
Analyst: HT
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 08:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.240	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.481	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.240	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.240	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.240	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.240	--	1
Perfluorooctanesulfonic Acid (PFOS)	1.35	F	ng/g	0.240	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.240	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.481	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.481	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.481	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.481	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.481	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.481	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-26 Date Collected: 05/20/21 00:00

Client ID: S6-T2 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	93		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	98		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	99		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	101		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	90		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	84		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	92		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	89		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	99		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	92		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	98		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	93		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	97		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	118		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	81		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	130		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	123		24-159

Serial_No:06112117:30

Project Name: PFAS STUDY
Lab Number: L2127213
Project Number: Not Specified
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-27
Client ID: S6-FB1
Sample Location: NANJEMOY/PISCATAWAY

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/02/21 13:18
Analyst: HT

Date Collected: 05/20/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 04:35

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.84	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.84	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.84	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.84	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.84	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.84	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.84	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.84	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.84	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.84	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.84	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.84	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.84	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.84	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-27 Date Collected: 05/20/21 00:00

Client ID: S6-FB1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	71		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	93		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	92		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	87		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	93		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	93		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	92		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	87		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	69		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	91		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	69		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	93		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	63		22-136

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-34
Client ID: S1-T1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/14/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Tissue
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/04/21 04:15
Analyst: HT
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 08:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.240	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.480	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.240	--	1
Perfluorohexanesulfonic Acid (PFHxS)	0.512	F	ng/g	0.240	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.240	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.240	--	1
Perfluorooctanesulfonic Acid (PFOS)	94.2		ng/g	0.240	--	1
Perfluorodecanoic Acid (PFDA)	1.75		ng/g	0.240	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.480	--	1
Perfluoroundecanoic Acid (PFUnA)	1.69		ng/g	0.480	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.480	--	1
Perfluorododecanoic Acid (PFDoA)	1.26		ng/g	0.480	--	1
Perfluorotridecanoic Acid (PFTrDA)	0.774		ng/g	0.480	--	1
Perfluorotetradecanoic Acid (PFTA)	0.502		ng/g	0.480	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-34 Date Collected: 05/14/21 00:00

Client ID: S1-T1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	93		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	99		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	124		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	123		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	86		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	81		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	118		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	90		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	143		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	93		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	100		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	95		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	95		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	114		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	79		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	105		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	121		24-159

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-40
Client ID: S1-T2
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/14/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Tissue
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/04/21 04:31
Analyst: HT
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 08:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.229	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.458	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.229	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.229	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.229	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.229	--	1
Perfluorooctanesulfonic Acid (PFOS)	2.52	F	ng/g	0.229	--	1
Perfluorodecanoic Acid (PFDA)	0.403		ng/g	0.229	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.458	--	1
Perfluoroundecanoic Acid (PFUnA)	0.590		ng/g	0.458	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.458	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.458	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.458	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.458	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-40 Date Collected: 05/14/21 00:00

Client ID: S1-T2 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	88		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	91		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	93		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	87		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	83		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	80		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	88		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	81		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	91		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	86		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	90		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	84		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	85		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	106		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	71		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	112		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	106		24-159

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-41
Client ID: S1-W1
Sample Location: NANJEMOY/PISCATAWAY

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 05/29/21 03:33
Analyst: RS

Date Collected: 05/14/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 05/25/21 03:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	6.89		ng/l	1.84	--	1
Perfluorohexanoic Acid (PFHxA)	24.0		ng/l	1.84	--	1
Perfluoroheptanoic Acid (PFHpA)	10.4		ng/l	1.84	--	1
Perfluorohexanesulfonic Acid (PFHxS)	62.4		ng/l	1.84	--	1
Perfluorooctanoic Acid (PFOA)	27.1		ng/l	1.84	--	1
Perfluorononanoic Acid (PFNA)	2.70		ng/l	1.84	--	1
Perfluorooctanesulfonic Acid (PFOS)	73.6		ng/l	1.84	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.84	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.84	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.84	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.84	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.84	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.84	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.84	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-41 Date Collected: 05/14/21 00:00

Client ID: S1-W1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	109		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	95		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	95		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	91		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	95		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	93		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	86		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	99		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	88		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	48		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	90		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	50		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	82		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	78		22-136

Serial_No:06112117:30

Project Name: PFAS STUDY
Lab Number: L2127213
Project Number: Not Specified
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-42
Client ID: S1-FB1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/14/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 05/29/21 03:50
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 05/25/21 03:46

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.88	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.88	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.88	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.88	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.88	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.88	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.88	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.88	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.88	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.88	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.88	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.88	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.88	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.88	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-42 Date Collected: 05/14/21 00:00

Client ID: S1-FB1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	107		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	49		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	105		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	98		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	95		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	100		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	96		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	91		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	61		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	90		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	55		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	84		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	79		22-136

Serial_No:06112117:30

Project Name: PFAS STUDY
Lab Number: L2127213
Project Number: Not Specified
Report Date: 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-43
Client ID: TB-1
Sample Location: NANJEMOY/PISCATAWAY

Date Collected: 05/14/21 00:00
Date Received: 05/21/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 05/29/21 04:06
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 05/25/21 03:46

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.83	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.83	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.83	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.83	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.83	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.83	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.83	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.83	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.83	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.83	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.83	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.83	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.83	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.83	--	1

Serial_No:06112117:30

Project Name: PFAS STUDY **Lab Number:** L2127213

Project Number: Not Specified **Report Date:** 06/11/21

SAMPLE RESULTS

Lab ID: L2127213-43 Date Collected: 05/14/21 00:00

Client ID: TB-1 Date Received: 05/21/21

Sample Location: NANJEMOY/PISCATAWAY Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	110		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	48		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	104		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	98		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	89		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	93		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	83		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	80		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	74		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	48		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	76		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	47		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	73		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	69		22-136

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 05/29/21 12:12
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 05/25/21 03:43

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 41-43 Batch: WG1503141-1 R					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 05/29/21 12:12
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 05/25/21 03:43

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 41-43 Batch: WG1503141-1 R					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	98		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	126		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	106		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	80		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	101		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	99		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	100		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	96		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	92		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	92		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	96		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	92		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	90		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	71		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	94		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	36		10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	63		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	77		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	62		22-136

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127213
Report Date: 06/11/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/02/21 09:10
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 04:35

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 13,27 Batch: WG1504262-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/02/21 09:10
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 04:35

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 13,27 Batch: WG1504262-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	91		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	118		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	100		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	84		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	93		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	91		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	95		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	91		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	110		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	88		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	96		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	86		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	111		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	74		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	95		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	35		10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	69		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	83		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	68		22-136

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/04/21 02:03
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 08:11

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 06,12,20,26,34,40 Batch: WG1504298-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.250	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.500	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.250	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.250	--
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.250	--
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.250	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	0.250	--
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.250	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.500	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.500	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.500	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.500	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.500	--
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.500	--

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/04/21 02:03
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 05/27/21 08:11

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 06,12,20,26,34,40 Batch: WG1504298-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	100		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	116		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	106		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**175**	Q	14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	98		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	95		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	103		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	98		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	144		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	106		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	107		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	103		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	109		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	123		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	116		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	102		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	157		24-159

Serial_No:06112117:30

Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 41-43 Batch: WG1503141-2								
Perfluorobutanesulfonic Acid (PFBS)	95		-		65-157	-		30
Perfluorohexanoic Acid (PFHxA)	96		-		69-168	-		30
Perfluoroheptanoic Acid (PFHpA)	96		-		58-159	-		30
Perfluorohexanesulfonic Acid (PFHxS)	95		-		69-177	-		30
Perfluorooctanoic Acid (PFOA)	94		-		63-159	-		30
Perfluorononanoic Acid (PFNA)	93		-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	96		-		52-151	-		30
Perfluorodecanoic Acid (PFDA)	99		-		63-171	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	100		-		60-166	-		30
Perfluoroundecanoic Acid (PFUnA)	96		-		60-153	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	111		-		45-170	-		30
Perfluorododecanoic Acid (PFDoA)	104		-		67-153	-		30
Perfluorotridecanoic Acid (PFTrDA)	92		-		48-158	-		30
Perfluorotetradecanoic Acid (PFTA)	104		-		59-182	-		30

Serial_No:06112117:30

Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 41-43 Batch: WG1503141-2								

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	99				58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	127				62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	113				70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	96				12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	105				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	100				60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	104				71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	101				62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	118				14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	97				59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	104				69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	94				62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	115				10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	77				24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	99				55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	37				10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	72				27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	90				48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	84				22-136

Serial_No:06112117:30

Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 13,27 Batch: WG1504262-2								
Perfluorobutanesulfonic Acid (PFBS)	90		-		65-157	-		30
Perfluorohexanoic Acid (PFHxA)	91		-		69-168	-		30
Perfluoroheptanoic Acid (PFHpA)	91		-		58-159	-		30
Perfluorohexanesulfonic Acid (PFHxS)	89		-		69-177	-		30
Perfluorooctanoic Acid (PFOA)	90		-		63-159	-		30
Perfluorononanoic Acid (PFNA)	95		-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	93		-		52-151	-		30
Perfluorodecanoic Acid (PFDA)	92		-		63-171	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	86		-		60-166	-		30
Perfluoroundecanoic Acid (PFUnA)	93		-		60-153	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	102		-		45-170	-		30
Perfluorododecanoic Acid (PFDoA)	98		-		67-153	-		30
Perfluorotridecanoic Acid (PFTrDA)	91		-		48-158	-		30
Perfluorotetradecanoic Acid (PFTA)	94		-		59-182	-		30

Serial_No:06112117:30

Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 13,27 Batch: WG1504262-2								

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	89				58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	117				62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	100				70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	84				12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	92				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	90				60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	93				71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	89				62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	112				14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	87				59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	94				69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	84				62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	110				10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	77				24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	88				55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	40				10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	63				27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	80				48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	66				22-136

Serial_No:06112117:30

Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12,20,26,34,40 Batch: WG1504298-2								
Perfluorobutanesulfonic Acid (PFBS)	102		-		72-128	-		30
Perfluorohexanoic Acid (PFHxA)	99		-		70-132	-		30
Perfluoroheptanoic Acid (PFHpA)	100		-		71-131	-		30
Perfluorohexanesulfonic Acid (PFHxS)	100		-		67-130	-		30
Perfluorooctanoic Acid (PFOA)	99		-		69-133	-		30
Perfluorononanoic Acid (PFNA)	104		-		72-129	-		30
Perfluorooctanesulfonic Acid (PFOS)	100		-		68-136	-		30
Perfluorodecanoic Acid (PFDA)	96		-		69-133	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	91		-		63-144	-		30
Perfluoroundecanoic Acid (PFUnA)	103		-		64-136	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	99		-		61-139	-		30
Perfluorododecanoic Acid (PFDoA)	101		-		69-135	-		30
Perfluorotridecanoic Acid (PFTrDA)	112		-		66-139	-		30
Perfluorotetradecanoic Acid (PFTA)	114		-		69-133	-		30

Serial_No:06112117:30

Lab Control Sample Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12,20,26,34,40 Batch: WG1504298-2								

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	99				61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	113				58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	106				74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	163				14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	94				66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	92				71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	105				78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	97				75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	155	Q			20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	104				72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	105				79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	99				75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	111				31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	123				61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	114				34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	103				54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	139				24-159

Serial_No:06112117:30

Matrix Spike Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 41-43 QC Batch ID: WG1503141-3 QC Sample: L2126326-01 Client ID: MS Sample												
Perfluorobutanoic Acid (PFBA)	ND	35.9	36.1	99		-	-		67-148	-		30
Perfluoropentanoic Acid (PFPeA)	ND	35.9	37.1	100		-	-		63-161	-		30
Perfluorobutanesulfonic Acid (PFBS)	ND	31.9	32.2	98		-	-		65-157	-		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND	33.6	33.8	101		-	-		37-219	-		30
Perfluorohexanoic Acid (PFHxA)	2.47	35.9	38.5	100		-	-		69-168	-		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	33.7	37.7	111		-	-		52-156	-		30
Perfluoroheptanoic Acid (PFHpA)	ND	35.9	36.7	100		-	-		58-159	-		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	32.8	36.6	109		-	-		69-177	-		30
Perfluorooctanoic Acid (PFOA)	ND	35.9	36.1	97		-	-		63-159	-		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	39.4	34.2	70.3	90		-	-		49-187	-		30
Perfluoroheptanesulfonic Acid (PFHpS)	ND	34.2	33.2	97		-	-		61-179	-		30
Perfluorononanoic Acid (PFNA)	ND	35.9	35.7	100		-	-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	ND	33.3	33.6	98		-	-		52-151	-		30
Perfluorodecanoic Acid (PFDA)	ND	35.9	36.0	100		-	-		63-171	-		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	34.4	37.4	109		-	-		56-173	-		30
Perfluorononanesulfonic Acid (PFNS)	ND	34.5	33.1	96		-	-		48-150	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	35.9	39.3	110		-	-		60-166	-		30
Perfluoroundecanoic Acid (PFUnA)	ND	35.9	36.0	100		-	-		60-153	-		30
Perfluorodecanesulfonic Acid (PFDS)	ND	34.6	31.3	90		-	-		38-156	-		30
Perfluorooctanesulfonamide (FOSA)	ND	35.9	37.0F	103		-	-		46-170	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	35.9	49.8	136		-	-		45-170	-		30
Perfluorododecanoic Acid (PFDoA)	ND	35.9	39.6	110		-	-		67-153	-		30

Serial_No:06112117:30

Matrix Spike Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 41-43 QC Batch ID: WG1503141-3 QC Sample: L2126326-01 Client ID: MS Sample												
Perfluorotridecanoic Acid (PFTrDA)	ND	35.9	33.9	94		-	-		48-158	-		30
Perfluorotetradecanoic Acid (PFTA)	ND	35.9	39.6	110		-	-		59-182	-		30

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	73				10-162
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	66				12-142
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	78				14-147
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	37				27-126
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	48				24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	78				55-137
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	79				62-124
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	103				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	94				60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	99				71-134
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	77				48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	74				22-136
Perfluoro[13C4]Butanoic Acid (MPFBA)	94				58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	138				62-163
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	25				10-112
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	109				69-131
Perfluoro[13C8]Octanoic Acid (M8PFOA)	89				62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	86				59-139
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	117				70-131

Serial_No:06112117:30

Matrix Spike Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 13,27 QC Batch ID: WG1504262-3 QC Sample: L2126829-03 Client ID: MS Sample												
Perfluorobutanoic Acid (PFBA)	7.57	35.8	39.2	88		-	-		67-148	-		30
Perfluoropentanoic Acid (PFPeA)	3.28	35.8	35.6	90		-	-		63-161	-		30
Perfluorobutanesulfonic Acid (PFBS)	4.16	31.8	33.6	92		-	-		65-157	-		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND	33.6	31.9	95		-	-		37-219	-		30
Perfluorohexanoic Acid (PFHxA)	4.59	35.8	37.9	93		-	-		69-168	-		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	33.7	31.0	88		-	-		52-156	-		30
Perfluoroheptanoic Acid (PFHpA)	2.91	35.8	36.4	93		-	-		58-159	-		30
Perfluorohexanesulfonic Acid (PFHxS)	8.31	32.8	37.6	89		-	-		69-177	-		30
Perfluorooctanoic Acid (PFOA)	12.0	35.8	46.2	95		-	-		63-159	-		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	34.1	34.8	102		-	-		49-187	-		30
Perfluoroheptanesulfonic Acid (PFHpS)	ND	34.1	31.8	93		-	-		61-179	-		30
Perfluorononanoic Acid (PFNA)	1.86	35.8	36.9	98		-	-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	34.6	33.3	64.9	91		-	-		52-151	-		30
Perfluorodecanoic Acid (PFDA)	ND	35.8	35.4	97		-	-		63-171	-		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	34.4	37.6	109		-	-		56-173	-		30
Perfluorononanesulfonic Acid (PFNS)	ND	34.5	33.2	96		-	-		48-150	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	35.8	37.2	104		-	-		60-166	-		30
Perfluoroundecanoic Acid (PFUnA)	ND	35.8	36.3	101		-	-		60-153	-		30
Perfluorodecanesulfonic Acid (PFDS)	ND	34.6	29.7	86		-	-		38-156	-		30
Perfluorooctanesulfonamide (FOSA)	ND	35.8	35.1F	98		-	-		46-170	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	35.8	39.1	109		-	-		45-170	-		30
Perfluorododecanoic Acid (PFDoA)	ND	35.8	39.1	109		-	-		67-153	-		30

Serial_No:06112117:30

Matrix Spike Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 13,27 QC Batch ID: WG1504262-3 QC Sample: L2126829-03 Client ID: MS Sample												
Perfluorotridecanoic Acid (PFTrDA)	ND	35.8	34.5	96		-	-		48-158	-		30
Perfluorotetradecanoic Acid (PFTA)	ND	35.8	37.2	104		-	-		59-182	-		30

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	92				10-162
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	135				12-142
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	105				14-147
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	51				27-126
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	54				24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	83				55-137
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	81				62-124
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	90				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	93				60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	96				71-134
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	75				48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	57				22-136
Perfluoro[13C4]Butanoic Acid (MPFBA)	94				58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	107				62-163
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	14				10-112
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95				69-131
Perfluoro[13C8]Octanoic Acid (M8PFOA)	92				62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	89				59-139
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	97				70-131

Serial_No:06112117:30

Matrix Spike Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12,20,26,34,40 QC Batch ID: WG1504298-3 QC Sample: L2127213-20 Client ID: S6-T1												
Perfluorobutanesulfonic Acid (PFBS)	ND	3.9	4.07	104		-	-		72-128	-		30
Perfluorohexanoic Acid (PFHxA)	ND	4.4	4.52	103		-	-		70-132	-		30
Perfluoroheptanoic Acid (PFHpA)	ND	4.4	4.52	103		-	-		71-131	-		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	4.02	4.18	104		-	-		67-130	-		30
Perfluorooctanoic Acid (PFOA)	ND	4.4	4.48	102		-	-		69-133	-		30
Perfluorononanoic Acid (PFNA)	ND	4.4	4.64	106		-	-		72-129	-		30
Perfluorooctanesulfonic Acid (PFOS)	5.21	4.08	10.3	125		-	-		68-136	-		30
Perfluorodecanoic Acid (PFDA)	0.360	4.4	4.62	97		-	-		69-133	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	4.4	4.23	96		-	-		63-144	-		30
Perfluoroundecanoic Acid (PFUnA)	0.604	4.4	5.65	115		-	-		64-136	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	4.4	4.59	104		-	-		61-139	-		30
Perfluorododecanoic Acid (PFDoA)	ND	4.4	4.81	102		-	-		69-135	-		30
Perfluorotridecanoic Acid (PFTrDA)	ND	4.4	6.40	137		-	-		66-139	-		30
Perfluorotetradecanoic Acid (PFTA)	ND	4.4	5.15	113		-	-		69-133	-		30

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	97				14-167
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	101				20-154
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	75				34-137
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	88				31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	99				61-155

Serial_No:06112117:30

Matrix Spike Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified
Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12,20,26,34,40 QC Batch ID: WG1504298-3 QC Sample: L2127213-20 Client ID: S6-T1												

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	86				75-130
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	81				66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	76				71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	89				78-139
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	108				54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	109				24-159
Perfluoro[13C4]Butanoic Acid (MPFBA)	88				61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	93				58-150
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	91				79-136
Perfluoro[13C8]Octanoic Acid (M8PFOA)	84				75-130
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	88				72-140
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	92				74-139

Serial_No:06112117:30

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Duplicate Analysis
Batch Quality Control

Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 41-43 QC Batch ID: WG1503141-4 QC Sample: L2126326-03 Client ID: DUP Sample						
Perfluorobutanoic Acid (PFBA)	3.03	2.94	ng/l	3		30
Perfluoropentanoic Acid (PFPeA)	3.99	4.11	ng/l	3		30
Perfluorobutanesulfonic Acid (PFBS)	4.25	4.06	ng/l	5		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND	ND	ng/l	NC		30
Perfluorohexanoic Acid (PFHxA)	3.28	3.34	ng/l	2		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	ND	ng/l	NC		30
Perfluoroheptanoic Acid (PFHpA)	2.71	2.64	ng/l	3		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	ND	ng/l	NC		30
Perfluorooctanoic Acid (PFOA)	7.10	6.98	ng/l	2		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	ND	ng/l	NC		30
Perfluoroheptanesulfonic Acid (PFHpS)	ND	ND	ng/l	NC		30
Perfluorononanoic Acid (PFNA)	2.68	2.68	ng/l	0		30
Perfluorooctanesulfonic Acid (PFOS)	7.62	7.47	ng/l	2		30
Perfluorodecanoic Acid (PFDA)	ND	ND	ng/l	NC		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	ND	ng/l	NC		30
Perfluorononanesulfonic Acid (PFNS)	ND	ND	ng/l	NC		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	ND	ng/l	NC		30
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ng/l	NC		30
Perfluorodecanesulfonic Acid (PFDS)	ND	ND	ng/l	NC		30
Perfluorooctanesulfonamide (FOSA)	ND	ND	ng/l	NC		30

Serial_No:06112117:30

Lab Duplicate Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 41-43 QC Batch ID: WG1503141-4 QC Sample: L2126326-03 Client ID: DUP Sample						
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	ND	ng/l	NC		30
Perfluorododecanoic Acid (PFDoA)	ND	ND	ng/l	NC		30
Perfluorotridecanoic Acid (PFTrDA)	ND	ND	ng/l	NC		30
Perfluorotetradecanoic Acid (PFTA)	ND	ND	ng/l	NC		30

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	75		81		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	113		125		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	110		108		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	48		45		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	82		87		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	78		80		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	100		103		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	81		77		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	49		42		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	80		72		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	96		97		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	78		71		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	50		39		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	47		33		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	81		76		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	12		7	Q	10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	46		42		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	79		74		48-131

Serial_No:06112117:30

Lab Duplicate Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 41-43 QC Batch ID: WG1503141-4 QC Sample: L2126326-03 Client ID: DUP Sample						

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	72		75		22-136

Serial_No:06112117:30

Lab Duplicate Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 13,27 QC Batch ID: WG1504262-4 QC Sample: L2127112-01 Client ID: DUP Sample						
Perfluorooctanoic Acid (PFOA)	11.7	12.0	ng/l	3		30
Perfluorononanoic Acid (PFNA)	4.90	4.94	ng/l	1		30
Perfluorooctanesulfonic Acid (PFOS)	27.0	27.0	ng/l	0		30

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C8]Octanoic Acid (M8PFOA)	75		75		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	74		76		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	92		89		69-131

Serial_No:06112117:30

Lab Duplicate Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12,20,26,34,40 QC Batch ID: WG1504298-4 QC Sample: L2127213-26 Client ID: S6-T2						
Perfluorobutanesulfonic Acid (PFBS)	ND	ND	ng/g	NC		30
Perfluorohexanoic Acid (PFHxA)	ND	ND	ng/g	NC		30
Perfluoroheptanoic Acid (PFHpA)	ND	ND	ng/g	NC		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	ND	ng/g	NC		30
Perfluorooctanoic Acid (PFOA)	ND	ND	ng/g	NC		30
Perfluorononanoic Acid (PFNA)	ND	ND	ng/g	NC		30
Perfluorooctanesulfonic Acid (PFOS)	1.35F	1.26F	ng/g	7		30
Perfluorodecanoic Acid (PFDA)	ND	ND	ng/g	NC		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	ND	ng/g	NC		30
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ng/g	NC		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	ND	ng/g	NC		30
Perfluorododecanoic Acid (PFDoA)	ND	ND	ng/g	NC		30
Perfluorotridecanoic Acid (PFTrDA)	ND	ND	ng/g	NC		30
Perfluorotetradecanoic Acid (PFTA)	ND	ND	ng/g	NC		30

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	93		90		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	98		94		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	99		95		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	101		91		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	90		87		66-128

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Lab Duplicate Analysis
Batch Quality Control

Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127213
Report Date: 06/11/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12,20,26,34,40 QC Batch ID: WG1504298-4 QC Sample: L2127213-26 Client ID: S6-T2

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	84		80		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	92		90		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	89		87		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	99		89		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	92		88		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	98		92		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	93		86		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	97		93		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	118		108		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	81		73		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	130		116		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	123		120		24-159

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Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127213
Report Date: 06/11/21

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	*Custody Seal*
A	Absent
B	Absent

Container Information

Container ID	*Container Type*	*Cooler*	*Initial pH*	*Final pH*	*Temp deg C*	*Pres*	*Seal*	*Frozen Date/Time*	*Analysis(*)*
L2127213-01A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-02A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-03A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-04A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-05A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-06A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(28)
L2127213-07A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-08A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-09A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-10A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-11A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-12A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(28)
L2127213-13A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127213-14A	Plastic 250ml unpreserved	A	NA		4.8	Y	Absent		CANCELLED()
L2127213-15A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-16A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-17A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-18A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-19A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-20A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(28)
L2127213-21A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-22A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()

*Values in parentheses indicate holding time in days

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Project Name: PFAS STUDY
Project Number: Not Specified

Lab Number: L2127213
Report Date: 06/11/21

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2127213-23A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-24A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-25A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-26A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(28)
L2127213-26B	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(28)
L2127213-27A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127213-28A	Plastic 250ml unpreserved	A	NA		4.8	Y	Absent		CANCELLED()
L2127213-29A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-30A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-31A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-32A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-33A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-34A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(28)
L2127213-34B	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(28)
L2127213-35A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-36A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-37A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-38A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-39A	Bag	A	NA		4.8	Y	Absent		A2-TISSUE_PREP()
L2127213-40A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(28)
L2127213-40B	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(28)
L2127213-41A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127213-41B	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127213-42A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)
L2127213-43A	Plastic 250ml unpreserved	B	NA		2.2	Y	Absent		A2-537-ISOTOPE(14)

Container Comments

*Values in parentheses indicate holding time in days

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Project Number: Not Specified

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Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)

Container Comments

L2127213-14A this is a temp blank. cannot be analyzed.

L2127213-28A this is a temp blank. Cannot be analyzed.

*Values in parentheses indicate holding time in days

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Project Name: PFAS STUDY
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Project Number:
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PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

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GLOSSARY

Acronyms

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

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Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. (Note: 'PFAS, Total (6)' is applicable to MassDEP DW compliance analysis only.). If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

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Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

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Project Number:	Not Specified	**Report Date:**	06/11/21

REFERENCES

134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

5/22/21 Page ____ of 2 Serial No:06112117:30

Chain-of-Custody

Project Name: 2021 Piscataway PFAS Sampling

Station No. & FTC yr./Description		Coordinates:		Collecting Agency:	Samplers Initials:
S3	2021	N	38.74618 °	MDE	CNL, CAP, NWK
Site Description Piscataway Creek at Commo Road and upstream		W	76.84636 °		

Composite ID Number	Sample Matrix	Individual Fish Field ID Number	Length (cm)	Weight (g/lbs.)	Requested Contaminants	Species	Collection Date
S3-T1 -01	T	0517_S3_01	16.0	75	PFAS - 14 Compounds	Redbreast Sunfish--Lepomis auritus	
-02	T	0517_S3_02	15.0	70			
-03	T	0517_S3_03	15.5	70			
-04	T	0517_S3_04	16.0	80			
-05	T	0517_S3_05	14.8	69			
Summary Information	5		15.5	72.8	Lepomis auritus		5/17/2021
S3-T2 -07	T	0517_S3_06	19.5	99	PFAS - 14 Compounds	Yellow Bullhead Catfish--Ameiurus natalis	
-08	T	0517_S3_07	18.5	89			
-09	T	0517_S3_08	18.0	80			
-10	T	0517_S3_09	17.0	66			
-11	T	0517_S3_10	15.5	45			
Summary Information	5		17.7	75.8	Ameiurus natalis		5/17/2021
Surface Water Samples							
	RS						
	RS				PFAS - 14 Compounds		
Blank ID							
S3-FB1 -13	RS	Site 3 Field Blank (S3-FB1)			PFAS - 14 Compounds		5/17/2021
TB-2 -14	RS	Trip Blank 2			PFAS - 14 Compounds		5/17/2021

LABORATORY INFORMATION

Client Information:	MDE	1800 Washington Blvd.	Baltimore, MD 21230	410-537-3614	Amy.Laliberte@maryland.gov
Project Information:	2021 Fish Tissue PFAS				
Report Information:	Email: Amy.Laliberte@maryland.gov				
Alpha Job #			**Billing Info:**	Same as Client Info.	

Analytical Method: LCMSMS - Isotope Dilution

Delivery Shipment Record:		Deliver/Ship to: (Name, address and phone)		Date/Time Shipped from Collecting Agency:	
Delivery Method:		Alpha Analytical			
☑ Hand Carried					
Relinquished by: (signature)	Date/Time 5/21/21	Received by: (signature) 5/21/21 11:30	Relinquished by: (signature) AAL	Date/Time 5/21/21 17:02	Received by: (signature) 5/21/21 17:02
Relinquished by: (signature)	Date/Time 5/21/21 19	Received by Central Processing Laboratory by: (signature) 5/21/21 2300	Date/Time	Remarks: 5/22/21 0315	

Laboratory Custody:

Released Name/Date	Received Name/Date	Purpose	To Location

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5/21/21

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Serial No:06112117:30

Chain-of-Custody

Project Name: 2021 Piscataway PFAS Sampling

Station No. & FTC yr./Description		Coordinates:		Collecting Agency:	Samplers Initials:
S6	2021	N	38.44992 °	MDE	CNL, CAP, NWK
Site Description Nanjemoy Creek at tidal headwaters		W	77.15417 °		

Composite ID Number	Sample Matrix	Individual Fish Field ID Number	Length (cm)	Weight (g/lbs.)	Requested Contaminants	Species	Collection Date
S6-T1 -15 -16 -17 -18 -19	T	0520_S6_01	19.0	178	PFAS - 14 Compounds	Bluegill--Lepomis macrochirus	
	T	0520_S6_02	14.5	65			
	T	0520_S6_03	16.0	87			
	T	0520_S6_04	17.0	100			
	T	0520_S6_05	16.75	107			
Summary Information	5		**16.7**	**107.4**	**Lepomis macrochirus**		5/20/2021
S6-T2 -20 -21 -22 -23 -24 -25	T	0520_S6_06	48.0	1127	PFAS - 14 Compounds	Blue Catfish--Ictalurus furcatus	
	T	0520_S6_07	47.0	890			
	T	0520_S6_08	52.0	1292			
	T	0520_S6_09	44.0	791			
	T	0520_S6_10	51.0	1266			
Summary Information	5		**48.4**	**1073.2**	**Ictalurus furcatus**		5/20/2021
Surface Water Samples							
	RS				**PFAS - 14 Compounds**		
	RS				**PFAS - 14 Compounds**		
Blank ID							
S6-FB1 -27	RS	Site 1 Field Blank (S6-FB1)			**PFAS - 14 Compounds**		5/20/2021
TB-3 -28	RS	Trip Blank 3			**PFAS - 14 Compounds**		5/20/2021

LABORATORY INFORMATION

Client Information:	MDE	1800 Washington Blvd.	Baltimore, MD 21230	410-537-3614	Amy.Laliberte@maryland.gov
Project Information:	2021 Fish Tissue PFAS				
Report Information:	Email: Amy.Laliberte@maryland.gov				
Alpha Job #			**Billing Info:**	Same as Client Info.	

Analytical Method: LCMSMS - Isotope Dilution

Delivery Shipment Record:		Deliver/Ship to: (Name, address and phone)		Date/Time Shipped from Collecting Agency:	
Delivery Method: ☑ Hand Carried		Alpha Analytical			
Relinquished by: (signature)	Date/ Time 5/21/21	Received by: (signature) 5/21/21 11:30	Relinquished by: (signature)	Date/Time 5/21/21 17:02	Received by: (signature) 5/21/21 17:02
Relinquished by: (signature)	Date/ Time 5/21/21	Received by Central Processing Laboratory by: (signature) 5/21/21	Date/Time 7300	Remarks: AAC 5/22/21 0315	

Laboratory Custody:

Released Name/Date	Received Name/Date	Purpose	To Location

Chris Johnson 5/22/21 0830

5/27/21

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Serial No:06112117:30

Chain-of-Custody

Project Name: 2021 Piscataway PFAS Sampling

Station No. & FTC yr./Description		Coordinates:		Collecting Agency:	Samplers Initials:
S1	2021	N	38.69522 °	MDE	CNL, CAP, NWK
Site Description Piscataway Creek at tidal headwaters		W	77.00623 °		

Composite ID Number	Sample Matrix	Individual Fish Field ID Number	Length (cm)	863	Requested Contaminants	Species	Collection Date
-29	T	0514_S1_01	41.25	863	PFAS - 14 Compounds	Largemouth Bass--Micropterus salmoides	
-30	T	0514_S1_02	41.25	1028			
S1-T1 -31	T	0514_S1_03	39.4	884			
-32	T	0514_S1_04	39.4	956			
-37	T	0514_S1_05	38.1	823			
Summary Information	5		39.9	910.8	Micropterus salmoides		5/14/2021
-35	T	0514_S1_06	54.6	1772	PFAS - 14 Compounds	Blue Catfish--Ictalurus furcatus	
-36	T	0514_S1_07	49.5	1199			
S1-T2 -37	T	0514_S1_08	46.4	1055			
-38	T	0514_S1_09	45.1	827			
-39	T	0514_S1_10	41.3	552			
Summary Information	5		47.38	1081	Ictalurus furcatus		5/14/2021
Surface Water Samples							
S1-W1 -41	RS	Piscataway Creek - Tidal Water Sample			PFAS - 14 Compounds		5/14/2021
	RS				PFAS - 14 Compounds		5/14/2021
Blank ID							
S1-FB1 -42	RS	Site 1 Field Blank (S1-FB1)			PFAS - 14 Compounds		5/14/2021
TB-1 -43	RS	Trip Blank 1			PFAS - 14 Compounds		5/14/2021

LABORATORY INFORMATION

Client Information:	MDE	1800 Washington Blvd.	Baltimore, MD 21230	410-537-3614	Amy.Laliberte@maryland.gov
Project Information:	2021 Fish Tissue PFAS				
Report Information:	Email: Amy.Laliberte@maryland.gov				
Alpha Job #			**Billing Info:**	Same as Client Info.	

Analytical Method: LCMSMS - Isotope Dilution

Delivery Shipment Record:	Deliver/Ship to: (Name, address and phone)	Date/Time Shipped from Collecting Agency:
Delivery Method: ☑ Hand Carried	Alpha Analytical	

Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Received by: (signature)
	5/21/21	5/21/21 1130 AAL	AAL	5/21/21 17:02	5/21/21 17:02
Relinquished by: (signature)	Date/Time 5/21/21	Received by Central Processing Laboratory by: (signature)	Date/Time 5/21/21 2300	Remarks:	AAL 5/22/21 0315 5/22/21 0315

Laboratory Custody:

Released Name/Date	Received Name/Date	Purpose	To Location

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Chris Jelesan 5/27/21 0830

Serial_No:06172112:54

ANALYTICAL REPORT

Lab Number:	L2128737
Client:	Maryland Department of the Environment 1800 Washington Boulevard Baltimore, MD 21230
ATTN:	Amy Laliberte
Phone:	(410) 537-3614
Project Name:	2021 PISCATAWAY PFAS SAMPLING
Project Number:	Not Specified
Report Date:	06/17/21

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified

Lab Number: L2128737
Report Date: 06/17/21

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2128737-01	0526_S7_01		Not Specified	05/26/21 00:00	05/28/21
L2128737-02	0526_S7_02		Not Specified	05/26/21 00:00	05/28/21
L2128737-03	0526_S7_03		Not Specified	05/26/21 00:00	05/28/21
L2128737-04	0526_S7_04		Not Specified	05/26/21 00:00	05/28/21
L2128737-05	0526_S7_05		Not Specified	05/26/21 00:00	05/28/21
L2128737-06	S7-T1	TISSUE	Not Specified	05/26/21 00:00	05/28/21
L2128737-07	0526_S7_06		Not Specified	05/26/21 00:00	05/28/21
L2128737-08	0526_S7_07		Not Specified	05/26/21 00:00	05/28/21
L2128737-09	0526_S7_08		Not Specified	05/26/21 00:00	05/28/21
L2128737-10	0526_S7_09		Not Specified	05/26/21 00:00	05/28/21
L2128737-11	0526_S7_10		Not Specified	05/26/21 00:00	05/28/21
L2128737-12	S7-T2	TISSUE	Not Specified	05/26/21 00:00	05/28/21
L2128737-13	S7-FB1	WATER	Not Specified	05/26/21 00:00	05/28/21
L2128737-14	TB-4	WATER	Not Specified	05/26/21 00:00	05/28/21

Serial_No:06172112:54

Project Name:	2021 PISCATAWAY PFAS SAMPLING	**Lab Number:**	L2128737
Project Number:	Not Specified	**Report Date:**	06/17/21

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Serial_No:06172112:54

Project Name:	2021 PISCATAWAY PFAS SAMPLING	**Lab Number:**	L2128737
Project Number:	Not Specified	**Report Date:**	06/17/21

Case Narrative (continued)

Perfluorinated Alkyl Acids by Isotope Dilution

WG1512639-1, WG1512639-2, and WG1512639-4: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

The WG1512639-3 MS recovery, performed on L2128737-06, is outside the acceptance criteria for perfluorotridecanoic acid (pftrda) (145%).

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Susan E O'Neil Susan O' Neil

Title: Technical Director/Representative Date: 06/17/21

Serial_No:06172112:54

ORGANICS

Serial_No:06172112:54

SEMIVOLATILES

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

SAMPLE RESULTS

Lab ID: L2128737-06
Client ID: S7-T1
Sample Location: Not Specified

Date Collected: 05/26/21 00:00
Date Received: 05/28/21
Field Prep: Not Specified

Sample Depth:
Matrix: Tissue
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/16/21 21:35
Analyst: MP
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA 23528
Extraction Date: 06/16/21 07:46

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.242	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.484	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.242	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.242	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.242	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.242	--	1
Perfluorooctanesulfonic Acid (PFOS)	5.20		ng/g	0.242	--	1
Perfluorodecanoic Acid (PFDA)	0.504		ng/g	0.242	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.484	--	1
Perfluoroundecanoic Acid (PFUnA)	1.10		ng/g	0.484	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.484	--	1
Perfluorododecanoic Acid (PFDoA)	0.706		ng/g	0.484	--	1
Perfluorotridecanoic Acid (PFTrDA)	1.43	F	ng/g	0.484	--	1
Perfluorotetradecanoic Acid (PFTA)	0.653		ng/g	0.484	--	1

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

SAMPLE RESULTS

Lab ID: L2128737-06 Date Collected: 05/26/21 00:00

Client ID: S7-T1 Date Received: 05/28/21

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	86		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	97		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	93		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	84		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	85		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	74		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	84		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	82		75-130
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	100		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	90		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	86		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	82		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	98		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	85		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	82		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	86		24-159

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Lab Number: L2128737
Project Number: Not Specified
Report Date: 06/17/21

SAMPLE RESULTS

Lab ID: L2128737-12
Client ID: S7-T2
Sample Location: Not Specified

Date Collected: 05/26/21 00:00
Date Received: 05/28/21
Field Prep: Not Specified

Sample Depth:
Matrix: Tissue
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/16/21 22:08
Analyst: MP
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA 23528
Extraction Date: 06/16/21 07:46

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.234	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.467	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.234	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.234	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.234	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.234	--	1
Perfluorooctanesulfonic Acid (PFOS)	3.30	F	ng/g	0.234	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.234	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.467	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.467	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.467	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.467	--	1
Perfluorotridecanoic Acid (PFTrDA)	0.472		ng/g	0.467	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.467	--	1

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

SAMPLE RESULTS

Lab ID: L2128737-12 Date Collected: 05/26/21 00:00

Client ID: S7-T2 Date Received: 05/28/21

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	83		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	91		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	88		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	66		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	85		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	71		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	78		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	80		75-130
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	96		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	84		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	84		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	69		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	95		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	72		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	91		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	80		24-159

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

SAMPLE RESULTS

Lab ID: L2128737-13
Client ID: S7-FB1
Sample Location: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 10:31
Analyst: MP

Date Collected: 05/26/21 00:00
Date Received: 05/28/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 06/02/21 17:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.84	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.84	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.84	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.84	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.84	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.84	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.84	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.84	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.84	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.84	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.84	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.84	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.84	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.84	--	1

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

SAMPLE RESULTS

Lab ID: L2128737-13 Date Collected: 05/26/21 00:00

Client ID: S7-FB1 Date Received: 05/28/21

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	94		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	95		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	88		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	84		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	92		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	84		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	92		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	93		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	102		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	111		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	89		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	104		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	100		22-136

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

SAMPLE RESULTS

Lab ID: L2128737-14
Client ID: TB-4
Sample Location: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 10:47
Analyst: MP

Date Collected: 05/26/21 00:00
Date Received: 05/28/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 06/02/21 17:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.82	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.82	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.82	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.82	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.82	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.82	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.82	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.82	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.82	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.82	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.82	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.82	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.82	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.82	--	1

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

SAMPLE RESULTS

Lab ID: L2128737-14 Date Collected: 05/26/21 00:00

Client ID: TB-4 Date Received: 05/28/21

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	95		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	98		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	89		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	83		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	93		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	84		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	89		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	93		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	85		62-124
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	97		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	98		55-137
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	79		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	96		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	95		22-136

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 09:57
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 06/02/21 17:05

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 13-14 Batch: WG1506705-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified
Lab Number: L2128737
Report Date: 06/17/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/05/21 09:57
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 06/02/21 17:05

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 13-14 Batch: WG1506705-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	90		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	103		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	95		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	96		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	89		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	82		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	91		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	80		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	93		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	84		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	90		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	82		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	89		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	98		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	98		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	46		10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	82		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	94		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	100		22-136

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/16/21 20:56
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 06/16/21 07:46

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 06,12 Batch: WG1512639-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.250	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.500	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.250	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.250	--
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.250	--
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.250	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	0.250	--
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.250	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.500	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.500	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.500	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.500	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.500	--
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.500	--

Serial_No:06172112:54

Project Name: 2021 PISCATAWAY PFAS SAMPLING **Lab Number:** L2128737

Project Number: Not Specified **Report Date:** 06/17/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 06/16/21 20:56
Analyst: MP

Extraction Method: ALPHA 23528
Extraction Date: 06/16/21 07:46

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 06,12 Batch: WG1512639-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	105		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	125		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	114		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**204**	Q	14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	105		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	92		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	104		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	104		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	**163**	Q	20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	132		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	114		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	105		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	**288**	Q	19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**138**	Q	31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	127		61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	40		10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	119		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	95		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	111		24-159

Serial_No:06172112:54

Lab Control Sample Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified
Lab Number: L2128737
Report Date: 06/17/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 13-14 Batch: WG1506705-2								
Perfluorobutanesulfonic Acid (PFBS)	107		-		65-157	-		30
Perfluorohexanoic Acid (PFHxA)	106		-		69-168	-		30
Perfluoroheptanoic Acid (PFHpA)	106		-		58-159	-		30
Perfluorohexanesulfonic Acid (PFHxS)	109		-		69-177	-		30
Perfluorooctanoic Acid (PFOA)	112		-		63-159	-		30
Perfluorononanoic Acid (PFNA)	111		-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	106		-		52-151	-		30
Perfluorodecanoic Acid (PFDA)	105		-		63-171	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	98		-		60-166	-		30
Perfluoroundecanoic Acid (PFUnA)	118		-		60-153	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	105		-		45-170	-		30
Perfluorododecanoic Acid (PFDoA)	107		-		67-153	-		30
Perfluorotridecanoic Acid (PFTrDA)	122		-		48-158	-		30
Perfluorotetradecanoic Acid (PFTA)	125		-		59-182	-		30

Serial_No:06172112:54

Lab Control Sample Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified
Lab Number: L2128737
Report Date: 06/17/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 13-14 Batch: WG1506705-2								

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	93				58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	109				62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98				70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	101				12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	90				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	84				60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	93				71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	85				62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	103				14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	86				59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	94				69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	86				62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	98				10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	99				24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	99				55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	41				10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	86				27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	105				48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	93				22-136

Serial_No:06172112:54

Lab Control Sample Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified
Lab Number: L2128737
Report Date: 06/17/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12 Batch: WG1512639-2								
Perfluorobutanesulfonic Acid (PFBS)	105		-		72-128	-		30
Perfluorohexanoic Acid (PFHxA)	99		-		70-132	-		30
Perfluoroheptanoic Acid (PFHpA)	102		-		71-131	-		30
Perfluorohexanesulfonic Acid (PFHxS)	101		-		67-130	-		30
Perfluorooctanoic Acid (PFOA)	103		-		69-133	-		30
Perfluorononanoic Acid (PFNA)	91		-		72-129	-		30
Perfluorooctanesulfonic Acid (PFOS)	102		-		68-136	-		30
Perfluorodecanoic Acid (PFDA)	101		-		69-133	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	86		-		63-144	-		30
Perfluoroundecanoic Acid (PFUnA)	108		-		64-136	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	89		-		61-139	-		30
Perfluorododecanoic Acid (PFDoA)	102		-		69-135	-		30
Perfluorotridecanoic Acid (PFTrDA)	139		-		66-139	-		30
Perfluorotetradecanoic Acid (PFTA)	110		-		69-133	-		30

Serial_No:06172112:54

Lab Control Sample Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified
Lab Number: L2128737
Report Date: 06/17/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12 Batch: WG1512639-2								

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	104				61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	126				58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	116				74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**221**	Q			14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	102				66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	91				71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	105				78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	103				75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	**179**	Q			20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	129				72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	112				79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	98				75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	**297**	Q			19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	**155**	Q			31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	123				61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	37				10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	115				34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	101				54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	123				24-159

Serial_No:06172112:54

Matrix Spike Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified
Lab Number: L2128737
Report Date: 06/17/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 13-14 QC Batch ID: WG1506705-3 QC Sample: L2129127-01 Client ID: MS Sample												
Perfluorobutanoic Acid (PFBA)	ND	41.8	45.8	110		-	-		67-148	-		30
Perfluoropentanoic Acid (PFPeA)	ND	41.8	43.2	103		-	-		63-161	-		30
Perfluorohexanoic Acid (PFHxA)	ND	41.8	44.9	106		-	-		69-168	-		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	39.3	39.7	101		-	-		52-156	-		30
Perfluoroheptanoic Acid (PFHpA)	ND	41.8	45.1	107		-	-		58-159	-		30
Perfluorooctanoic Acid (PFOA)	468	41.8	508	96		-	-		63-159	-		30
Perfluorononanoic Acid (PFNA)	ND	41.8	46.3	111		-	-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	ND	38.8	41.2	106		-	-		52-151	-		30

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	101				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	97				60-129
Perfluoro[13C4]Butanoic Acid (MPFBA)	90				58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	106				62-163
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	91				69-131
Perfluoro[13C8]Octanoic Acid (M8PFOA)	85				62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	102				59-139

Serial_No:06172112:54

Matrix Spike Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified
Lab Number: L2128737
Report Date: 06/17/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12 QC Batch ID: WG1512639-3 QC Sample: L2128737-06 Client ID: S7-T1												
Perfluorobutanesulfonic Acid (PFBS)	ND	4.25	4.56	107		-	-		72-128	-		30
Perfluorohexanoic Acid (PFHxA)	ND	4.78	4.70	98		-	-		70-132	-		30
Perfluoroheptanoic Acid (PFHpA)	ND	4.78	4.89	102		-	-		71-131	-		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	4.37	4.42	101		-	-		67-130	-		30
Perfluorooctanoic Acid (PFOA)	ND	4.78	4.89	102		-	-		69-133	-		30
Perfluorononanoic Acid (PFNA)	ND	4.78	4.64	93		-	-		72-129	-		30
Perfluorooctanesulfonic Acid (PFOS)	5.20	4.44	9.54	98		-	-		68-136	-		30
Perfluorodecanoic Acid (PFDA)	0.504	4.78	5.49	104		-	-		69-133	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	4.78	4.03	80		-	-		63-144	-		30
Perfluoroundecanoic Acid (PFUnA)	1.10	4.78	6.16	106		-	-		64-136	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	4.78	4.19	83		-	-		61-139	-		30
Perfluorododecanoic Acid (PFDoA)	0.706	4.78	5.42	99		-	-		69-135	-		30
Perfluorotridecanoic Acid (PFTrDA)	1.43F	4.78	8.38	**145**	Q	-	-		66-139	-		30
Perfluorotetradecanoic Acid (PFTA)	0.653	4.78	6.46	121		-	-		69-133	-		30

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	77				14-167
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	87				34-137
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	81				31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	99				61-155
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	82				75-130

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Matrix Spike Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified
Lab Number: L2128737
Report Date: 06/17/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12 QC Batch ID: WG1512639-3 QC Sample: L2128737-06 Client ID: S7-T1												

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	82				66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	71				71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	81				78-139
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	85				54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	84				24-159
Perfluoro[13C4]Butanoic Acid (MPFBA)	83				61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	91				58-150
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	90				79-136
Perfluoro[13C8]Octanoic Acid (M8PFOA)	81				75-130
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	100				72-140
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	89				74-139

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Lab Duplicate Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified

Lab Number: L2128737
Report Date: 06/17/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 13-14 QC Batch ID: WG1506705-4 QC Sample: L2129127-02 Client ID: DUP Sample						
Perfluorobutanoic Acid (PFBA)	ND	ND	ng/l	NC		30
Perfluoropentanoic Acid (PFPeA)	ND	ND	ng/l	NC		30
Perfluorohexanoic Acid (PFHxA)	ND	ND	ng/l	NC		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	ND	ng/l	NC		30
Perfluoroheptanoic Acid (PFHpA)	ND	ND	ng/l	NC		30
Perfluorooctanoic Acid (PFOA)	442	413	ng/l	7		30
Perfluorononanoic Acid (PFNA)	ND	ND	ng/l	NC		30
Perfluorooctanesulfonic Acid (PFOS)	ND	ND	ng/l	NC		30

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	92		90		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	110		108		62-163
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	103		103		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	96		95		60-129
Perfluoro[13C8]Octanoic Acid (M8PFOA)	84		83		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	105		100		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	88		85		69-131

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Lab Duplicate Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified

Lab Number: L2128737
Report Date: 06/17/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12 QC Batch ID: WG1512639-4 QC Sample: L2128737-12 Client ID: S7-T2						
Perfluorobutanesulfonic Acid (PFBS)	ND	ND	ng/g	NC		30
Perfluorohexanoic Acid (PFHxA)	ND	ND	ng/g	NC		30
Perfluoroheptanoic Acid (PFHpA)	ND	ND	ng/g	NC		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	ND	ng/g	NC		30
Perfluorooctanoic Acid (PFOA)	ND	ND	ng/g	NC		30
Perfluorononanoic Acid (PFNA)	ND	ND	ng/g	NC		30
Perfluorooctanesulfonic Acid (PFOS)	3.30F	3.08F	ng/g	7		30
Perfluorodecanoic Acid (PFDA)	ND	ND	ng/g	NC		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	ND	ng/g	NC		30
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ng/g	NC		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	ND	ng/g	NC		30
Perfluorododecanoic Acid (PFDoA)	ND	ND	ng/g	NC		30
Perfluorotridecanoic Acid (PFTrDA)	0.472	ND	ng/g	NC		30
Perfluorotetradecanoic Acid (PFTA)	ND	ND	ng/g	NC		30

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	83		80		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	91		87		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	88		85		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	66		67		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	85		82		66-128

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Lab Duplicate Analysis
Batch Quality Control

Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified

Lab Number: L2128737
Report Date: 06/17/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 06,12 QC Batch ID: WG1512639-4 QC Sample: L2128737-12 Client ID: S7-T2

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	71		69	Q	71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	78		78		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	80		77		75-130
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	96		91		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	84		83		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	84		77		75-130
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	69		68		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	95		91		61-155
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	72		62		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	91		86		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	80		82		24-159

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Project Name: 2021 PISCATAWAY PFAS SAMPLING
Project Number: Not Specified

Lab Number: L2128737
Report Date: 06/17/21

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2128737-01A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-02A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-03A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-04A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-05A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-06A	Plastic 8oz unpreserved	A	NA		3.0	Y	Absent		A2-537-ISOTOPE(28)
L2128737-06X	Plastic 8oz unpreserved	A	NA		3.0	Y	Absent		A2-537-ISOTOPE(28)
L2128737-07A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-08A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-09A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-10A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-11A	Bag	A	NA		3.0	Y	Absent		A2-TISSUE_PREP()
L2128737-12A	Plastic 8oz unpreserved	A	NA		3.0	Y	Absent		A2-537-ISOTOPE(28)
L2128737-12X	Plastic 8oz unpreserved	A	NA		3.0	Y	Absent		A2-537-ISOTOPE(28)
L2128737-13A	Plastic 250ml unpreserved	A	NA		3.0	Y	Absent		A2-537-ISOTOPE(14)
L2128737-14A	Plastic 250ml unpreserved	A	NA		3.0	Y	Absent		A2-537-ISOTOPE(14)

*Values in parentheses indicate holding time in days

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Project Name: 2021 PISCATAWAY PFAS SAMPLING
Lab Number: L2128737
Project Number:
Report Date: 06/17/21

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

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Project Name:	2021 PISCATAWAY PFAS SAMPLING	**Lab Number:**	L2128737
Project Number:	Not Specified	**Report Date:**	06/17/21

GLOSSARY

Acronyms

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: Data Usability Report

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Project Name:	2021 PISCATAWAY PFAS SAMPLING	**Lab Number:**	L2128737
Project Number:	Not Specified	**Report Date:**	06/17/21

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. (Note: 'PFAS, Total (6)' is applicable to MassDEP DW compliance analysis only.). If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

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Project Name:	2021 PISCATAWAY PFAS SAMPLING	**Lab Number:**	L2128737
Project Number:	Not Specified	**Report Date:**	06/17/21

Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

Report Format: Data Usability Report

Serial_No:06172112:54

Project Name:	2021 PISCATAWAY PFAS SAMPLING	**Lab Number:**	L2128737
Project Number:	Not Specified	**Report Date:**	06/17/21

REFERENCES

134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

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Chain-of-Custody

Project Name: 2021 Piscataway PFAS Sampling

Station No. & FTC yr./Description		Coordinates:		Collecting Agency:	Samplers Initials:
S7	2021	N	38.42201 °	MDE	CNL, CAP
Site Description Nanjemoy Creek, NON tidal		W	77.21040 °		

Composite ID Number	Sample Matrix	Individual Fish Field ID Number	Length (cm)	Weight (g/lbs.)	Requested Contaminants	Species	Collection Date
-01	T	0526_S7_01	16.5	79	PFAS - 14 Compounds	Redbreast Sunfish--Lepomis auritus	
-02	T	0526_S7_02	14.0	54			
S7-T1 -03	T	0526_S7_03	14.5	53			
-04	T	0526_S7_04	15.0	58			
-05	T	0526_S7_05	14.5	57			
Summary Information	5		14.9	60.2	Lepomis auritus		5/26/2021
-07	T	0526_S7_06	24.0	209	PFAS - 14 Compounds	Yellow Bullhead Catfish--Ameiurus natalis	
-08	T	0526_S7_07	22.0	137			
S7-T2 -09	T	0526_S7_08	20.0	135			
-10	T	0526_S7_09	19.5	121			
-11	T	0526_S7_10	20.0	109			
Summary Information	5		21.1	142.2	Ameiurus natalis		5/26/2021
Surface Water Samples							
	RS				PFAS - 14 Compounds		
	RS				PFAS - 14 Compounds		
Blank ID							
S7-FB1 -12	RS	Site 7 Field Blank (S7-FB1)			PFAS - 14 Compounds		5/26/2021
TB-4 -14	RS	Trip Blank 4			PFAS - 14 Compounds		5/26/2021

LABORATORY INFORMATION

Client Information:	MDE	1800 Washington Blvd.	Baltimore, MD 21230	410-537-3614	Amy.Laliberte@maryland.gov
Project Information:	2021 Fish Tissue PFAS				
Report Information:	Email: Amy.Laliberte@maryland.gov				
Alpha Job #			Billing Info:	Same as Client Info.	

Analytical Method: LCMSMS - Isotope Dilution

Delivery Shipment Record:		Deliver/Ship to: (Name, address and phone)		Date/Time Shipped from Collecting Agency:	
Delivery Method:		Alpha Analytical		5-28-2021 1000	
☑ Hand Carried					
Relinquished by: (signature)	Date/Time 5-28 1001	Received by: (signature)	Relinquished by: (signature)	Date/Time 5/28/21 1430	Received by: (signature)
Relinquished by: (signature)	Date/Time	Received by Central Processing Laboratory by: (signature)	Date/Time	Remarks:	

Laboratory Custody:			
Released Name/Date	Received Name/Date	Purpose	To Location
	5/28/21	Alpha	
	5/28/21	Alpha 1800	
5/28/21 1130	5/28/21 1130	AAC	5/28/21 1200
AAC 5/29/21 0250			5/29/21 0250

APPENDIX 3: TARGET ANALYTE LIST, ANALYTICAL METHODOLOGY, AND SUPPORTING DOCUMENTATION

APPENDIX 3: Target Analyte List, Analytical Methodology, and Supporting Documentation

Per- and Polyfluoroalkyl Substances (PFAS) Substance Surface Water and Fish Tissue Target Analyte List (TAL) and Methodology

The TAL of PFAS compounds utilized in this study will comprise 1 suite of 14 PFAS compounds (see attached tables identifying the PFAS TALs and approximate method detection limits for water and tissue). Additionally, a brief narrative of the sample preparation and analytical methodology is presented in the supporting documents.

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PFAAs via LCMSMS-Isotope Dilution (WATER)

Holding Time: 14 days
Container/Sample Preservation: 1 - 2 Plastic Trizma/1 Plastic/1 H20+Trizma

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	2	0.284	ng/l	70-130	30	70-130	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	2	0.2632	ng/l	70-130	30	70-130	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	2	0.26	ng/l	70-130	30	70-130	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	2	0.48	ng/l	70-130	30	70-130	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	2	0.624	ng/l	70-130	30	70-130	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	2	0.476	ng/l	70-130	30	70-130	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	2	0.492	ng/l	70-130	30	70-130	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	2	0.644	ng/l	70-130	30	70-130	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOS/	2355-31-9	2	0.936	ng/l	70-130	30	70-130	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	2	0.816	ng/l	70-130	30	70-130	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	2	0.952	ng/l	70-130	30	70-130	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	2	0.648	ng/l	70-130	30	70-130	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	2	0.508	ng/l	70-130	30	70-130	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	2	0.432	ng/l	70-130	30	70-130	30	30			
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	*NONE*									*70-130*		
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	*NONE*									*70-130*		
N-Deuteroethylperfluoro-1-octanesulfonamidoacetic Acid (	*NONE*									*70-130*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

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File: PM8337-1
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PFAAs via LCMSMS-Isotope Dilution (WATER)

Holding Time: 14 days
Container/Sample Preservation: 1 - 2 Plastic/1 Plastic/1 H20 Plastic

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanoic Acid (PFBA)	375-22-4	2	0.408	ng/l	67-148	30	67-148	30	30			
Perfluoropentanoic Acid (PFPeA)	2706-90-3	2	0.396	ng/l	63-161	30	63-161	30	30			
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	2	0.238	ng/l	65-157	30	65-157	30	30			
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	757124-72-4	2	0.452	ng/l	37-219	30	37-219	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	2	0.328	ng/l	69-168	30	69-168	30	30			
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	2	0.2452	ng/l	52-156	30	52-156	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	2	0.2252	ng/l	58-159	30	58-159	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	2	0.376	ng/l	69-177	30	69-177	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	2	0.236	ng/l	63-159	30	63-159	30	30			
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	2	1.332	ng/l	49-187	30	49-187	30	30			
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	2	0.688	ng/l	61-179	30	61-179	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	2	0.312	ng/l	68-171	30	68-171	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	2	0.504	ng/l	52-151	30	52-151	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	2	0.304	ng/l	63-171	30	63-171	30	30			
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	2	1.212	ng/l	56-173	30	56-173	30	30			
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	2	1.12	ng/l	48-150	30	48-150	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA	2355-31-9	2	0.648	ng/l	60-166	30	60-166	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	2	0.26	ng/l	60-153	30	60-153	30	30			
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	2	0.98	ng/l	38-156	30	38-156	30	30			
Perfluorooctanesulfonamide (FOSA)	754-91-6	2	0.58	ng/l	46-170	30	46-170	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA	2991-50-6	2	0.804	ng/l	45-170	30	45-170	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	2	0.372	ng/l	67-153	30	67-153	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	2	0.3272	ng/l	48-158	30	48-158	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	2	0.248	ng/l	59-182	30	59-182	30	30			
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-Heptafluoropropoxy)-P	13252-13-6	50	22.7	ng/l	50-150	30	50-150	30	30			
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	919005-14-4	2	0.336	ng/l	50-150	30	50-150	30	30			
Perfluorohexadecanoic Acid (PFHxDA)	67905-19-5	4	1.24	ng/l	50-150	30	50-150	30	30			
Perfluorooctadecanoic Acid (PFODA)	16517-11-6	4	1.148	ng/l	50-150	30	50-150	30	30			
Perfluorododecane Sulfonic Acid (PFDoDS)	79780-39-5	2	0.616	ng/l	50-150	30	50-150	30	30			
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2FTS)	120226-60-0	5	2.02	ng/l	50-150	30	50-150	30	30			
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF	756426-58-1	2	0.2768	ng/l	50-150	30	50-150	30	30			
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11C	763051-92-9	2	0.2932	ng/l	50-150	30	50-150	30	30			
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	31506-32-8	20	7.36	ng/l	50-150	30	50-150	30	30			
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	4151-50-2	20	6.64	ng/l	50-150	30	50-150	30	30			
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	24448-09-7	50	22.2	ng/l	50-150	30	50-150	30	30			
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	1691-99-2	50	22.52	ng/l	50-150	30	50-150	30	30			
PFOA/PFOS, Total		2	0.236	ng/l				30	30			
PFAS, Total (5)		2	0.2252	ng/l				30	30			
Perfluoro[13C4]Butanoic Acid (MPFBA)	*NONE*									*2-156*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*16-173*		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*31-159*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2	*NONE*									*1-313*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

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PFAAs via LCMSMS-Isotope Dilution (WATER)

Holding Time: 14 days
Container/Sample Preservation: 1 - 2 Plastic/1 Plastic/1 H20 Plastic

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	NONE									21-145		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	NONE									30-139		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	NONE									47-153		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	NONE									36-149		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2	NONE									1-244		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	NONE									34-146		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	NONE									42-146		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	NONE									38-144		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2	NONE									7-170		
N-Deuteromethylperfluoro-1-octanesulfonamidoacetic Acid	NONE									1-181		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	NONE									40-144		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	NONE									1-87		
N-Deuteroethylperfluoro-1-octanesulfonamidoacetic Acid (	NONE									23-146		
Perfluoro[1,2-13C2]Dodecanoic Acid (M2PFDOA)	NONE									24-161		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	NONE									33-143		
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-Heptafluoropropoxy)-1	NONE									50-150		
Perfluoro[13C2]Hexadecanoic Acid (M2PFHxDA)	NONE									50-150		
N-Methyl-d3-Perfluoro-1-Octanesulfonamide (d3-NMeFOSA	NONE									50-150		
N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (d5-NEtFOSA)	NONE									50-150		
2-(N-Methyl-d3-Perfluoro-1-Octanesulfonamido)ethan-d4-c	1265205-95-5									50-150		
2-(N-Ethyl-d5-Perfluoro-1-Octanesulfonamido)ethan-d4-ol	NONE									50-150		

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PFAAs via LCMSMS-Isotope Dilution (TISSUE)

Holding Time: 28 days
Container/Sample Preservation: 1 - Plastic 8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	1	0.039	ng/g	72-128	30	72-128	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	1	0.0525	ng/g	70-132	30	70-132	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	1	0.0451	ng/g	71-131	30	71-131	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	1	0.0605	ng/g	67-130	30	67-130	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	1	0.0419	ng/g	69-133	30	69-133	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	1	0.075	ng/g	72-129	30	72-129	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	1	0.13	ng/g	68-136	30	68-136	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	1	0.067	ng/g	69-133	30	69-133	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA	2355-31-9	1	0.2015	ng/g	63-144	30	63-144	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	1	0.0468	ng/g	64-136	30	64-136	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA	2991-50-6	1	0.0845	ng/g	61-139	30	61-139	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	1	0.07	ng/g	69-135	30	69-135	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	1	0.2045	ng/g	66-139	30	66-139	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	1	0.054	ng/g	69-133	30	69-133	30	30			
Perfluoro[13C4]Butanoic Acid (MPFBA)	*NONE*									*60-153*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*65-182*		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*70-151*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2	*NONE*									*56-138*		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	*NONE*									*61-147*		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	*NONE*									*62-149*		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	*NONE*									*63-166*		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	*NONE*									*62-152*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-	*NONE*									*32-182*		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	*NONE*									*61-154*		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	*NONE*									*65-151*		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	*NONE*									*65-150*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2	*NONE*									*25-186*		
N-Deuteromethylperfluoro-1-octanesulfonamidoacetic Acid	*NONE*									*45-137*		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	*NONE*									*64-158*		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	*NONE*									*1-125*		
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (	*NONE*									*42-136*		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	*NONE*									*56-148*		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	*NONE*									*26-160*		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-1	*NONE*									*50-150*		
Perfluoro[13C2]Hexadecanoic Acid (M2PFHxDA)	*NONE*									*50-150*		
N-Methyl-d3-Perfluoro-1-Octanesulfonamide (d3-NMeFOSA	*NONE*									*50-150*		
N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (d5-NEtFOSA)	*NONE*									*50-150*		
2-(N-Methyl-d3-Perfluoro-1-Octanesulfonamido)ethan-d4-c	*1265205-95-5*									*50-150*		
2-(N-Ethyl-d5-Perfluoro-1-Octanesulfonamido)ethan-d4-ol	*NONE*									*50-150*		

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PFAAs via LCMSMS-Isotope Dilution (TISSUE)

Holding Time: 28 days
Container/Sample Preservation: 1 - Plastic 8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanoic Acid (PFBA)	375-22-4	1	0.0227	ng/g	71-135	30	71-135	30	30			
Perfluoropentanoic Acid (PFPeA)	2706-90-3	1	0.046	ng/g	69-132	30	69-132	30	30			
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	1	0.039	ng/g	72-128	30	72-128	30	30			
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	757124-72-4	1	0.0645	ng/g	62-145	30	62-145	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	1	0.0525	ng/g	70-132	30	70-132	30	30			
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	1	0.0835	ng/g	73-123	30	73-123	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	1	0.0451	ng/g	71-131	30	71-131	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	1	0.0605	ng/g	67-130	30	67-130	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	1	0.0419	ng/g	69-133	30	69-133	30	30			
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	1	0.1795	ng/g	64-140	30	64-140	30	30			
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	1	0.1365	ng/g	70-132	30	70-132	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	1	0.075	ng/g	72-129	30	72-129	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	1	0.13	ng/g	68-136	30	68-136	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	1	0.067	ng/g	69-133	30	69-133	30	30			
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	1	0.287	ng/g	65-137	30	65-137	30	30			
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	1	0.299	ng/g	69-125	30	69-125	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA	2355-31-9	1	0.2015	ng/g	63-144	30	63-144	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	1	0.0468	ng/g	64-136	30	64-136	30	30			
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	1	0.153	ng/g	59-134	30	59-134	30	30			
Perfluorooctanesulfonamide (FOSA)	754-91-6	1	0.098	ng/g	67-137	30	67-137	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA	2991-50-6	1	0.0845	ng/g	61-139	30	61-139	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	1	0.07	ng/g	69-135	30	69-135	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	1	0.2045	ng/g	66-139	30	66-139	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	1	0.054	ng/g	69-133	30	69-133	30	30			
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-P	13252-13-6	10	3.81	ng/g	50-150	30	50-150	30	30			
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	919005-14-4	1	0.0413	ng/g	50-150	30	50-150	30	30			
Perfluorohexadecanoic Acid (PFHxDA)	67905-19-5	2	0.12	ng/g	50-150	30	50-150	30	30			
Perfluorooctadecanoic Acid (PFODA)	16517-11-6	2	0.171	ng/g	50-150	30	50-150	30	30			
Perfluorododecane Sulfonic Acid (PFDoDS)	79780-39-5	1	0.086	ng/g	50-150	30	50-150	30	30			
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2FTS)	120226-60-0	1	0.275	ng/g	50-150	30	50-150	30	30			
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF	756426-58-1	1	0.0374	ng/g	50-150	30	50-150	30	30			
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11C	763051-92-9	1	0.0388	ng/g	50-150	30	50-150	30	30			
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	31506-32-8	1	0.379	ng/g	50-150	30	50-150	30	30			
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	4151-50-2	1	0.407	ng/g	50-150	30	50-150	30	30			
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	24448-09-7	2	0.52	ng/g	50-150	30	50-150	30	30			
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	1691-99-2	2	0.73	ng/g	50-150	30	50-150	30	30			
PFOA/PFOS, Total		1	0.0419	ng/g				30	30			
PFAS, Total (5)		1	0.0419	ng/g				30	30			
Perfluoro[13C4]Butanoic Acid (MPFBA)	*NONE*									*60-153*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*65-182*		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*70-151*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2	*NONE*									*56-138*		

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PFAAs via LCMSMS-Isotope Dilution (TISSUE)

Holding Time: 28 days
Container/Sample Preservation: 1 - Plastic 8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (MSPFHxA)	NONE									61-147		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	NONE									62-149		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	NONE									63-166		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	NONE									62-152		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2	NONE									32-182		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	NONE									61-154		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	NONE									65-151		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	NONE									65-150		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2	NONE									25-186		
N-Deuteriomethyl(perfluoro-1-octanesulfonamido)acetic Acid	NONE									45-137		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	NONE									64-158		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	NONE									1-125		
N-Deuteroethyl(perfluoro-1-octanesulfonamido)acetic Acid (	NONE									42-136		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	NONE									56-148		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	NONE									26-160		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-2	NONE									50-150		
Perfluoro[13C2]Hexadecanoic Acid (M2PFHxDA)	NONE									50-150		
N-Methyl-d3-Perfluoro-1-Octanesulfonamide (d3-NMeFOSA	NONE									50-150		
N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (d5-NEtFOSA)	NONE									50-150		
2-(N-Methyl-d3-Perfluoro-1-Octanesulfonamido)ethan-d4-o	1265205-95-5									50-150		
2-(N-Ethyl-d5-Perfluoro-1-Octanesulfonamido)ethan-d4-ol	NONE									50-150		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Alpha SPE-LC/MS/MS Isotope Dilution Method

EPA Methods 537.1 and 533 are limited to clean water applications primarily. For all other cases, where non-potable water, soils or tissues need to be analyzed, another analytical method will need to be utilized. This is also the case when there are additional, specific PFAS compounds that need to be included that are not on either method's target compound list. EPA did release SW-846 Method 8327 in 2019. While this method was intended for non-potable water, it does not address solid matrices. Anecdotally, this method was not well received in the environmental laboratory community. It specifies direct aqueous injection rather than solid phase extraction (SPE), and the analyte quantification procedure is based on an external rather internal calibration approach that does not incorporate isotopic dilution. The DoD considers Method 8327 a "screening method" (Alyssa G. Wingard, Senior Chemist, NAVSEA 04X6 Laboratory Quality and Accreditation Office (LQAO); July 2019, email correspondence, DENIX).

Given the lack of standardized, published analytical methods for non-drinking water sample media, and the fact that EPA 500 series methods are not allowed to be modified in this way, Alpha Analytical has developed its own procedure. This Alpha method is also a liquid chromatography tandem mass spectrometry method (LC/MS/MS) with solid phase extraction and it is most similar to Method 533 in that it utilizes the weak anion exchange (WAX) SPE cartridge and the method calibration employs the isotope dilution technique. This method incorporates the maximum number of commercially available extracted internal standards, consisting of (18) ^{13}C –enriched and (2) ^{2}H-enriched compounds. As more of these reference standards become available, they will be incorporated into our method as well. We can analyze for up to 36 PFAS compounds, or any subset, using this approach. We analyze a wide range of sample matrices in addition to aqueous samples including soils/sediments, biosolids, and tissues. Given our laboratory's extensive background supporting ecological risk assessments in general, we have considerable experience working with fish, shellfish, soils and sediments.

In practice, aqueous reporting limits are 2 ng/L and we have demonstrated reporting limits in the range of 1 ng/G for oyster samples from a past project. Some of the more difficult target analytes have poorer performance and higher reporting limits. Please see the attached compound lists and the associated standard RL/MDL information that is included with our quotation.

Summary of Method

A 250-mL water sample is fortified with extracted internal standards (EIS) and passed through a solid phase extraction (WAX) cartridge containing a mixed mode, Weak Anion Exchange, reversed phase, water-wettable polymer to extract the method analytes and isotopically-labeled compounds. The compounds are eluted from the solid phase in two fractions. An injection is made into an LC equipped with a C18 column that is interfaced to an MS/MS. The analytes are separated and identified by comparing the acquired mass spectra and retention times to reference spectra and retention times for calibration standards acquired under

identical LC/MS/MS conditions. The concentration of each analyte is determined by using the isotope dilution technique. Extracted Internal Standards (EIS) analytes are used to monitor the extraction efficiency of the method analytes.

Initial Calibration Verification (ICV)

As part of the IDC and after each ICAL, analyze a QCS sample from a source different from the source of the CAL standards. If a second vendor is not available, then a different lot of the standard should be used. The QCS should be prepared and analyzed just like a CCV. Acceptance criteria for the QCS are identical to the CCVs; the calculated amount for each analyte must be ± 30% of the expected value. If measured analyte concentrations are not of acceptable accuracy, check the entire analytical procedure to locate and correct the problem

Continuing Calibration Verification (CCV)

CCV Standards are analyzed at the beginning of each analysis batch, after every 10 Field Samples, and at the end of the analysis batch. See Section 10.7 for concentration requirements and acceptance criteria.

Initial Calibration - Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed. After the initial calibration is successful, a CCV is required at the beginning and end of each period in which analyses are performed, and after every tenth Field Sample.

Establish LC operating parameters that optimize resolution and peak shape. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

Inject a mid-level CAL standard under LC/MS conditions to obtain the retention times of each method analyte.

Inject a mid-level CAL standard under optimized LC/MS/MS conditions to ensure that each method analyte is observed in its MS/MS window and that there are at least 10 scans across the peak for optimum precision.

CAL standards are prepared according to SOP. The lowest concentration CAL standard must be at or below the RL (2 ng/L), which may depend on system sensitivity.

The LC/MS/MS system is calibrated using the IS technique. Use the LC/MS/MS data system software to generate a linear regression or quadratic calibration curve for each of the analytes. This curve must always be forced through zero and may be concentration weighted, if necessary. Forcing zero allows for a better estimate of the background levels of method analytes. A minimum of 5 levels are required for a linear calibration model and a minimum of 6 levels are required for a quadratic calibration model.

CALIBRATION ACCEPTANCE CRITERIA – A linear fit is acceptable if the coefficient of determination (r2) is greater than 0.99. When quantitated using the initial calibration curve, each calibration point, except the lowest point, for each analyte should calculate to be within 70-130% of its true value. The lowest CAL point should calculate to be within 50-150% of its true value. If these criteria cannot be met, the analyst will have difficulty meeting ongoing QC criteria. It is recommended that corrective action is taken to reanalyze the CAL standards, restrict the range of calibration, or select an alternate method of calibration (forcing the curve through zero is still required).

CONTINUING CALIBRATION CHECK (CCV) – Minimum daily calibration verification is as follows. Verify the initial calibration at the beginning and end of each group of analyses, and after every tenth sample during analyses. In this context, a "sample" is considered to be a Field Sample. MBs, CCVs, LCSs, MSs, FDs FRBs and MSDs are not counted as samples. The beginning CCV of each analysis batch must be at or below the RL in order to verify instrument sensitivity prior to any analyses. If standards have been prepared such that all low CAL points are not in the same CAL solution, it may be necessary to analyze two CAL standards to meet this requirement. Alternatively, the analyte concentrations in the analyte PDS may be customized to meet these criteria. Subsequent CCVs should alternate between a medium and Low concentration CAL standard.

REMEDIAL ACTION – Failure to meet CCV QC performance criteria may require remedial action. Major maintenance, such as cleaning the electrospray probe, atmospheric pressure ionization source, cleaning the mass analyzer, replacing the LC column, etc., requires recalibration (Sect 10.6) and verification of sensitivity by analyzing a CCV at or below the RL (Sect 10.7).

PFAS Tissue Prep Summary

Sample Prep and Extraction Protocol for Tissues, Oils and Biosolids, Methanol Extraction

Homogenize and weigh sample (measured to the nearest hundredth of a gram) into a 50 ml polypropylene centrifuge tube. For laboratory control blanks and spikes, clean sand is used. Add EIS PDS to each sample.

If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS . Cap and invert each sample to mix. Samples vortexed, sonicated and centrifuged.

Extract Clean-up: Tissues, Oils and Biosolids

CARTRIDGE CLEAN-UP AND CONDITIONING – WAX cartridge and GCB cartridges. Sequential rinses. Attach the sample transfer tubes, turn on the vacuum.

SAMPLE elution AND CARTRIDGE RINSE

Extract Concentration

Concentrate the extract to dryness under a gentle stream of nitrogen in a heated water bath. Vortex

APPENDIX 4: RISK CALCULATION SPREADSHEETS

Surface Water Recreator - 52 days per year

Site-specific
Recreator Surface Water Inputs 1

Variable	Recreator Surface Water Default Value	Form-input Value
$BW_{a,2}$ (body weight) kg	15	15
$BW_{2,6}$ (body weight) kg	15	15
$BW_{6,16}$ (body weight) kg	80	80
$BW_{16,30}$ (body weight) kg	80	80
BW_{a} (body weight - adult) kg	80	80
BW_{adult} (body weight - adult) kg	80	80
$DFW_{mc,adj}$ (age-adjusted dermal factor) cm ^{2}-event/kg	.	387868
$DFWM_{mc,adj}$ (mutagenic age-adjusted dermal factor) cm ^{2}-event/kg	.	1217042.66
ED_{mr} (exposure duration - recreator) years	26	26
$ED_{a,2}$ (exposure duration) years	2	2
$ED_{2,6}$ (exposure duration) years	4	4
$ED_{6,16}$ (exposure duration) years	10	10
$ED_{16,30}$ (exposure duration) years	10	10
$ED_{mr,a}$ (exposure duration - adult) years	20	20
EF_{recall} (exposure frequency) days/year	.	52
$EF_{2,6}$ (exposure frequency) days/year	.	52
$EF_{6,16}$ (exposure frequency) days/year	.	52
$EF_{16,30}$ (exposure frequency) days/year	.	52
$EF_{mr,a}$ (adult exposure frequency) days/year	.	52
$ET_{a,2}$ (exposure time) hours/event	.	2
$ET_{2,6}$ (exposure time) hours/event	.	2
$ET_{6,16}$ (exposure time) hours/event	.	2
$ET_{16,30}$ (exposure time) hours/event	.	2
$ET_{mr,a}$ (adult exposure time) hours/event	.	2
$EV_{a,2}$ (events) events/day	.	1
$EV_{2,6}$ (events) events/day	.	1
$EV_{6,16}$ (events) events/day	.	1
$EV_{16,30}$ (events) events/day	.	1
$EV_{mr,a}$ (adult) events/day	.	1
THQ (target hazard quotient) unitless	0.1	1

Output generated 28SEP2021:13:15:42

Site-specific
Recreator Surface Water Inputs

2

Variable	Recreator Surface Water Default Value	Form-input Value
IFW (age-adjusted water intake rate) L/kg	.	7.852
IFWM (mutagenic age-adjusted water intake rate) L/kg	.	32.741
IRW (water intake rate) L/hour	0.12	0.12
IRW (water intake rate) L/hour	0.12	0.12
IRW (water intake rate) L/hour	0.124	0.124
IRW (water intake rate) L/hour	0.0985	0.0985
IRW (water intake rate - adult) L/day	0.11	0.11
IRW (water intake rate - adult) L/hr	0.11	0.11
LT (lifetime - recreator) years	70	70
SA (skin surface area) cm ^{2}	6365	6365
SA (skin surface area) cm ^{2}	6365	6365
SA (skin surface area) cm ^{2}	19652	19652
SA (skin surface area) cm ^{2}	19652	19652
SA (skin surface area - adult) cm ^{2}	19652	19652
SA (skin surface area - adult) cm ^{2}	19652	19652
Apparent thickness of stratum corneum (cm)	0.001	0.001
TR (target risk) unitless	1.0E-06	1.0E-05

Output generated 28SEP2021:13:15:42

Site-specific

3

Recreator Regional Screening Levels (RSL) for Surface Water

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Chemical Type	SF$_o$ (mg/kg-day)$^{-1}$	SF$_o$ Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	RAGSe GIABS (unitless)	K$_p$ (cm/hr)	MW	FA (unitless)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	Organics	-		3.00E-04	P	-		1	0.0000193	300.1	1
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	Organics	-		2.00E-05	D	-		1	4.6851E-7	500.1	1
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	Organics	7.00E-02	D	2.00E-05	D	-		1	-	414.4	0

In EPD?	DA$_{event}$ (ca)*	DA$_{event}$ (nc child)*	DA$_{event}$ (nc adult)*	Ingestion SL TR=1E-05 (ug/L)	Dermal SL TR=1E-05 (ug/L)	Carcinogenic SL TR=1E-05 (ug/L)	Ingestion SL (Child) THQ=1 (ug/L)	Dermal SL (Child) THQ=1 (ug/L)	Noncarcinogenic SL (Child) THQ=1 (ug/L)	Ingestion SL (Adult) THQ=1 (ug/L)	Dermal SL (Adult) THQ=1 (ug/L)	Noncarcinogenic SL (Adult) THQ=1 (ug/L)	Screening Level (ug/L)
Yes	-	0.0049625	0.0085722	-	-	-	1.32E+02	2.93E+04	1.31E+02	7.66E+02	5.07E+04	7.54E+02	1.31E+02 nc
No	-	-	-	-	-	-	8.77E+00	-	8.77E+00	5.10E+01	-	5.10E+01	8.77E+00 nc
No	-	-	-	4.65E+02	-	4.65E+02	8.77E+00	-	8.77E+00	5.10E+01	-	5.10E+01	8.77E+00 nc

Output generated 28SEP2021:13:15:42

Surface Water Recreator - 26 days per year

Site-specific
Recreator Surface Water Inputs 1

Variable	Recreator Surface Water Default Value	Form-input Value
BW_{1-2} (body weight) kg	15	15
BW_{3-5} (body weight) kg	15	15
BW_{6-15} (body weight) kg	80	80
BW_{16-30} (body weight) kg	80	80
BW_{a} (body weight - adult) kg	80	80
BW_{recr-a} (body weight - adult) kg	80	80
$DFW_{recr-adj}$ (age-adjusted dermal factor) cm^2-event/kg	.	193934
$DFWM_{recr-adj}$ (mutagenic age-adjusted dermal factor) cm^2-event/kg	.	608521.333
ED_{recr} (exposure duration - recreator) years	26	26
ED_{1-2} (exposure duration) years	2	2
ED_{3-5} (exposure duration) years	4	4
ED_{6-15} (exposure duration) years	10	10
ED_{16-30} (exposure duration) years	10	10
ED_{recr-a} (exposure duration - adult) years	20	20
EF_{recr} (exposure frequency) days/year	.	26
EF_{3-5} (exposure frequency) days/year	.	26
EF_{6-15} (exposure frequency) days/year	.	26
EF_{16-30} (exposure frequency) days/year	.	26
EF_{recr-a} (adult exposure frequency) days/year	.	26
ET_{1-2} (exposure time) hours/event	.	2
ET_{3-5} (exposure time) hours/event	.	2
ET_{6-15} (exposure time) hours/event	.	2
ET_{16-30} (exposure time) hours/event	.	2
ET_{recr-a} (adult exposure time) hours/event	.	2
EV_{1-2} (events) events/day	.	1
EV_{3-5} (events) events/day	.	1
EV_{6-15} (events) events/day	.	1
EV_{16-30} (events) events/day	.	1
EV_{recr-a} (adult) events/day	.	1
THQ (target hazard quotient) unitless	0.1	1

Output generated 28SEP2021:13:13:14

Site-specific
Recreator Surface Water Inputs

2

Variable	Recreator Surface Water Default Value	Form-input Value
IFW (age-adjusted water intake rate) L/kg	.	3.926
IFWM (mutagenic age-adjusted water intake rate) L/kg	.	16.37
IRW (water intake rate) L/hour	0.12	0.12
IRW (water intake rate) L/hour	0.12	0.12
IRW (water intake rate) L/hour	0.124	0.124
IRW (water intake rate) L/hour	0.0985	0.0985
IRW (water intake rate - adult) L/day	0.11	0.11
IRW (water intake rate - adult) L/hr	0.11	0.11
LT (lifetime - recreator) years	70	70
SA (skin surface area) cm ^{2}	6365	6365
SA (skin surface area) cm ^{2}	6365	6365
SA (skin surface area) cm ^{2}	19652	19652
SA (skin surface area) cm ^{2}	19652	19652
SA (skin surface area - adult) cm ^{2}	19652	19652
SA (skin surface area - adult) cm ^{2}	19652	19652
Apparent thickness of stratum corneum (cm)	0.001	0.001
TR (target risk) unitless	1.0E-06	1.0E-05

Site-specific
Recreator Regional Screening Levels (RSL) for Surface Water

3

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Chemical Type	SF$_o$ (mg/kg-day)$^{-1}$	SF$_o$ Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	RAGSe GIABS (unitless)	K$_\backslash$ (cm/hr)	MW	FA (unitless)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	Organics	-		3.00E-04	P	-		1	0.0000193	300.1	1
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	Organics	-		2.00E-05	D	-		1	4.6851E-7	500.1	1
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	Organics	7.00E-02	D	2.00E-05	D	-		1	-	414.4	0

In EPD?	DA	DA	DA	Ingestion SL TR=1E-05 (ug/L)	Dermal SL TR=1E-05 (ug/L)	Carcinogenic SL TR=1E-05 (ug/L)	Ingestion SL (Child) THQ=1 (ug/L)	Dermal SL (Child) THQ=1 (ug/L)	Noncarcinogenic SL (Child) THQ=1 (ug/L)	Ingestion SL (Adult) THQ=1 (ug/L)	Dermal SL (Adult) THQ=1 (ug/L)	Noncarcinogenic SL (Adult) THQ=1 (ug/L)	Screening Level (ug/L)
Yes	-	0.0099251	0.0171445	-	-	-	2.63E+02	5.87E+04	2.62E+02	1.53E+03	1.01E+05	1.51E+03	2.62E+02 nc
No	-	-	-	-	-	-	1.75E+01	-	1.75E+01	1.02E+02	-	1.02E+02	1.75E+01 nc
No	-	-	-	9.30E+02	-	9.30E+02	1.75E+01	-	1.75E+01	1.02E+02	-	1.02E+02	1.75E+01 nc

Adult MDE Fish Consumption, 96 days, 8oz Meal

Site-specific
Fish Fish Inputs

1

Variable	Fish Fish Default Value	Form-input Value
AT (averaging time)	365	365
BW_{nc-ch} (body weight) kg	80	76
ED_{nc} (exposure duration) yr	26	26
EF_{nc-ch} (exposure frequency) days/yr	350	365
THQ (target hazard quotient) unitless	0.1	1
$IRFI_{nc-ch}$ (fish consumption rate - adult) mg/day		59650
LT (lifetime) yr	70	70
TR (target cancer risk) unitless	1.0E-06	1.0E-05

Site-specific
Fish Regional Screening Levels (RSL) for Fish

2

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o (mg/kg-day)$^{-1}$	SF_o Ref	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	P	-	3.82E-01	3.82E-01 nc
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-05	D	-	2.55E-02	2.55E-02 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	2.00E-05	D	4.90E-01	2.55E-02	2.55E-02 nc

Adult MDE Fish Consumption, 48 Days, 8oz Meal

Site-specific
Fish Fish Inputs

Variable	Fish Fish Default Value	Form-input Value
AT (averaging time)	365	365
BW (body weight) kg	80	76
ED (exposure duration) yr	26	26
EF (exposure frequency) days/yr	350	365
THQ (target hazard quotient) unitless	0.1	1
IRFI (fish consumption rate - adult) mg/day		29825
LT (lifetime) yr	70	70
TR (target cancer risk) unitless	1.0E-06	1.0E-05

Site-specific
Fish Regional Screening Levels (RSL) for Fish

2

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o (mg/kg-day)$^{-1}$	SF_o Ref	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	P	-	7.64E-01	7.64E-01 nc
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-05	D	-	5.10E-02	5.10E-02 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	2.00E-05	D	9.80E-01	5.10E-02	5.10E-02 nc

Adult MDE Fish Consumption, 12 days, 8oz Meal

Site-specific 1
Fish Fish Inputs

Variable	Fish Fish Default Value	Form-input Value
AT (averaging time)	365	365
BW_{adult} (body weight) kg	80	76
ED_{adult} (exposure duration) yr	26	26
EF_{adult} (exposure frequency) days/yr	350	365
THQ (target hazard quotient) unitless	0.1	1
$IRFI_{adult}$ (fish consumption rate - adult) mg/day		7456
LT (lifetime) yr	70	70
TR (target cancer risk) unitless	1.0E-06	1.0E-05

Site-specific 2
Fish Regional Screening Levels (RSL) for Fish
Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o (mg/kg-day)$^{-1}$	SF_o Ref	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	P	-	3.06E+00	3.06E+00 nc
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-05	D	-	2.04E-01	2.04E-01 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	2.00E-05	D	3.92E+00	2.04E-01	2.04E-01 nc

Child-bearing Women Fish Consumption, 96 days, 8oz Meal

Site-specific
Fish Fish Inputs

1

Variable	Fish Fish Default Value	Form-input Value
AT (averaging time)	365	365
BW_{adult} (body weight) kg	80	67
ED_{adult} (exposure duration) yr	26	26
EF_{adult} (exposure frequency) days/yr	350	365
THQ (target hazard quotient) unitless	0.1	1
$IRFI_{adult}$ (fish consumption rate - adult) mg/day		59650
LT (lifetime) yr	70	70
TR (target cancer risk) unitless	1.0E-06	1.0E-05

Site-specific
Fish Regional Screening Levels (RSL) for Fish

2

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o (mg/kg-day)$^{-1}$	SF_o Ref	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	P	-	3.37E-01	3.37E-01 nc
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-05	D	-	2.25E-02	2.25E-02 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	2.00E-05	D	4.32E-01	2.25E-02	2.25E-02 nc

Child-bearing Women Fish Consumption, 48 days, 8oz Meal

Site-specific
Fish Fish Inputs

1

Variable	Fish Fish Default Value	Form-input Value
AT (averaging time)	365	365
$BW_{\_\_\_}$ (body weight) kg	80	67
$ED_{\_\_\_}$ (exposure duration) yr	26	26
$EF_{\_\_\_}$ (exposure frequency) days/yr	350	365
THQ (target hazard quotient) unitless	0.1	1
$IRFI_{\_\_\_}$ (fish consumption rate - adult) mg/day		29825
LT (lifetime) yr	70	70
TR (target cancer risk) unitless	1.0E-06	1.0E-05

Site-specific
Fish Regional Screening Levels (RSL) for Fish

2

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF (mg/kg-day)$^{-1}$	SF Ref	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	P	-	6.74E-01	6.74E-01 nc
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-05	D	-	4.49E-02	4.49E-02 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	2.00E-05	D	8.64E-01	4.49E-02	4.49E-02 nc

Child-bearing Women Fish Consumption, 12 days, 8oz Meal

Site-specific
Fish Fish Inputs

1

Variable	Fish Fish Default Value	Form-input Value
AT (averaging time)	365	365
BW_{adult} (body weight) kg	80	67
ED_{adult} (exposure duration) yr	26	26
EF_{adult} (exposure frequency) days/yr	350	365
THQ (target hazard quotient) unitless	0.1	1
$IRFI_{\text{adult}}$ (fish consumption rate - adult) mg/day		7456
LT (lifetime) yr	70	70
TR (target cancer risk) unitless	1.0E-06	1.0E-05

Site-specific
Fish Regional Screening Levels (RSL) for Fish

2

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o (mg/kg-day)$^{-1}$	SF_o Ref	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	P	-	2.70E+00	2.70E+00 nc
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-05	D	-	1.80E-01	1.80E-01 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	2.00E-05	D	3.46E+00	1.80E-01	1.80E-01 nc

Child Fish Consumption, 96 days, 3oz Meal

Site-specific
Fish Fish Inputs

1

Variable	Fish Fish Default Value	Form-input Value
AT (averaging time)	365	365
BW_{adult} (body weight) kg	80	14.5
ED_{adult} (exposure duration) yr	26	26
EF_{adult} (exposure frequency) days/yr	350	365
THQ (target hazard quotient) unitless	0.1	1
$IRFI_{adult}$ (fish consumption rate - adult) mg/day		22369
LT (lifetime) yr	70	70
TR (target cancer risk) unitless	1.0E-06	1.0E-05

Site-specific
Fish Regional Screening Levels (RSL) for Fish

2

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o (mg/kg-day)$^{-1}$	SF_o Ref	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	P	-	1.94E-01	1.94E-01 nc
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-05	D	-	1.30E-02	1.30E-02 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	2.00E-05	D	2.49E-01	1.30E-02	1.30E-02 nc

Child Fish Consumption, 48 days, 3oz Meal

Site-specific
Fish Fish Inputs

1

Variable	Fish Fish Default Value	Form-input Value
AT (averaging time)	365	365
BW_{ma-c} (body weight) kg	80	14.5
ED_{ma} (exposure duration) yr	26	26
EF_{ma-c} (exposure frequency) days/yr	350	365
THQ (target hazard quotient) unitless	0.1	1
$IRFI_{ma-c}$ (fish consumption rate - adult) mg/day		11184
LT (lifetime) yr	70	70
TR (target cancer risk) unitless	1.0E-06	1.0E-05

Site-specific
Fish Regional Screening Levels (RSL) for Fish

2

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o (mg/kg-day)$^{-1}$	SF_o Ref	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	P	-	3.89E-01	3.89E-01 nc
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-05	D	-	2.59E-02	2.59E-02 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	2.00E-05	D	4.99E-01	2.59E-02	2.59E-02 nc

Child Fish Consumption, 12 days, 3oz Meal

Site-specific
Fish Fish Inputs

1

Variable	Fish Fish Default Value	Form-input Value
AT (averaging time)	365	365
$BW_{\text{---}}$ (body weight) kg	80	14.5
$ED_{\text{---}}$ (exposure duration) yr	26	26
$EF_{\text{---}}$ (exposure frequency) days/yr	350	365
THQ (target hazard quotient) unitless	0.1	1
$IRFI_{\text{---}}$ (fish consumption rate - adult) mg/day		2796
LT (lifetime) yr	70	70
TR (target cancer risk) unitless	1.0E-06	1.0E-05

Site-specific
Fish Regional Screening Levels (RSL) for Fish

2

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o (mg/kg-day)$^{-1}$	SF_o Ref	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutane sulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	P	-	1.56E+00	1.56E+00 nc
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-05	D	-	1.04E-01	1.04E-01 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	2.00E-05	D	1.99E+00	1.04E-01	1.04E-01 nc

APPENDIX 5: EXPOSURE EQUATIONS AND VARIABLES

Exposure Equations and Variables

Noncarcinogenic - Child

The recreator surface water land use equation, presented here, contains the following exposure routes:

- incidental ingestion of water

$$SL_{rec\text{-}wat\text{-}nc\text{-}ing\text{-}c}\left(\mu g/L\right)=\frac{THQ\times AT_{rec\text{-}c}\left(\frac{365\ days}{year}\right)\times ED_{rec\text{-}c}\left(6\ years\right)\times BW_{rec\text{-}c}\left(15\ kg\right)\times\left(\frac{1000\ \mu g}{mg}\right)}{EF_{rec\text{-}c}\left(\frac{days}{year}\right)\times ED_{rec\text{-}c}\left(6\ years\right)\times\frac{1}{RfD_o\left(\frac{mg}{kg\text{-}d}\right)}\times IRW_{rec\text{-}c}\left(\frac{0.12\ L}{hour}\right)\times EV_{rec\text{-}c}\left(\frac{events}{day}\right)\times ET_{event\text{-}rec\text{-}c}\left(\frac{hours}{event}\right)}$$

- dermal

FOR INORGANICS:

$$SL_{rec\text{-}wat\text{-}nc\text{-}der\text{-}c}\left(\mu g/L\right)=\frac{DA_{event}\left(\frac{ug}{cm^2\text{-}event}\right)\times\left(\frac{1000\ cm^3}{L}\right)}{K_p\left(\frac{cm}{hour}\right)\times ET_{event\text{-}rec\text{-}c}\left(\frac{hours}{event}\right)}$$

FOR ORGANICS:

$$IF\ ET_{event\text{-}rec\text{-}c}\left(\frac{hours}{event}\right)\le t^*\left(hour\right),then\ SL_{rec\text{-}wat\text{-}nc\text{-}der}\left(\mu g/L\right)=\frac{DA_{event}\left(\frac{ug}{cm^2\text{-}event}\right)\times\left(\frac{1000\ cm^3}{L}\right)}{2\times FA\times K_p\left(\frac{cm}{hour}\right)\sqrt{\frac{6\times\tau_{event}\left(\frac{hours}{event}\right)\times ET_{event\text{-}rec\text{-}c}\left(\frac{hours}{event}\right)}{\pi}}}$$

or,

$$IF\ ET_{event\text{-}rec\text{-}c}\left(\frac{hours}{event}\right)>t^*\left(hour\right),then\ SL_{rec\text{-}wat\text{-}nc\text{-}der}\left(\mu g/L\right)=\frac{DA_{event}\left(\frac{ug}{cm^2\text{-}event}\right)\times\left(\frac{1000\ cm^3}{L}\right)}{FA\times K_p\left(\frac{cm}{hour}\right)\times\left[\frac{ET_{event\text{-}rec\text{-}c}\left(\frac{hours}{event}\right)}{1+B}+2\times\tau_{event}\left(\frac{hours}{event}\right)\times\left(\frac{1+3B+3B^2}{\left(1+B\right)^2}\right)\right]}$$

where:

$$DA_{event}\left(\frac{ug}{cm^2\text{-}event}\right)=\frac{THQ\times AT_{rec\text{-}c}\left(\frac{365\ days}{year}\right)\times ED_{rec\text{-}c}\left(6\ years\right)\times\left(\frac{1000\ \mu g}{mg}\right)\times BW_{rec\text{-}c}\left(15\ kg\right)}{\left(\frac{1}{RfD_o\left(\frac{mg}{kg\text{-}day}\right)\times GIABS}\right)\times EV_{rec\text{-}c}\left(\frac{events}{day}\right)\times ED_{rec\text{-}c}\left(6\ years\right)\times EF_{rec\text{-}c}\left(\frac{days}{year}\right)\times SA_{rec\text{-}c}\left(6365\ cm^2\right)}$$

- Total

$$SL_{rec\text{-}wat\text{-}nc\text{-}tot\text{-}c}\left(\mu g/L\right)=\frac{1}{\frac{1}{SL_{rec\text{-}wat\text{-}nc\text{-}ing\text{-}c}}+\frac{1}{SL_{rec\text{-}wat\text{-}nc\text{-}der\text{-}c}}}$$

Noncarcinogenic - Adult

The recreator surface water land use equation, presented here, contains the following exposure routes:

- incidental ingestion of water

$$SL_{rec\text{-}wat\text{-}nc\text{-}ing\text{-}a}\left(\mu g/L\right)=\frac{THQ\times AT_{rec\text{-}a}\left(\frac{365\ days}{year}\times ED_{rec\text{-}a}\left(20\ years\right)\right)\times BW_{rec\text{-}a}\left(80\ kg\right)\times\left(\frac{1000\ \mu g}{mg}\right)}{EF_{rec\text{-}a}\left(\frac{days}{year}\right)\times ED_{rec\text{-}a}\left(20\ years\right)\times\frac{1}{RfD_o\left(\frac{mg}{kg\text{-}d}\right)}\times IRW_{rec\text{-}a}\left(\frac{0.11\ L}{hour}\right)\times EV_{rec\text{-}a}\left(\frac{events}{day}\right)\times ET_{event\text{-}rec\text{-}a}\left(\frac{hours}{event}\right)}$$

- dermal

FOR INORGANICS:

$$SL_{rec\text{-}wat\text{-}nc\text{-}der\text{-}a}\left(\mu g/L\right)=\frac{DA_{event}\left(\frac{ug}{cm^2\text{-}event}\right)\times\left(\frac{1000\ cm^3}{L}\right)}{K_p\left(\frac{cm}{hour}\right)\times ET_{event\text{-}rec\text{-}c}\left(\frac{hours}{event}\right)}$$

FOR ORGANICS:

$$IF\ ET_{event\text{-}rec\text{-}a}\left(\frac{hours}{event}\right)\le t^*\left(hour\right),then\ SL_{rec\text{-}wat\text{-}nc\text{-}der}\left(\mu g/L\right)=\frac{DA_{event}\left(\frac{ug}{cm^2\text{-}event}\right)\times\left(\frac{1000\ cm^3}{L}\right)}{2\times FA\times K_p\left(\frac{cm}{hour}\right)\sqrt{\frac{6\times\tau_{event}\left(\frac{hours}{event}\right)\times ET_{event\text{-}rec\text{-}a}\left(\frac{hours}{event}\right)}{\pi}}}$$

or,

$$IF\ ET_{event\text{-}rec\text{-}a}\left(\frac{hours}{event}\right)>t^*\left(hour\right),then\ SL_{rec\text{-}wat\text{-}nc\text{-}der}\left(\mu g/L\right)=\frac{DA_{event}\left(\frac{ug}{cm^2\text{-}event}\right)\times\left(\frac{1000\ cm^3}{L}\right)}{FA\times K_p\left(\frac{cm}{hour}\right)\times\left[\frac{ET_{event\text{-}rec\text{-}a}\left(\frac{hours}{event}\right)}{1+B}+2\times\tau_{event}\left(\frac{hours}{event}\right)\times\left(\frac{1+3B+3B^2}{\left(1+B\right)^2}\right)\right]}$$

where:

$$DA_{event}\left(\frac{ug}{cm^2\text{-}event}\right)=\frac{THQ\times AT_{rec\text{-}a}\left(\frac{365\ days}{year}\times ED_{rec\text{-}a}\left(20\ years\right)\right)\times\left(\frac{1000\ \mu g}{mg}\right)\times BW_{rec\text{-}a}\left(80\ kg\right)}{\left(\frac{1}{RfD_o\left(\frac{mg}{kg\text{-}day}\right)\times GIABS}\right)\times EV_{rec\text{-}a}\left(\frac{events}{day}\right)\times ED_{rec\text{-}a}\left(20\ years\right)\times EF_{rec\text{-}a}\left(\frac{days}{year}\right)\times SA_{rec\text{-}a}\left(19652\ cm^2\right)}$$

- Total

$$SL_{rec\text{-}wat\text{-}nc\text{-}tot\text{-}a}\left(\mu g/L\right)=\frac{1}{\frac{1}{SL_{rec\text{-}wat\text{-}nc\text{-}ing\text{-}a}}+\frac{1}{SL_{rec\text{-}wat\text{-}nc\text{-}der\text{-}a}}}$$

Ingestion of Fish

The fish RSL represents the concentration, in the fish, that can be consumed. Note: the consumption rate for fish is not age adjusted for this land use.

The ingestion of fish land use is not provided in the Generic Tables but RSLs can be created by using the Calculator.

Noncarcinogenic

The ingestion of fish equation, presented here, contains the following exposure route:

- consumption of fish.

$$SL_{res\text{-}fsh\text{-}nc\text{-}ing}\left(\frac{mg}{kg}\right) = \frac{THQ \times AT_{res\text{-}a}\left(\frac{365\ days}{year}\right) \times ED_{res}\left(26\ years\right) \times BW_{res\text{-}a}\left(80\ kg\right)}{EF_{res\text{-}a}\left(\frac{350\ days}{year}\right) \times ED_{res}\left(26\ years\right) \times \frac{1}{RfD_o\left(\frac{mg}{kg\text{-}day}\right)} \times IRF_{res\text{-}a}\left(\frac{mg}{day}\right) \times \frac{10^{-6}kg}{1mg}}$$

Recreator SLs			
$SL_{rec\text{-}water\text{-}nc\text{-}ing}$	Recreator Surface Water Non-Carcinogenic Ingestion (µg/L)	Contaminant-specific	Determined in this calculator
$SL_{rec\text{-}water\text{-}nc\text{-}der}$	Recreator Surface Water Non-Carcinogenic Dermal (µg/L)	Contaminant-specific	Determined in this calculator
$SL_{rec\text{-}water\text{-}nc\text{-}tot}$	Recreator Surface Water Non-Carcinogenic Total (µg/L)	Contaminant-specific	Determined in this calculator
$SL_{rec\text{-}water\text{-}ca\text{-}ing}$	Recreator Surface Water Carcinogenic Ingestion (µg/L)	Contaminant-specific	Determined in this calculator
$SL_{rec\text{-}water\text{-}ca\text{-}der}$	Recreator Surface Water Carcinogenic Dermal (µg/L)	Contaminant-specific	Determined in this calculator
$SL_{rec\text{-}water\text{-}ca\text{-}tot}$	Recreator Surface Water Carcinogenic Total (µg/L)	Contaminant-specific	Determined in this calculator
$SL_{rec\text{-}water\text{-}mu\text{-}ing}$	Recreator Surface Water Mutagenic Ingestion (µg/L)	Mutagen-specific	Determined in this calculator
$SL_{rec\text{-}water\text{-}mu\text{-}der}$	Recreator Surface Water Mutagenic Dermal (µg/L)	Mutagen-specific	Determined in this calculator
$SL_{rec\text{-}water\text{-}mu\text{-}tot}$	Recreator Surface Water Mutagenic Total (µg/L)	Mutagen-specific	Determined in this calculator
Fish SLs			
$SL_{res\text{-}fsh\text{-}nc\text{-}ing}$	Resident Fish Noncarcinogenic Ingestion (mg/kg)	Contaminant-specific	Determined in this calculator
$SL_{res\text{-}fsh\text{-}ca\text{-}ing}$	Resident Fish Carcinogenic Ingestion (mg/kg)	Contaminant-specific	Determined in this calculator
Toxicity Values			

RfD_o or RFDOC	Chronic Oral Reference Dose (mg/kg-day)	Contaminant-specific	EPA Superfund hierarchy
RfC or RFCIC	Chronic Inhalation Reference Concentration (mg/m^3)	Contaminant-specific	EPA Superfund hierarchy
CSF_o or SFO	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Contaminant-specific	EPA Superfund hierarchy
IUR	Inhalation Unit Risk $(\mu g/m^3)^{-1}$	Contaminant-specific	EPA Superfund hierarchy
Miscellaneous Variables			
TR	target risk	1×10^{-5}	Selected by user
THQ	target hazard quotient	1	Selected by user
THI	target hazard index	1	Selected by user
K	Andelman Volatilization Factor (L/m^3)	0.5	U.S. EPA 1991b (pg. 20)
K_p	Dermal Permeability Constant (cm/hour)	Contaminant-specific Inorganic default = 0.001	U.S. EPA 2004 Exhibit 3-1 and Section 3.1.2.1
$K_{p,ve}$	Steady-state Permeability Coefficient (cm/hour)	Contaminant-specific	U.S. EPA 2004
K_{ew}	Equilibrium Partition Coefficient between epidermis and water (unitless)	1 - assuming epidermis behaves essentially as water	U.S. EPA 2004
D_e	Effective Diffusivity of absorbing chemical in the epidermis (cm^2/sec)	$(7.1 \times 10^{-6}) / (\sqrt{MW})$	U.S. EPA 2004
L_e	Effective Thickness of the Epidermis (cm)	10^{-2}	U.S. EPA 2004

AT_{res-c}	Averaging time - resident child (days)	365 x ED_{res-c} = 2190	U.S. EPA 1989 (pg. 6-23)
AT_{res-a}	Averaging time - resident adult (days)	365 x ED_{res} = 9490	U.S. EPA 1989 (pg. 6-23)
AT_{res}	Averaging time - resident age adjusted (days)	365 x LT = 25550	U.S. EPA 1989 (pg. 6-23)
AT_{rec-c}	Averaging time - recreator child (days)	365 x ED_{rec-c}	U.S. EPA 1989 (pg. 6-23)
AT_{rec-a}	Averaging time - recreator adult (days)	365 x ED_{rec-a}	U.S. EPA 1989 (pg. 6-23)
AT_{rec}	Averaging time - recreator (days)	365 x LT	U.S. EPA 1989 (pg. 6-23)
LT	Lifetime (years)	70	U.S. EPA 1989 (pg. 6-22)
$\Delta H_{v,b}$	Enthalpy of vaporization at the normal boiling point (cal/mol)	Contaminant-specific	See Chemical-specific hierarchy
$\Delta H_{v,gw}$	Enthalpy of vaporization at temperature of groundwater (cal/mol)	Contaminant-specific	Determined in this calculator
HLC	Henry's Law Constant at specified groundwater temperature (atm-m^3/mol)	Contaminant-specific	See Chemical-specific hierarchy
T_{gw}	Groundwater Temperatures (Kelvin)	Site-specific	Site-specific
T_C	Critical Temperatures (Kelvin)	Contaminant-specific	See Chemical-specific hierarchy
T_b	Normal Boiling Point (Kelvin)	Contaminant-specific	See Chemical-specific hierarchy

n	If ($T_b/T_C < 0.57$)
	If ($T_b/T_C > 0.71$)
	If ($0.57 < T_b/T_C \leq 0.71$)
		n = 0.3
		n = 0.41
		n = (0.74 x T_b/T_C - 0.116)
			U.S. EPA Fact Sheet
			Unitless exponent values used to determine ΔHv,gw

VPT_{gw}	Vapor Pressure at Groundwater Temperature (mmHg)	Contaminant-specific	Determined in this calculator

VP	Vapor Pressure at 25°C (mmHg)	Contaminant-specific	Contaminant-specific
Ingestion and Dermal Contact Rates			
IRW_{rec-c}	Recreator Surface Water Ingestion Rate - Child (L/hour)	0.12	U.S. EPA 2011, Table 3.5
IRW_{rec-a}	Recreator Surface Water Ingestion Rate - Adult (L/hour)	0.11	Time weighted average was calculated based on the upper percentile from U.S. EPA 2019, Table 3.7
$IFW_{rec-adj}$	Recreator Surface Water Ingestion Rate - Age-adjusted (L/kg)	Site-specific	Calculated using the age adjusted intake factors equation
IRW_{0-2}	Surface Water Ingestion Rate - Age Segment 0-2 (L/hour)	0.12	U.S. EPA 2011, Table 3.5
IRW_{2-6}	Surface Water Ingestion Rate - Age Segment 2-6 (L/hour)	0.12	U.S. EPA 2011, Table 3.5
IRW_{6-16}	Surface Water Ingestion Rate - Age Segment 6-16 (L/hour)	0.124	Time weighted average was calculated based on the upper percentile from U.S. EPA 2019, Table 3.7
IRW_{16-26}	Surface Water Ingestion Rate - Age Segment 16-26 (L/hour)	0.0985	Time weighted average was calculated based on the upper percentile from U.S. EPA 2019, Table 3.7
$IFWM_{rec-adj}$	Recreator Mutagenic Surface Water Ingestion Rate - Age-adjusted (L/kg)	Site-specific	Calculated using the age adjusted intake factors equation
$DFW_{res-adj}$	Resident water dermal contact factor-age-adjusted (cm^2 - event/kg)	2610650	Calculated using the age adjusted intake factors equation
$DFWM_{res-adj}$	Resident Mutagenic water dermal contact factor- age-adjusted (cm^2 - event/kg)	8191633	Calculated using the age adjusted intake factors equation

$DFW_{rec-adj}$	Recreator water dermal contact factor-age-adjusted (cm^2 - event/kg)	Site-specific	Calculated using the age adjusted intake factors equation
$DFWM_{rec-adj}$	Recreator Mutagenic water dermal contact factor- age-adjusted (cm^2 - event/kg)	Site-specific	Calculated using the age adjusted intake factors equation
IRF_{res-a}	Fish Ingestion Rate (mg/day)	Site-specific	Recommend using site-specific values
SA_{res-c}	Resident surface area water - child (cm^2)	6365	U.S. EPA 2014, weighted average of mean values for children <6 years.
SA_{res-a}	Resident surface area water - adult (cm^2)	19652	U.S. EPA 2014, weighted average of mean values for adults, male and female 21+.
SA_{rec-c}	Recreator surface area water - child (cm^2)	6365	U.S. EPA 2014, weighted average of mean values for children <6 years.
SA_{rec-a}	Recreator surface area water - adult (cm^2)	19652	U.S. EPA 2014, weighted average of mean values for adults, male and female 21+.
SA_{0-2}	Resident/Recreator surface area water - age segment 0-2 (cm^2)	6365	U.S. EPA 2014, weighted average of mean values for children <6 years.
SA_{2-6}	Resident/Recreator surface area water - age segment 2-6 (cm^2)	6365	U.S. EPA 2014, weighted average of mean values for children <6 years.
SA_{6-16}	Resident/Recreator surface area water - age segment 6-16 (cm^2)	19652	U.S. EPA 2014, weighted average of mean values for adults, male and female 21+.
SA_{16-26}	Resident/Recreator surface area water - age segment 16-26 (cm^2)	19652	U.S. EPA 2014, weighted average of mean values

			for adults, male and female 21+.
BW_{res-c}	Resident Body Weight - child (kg)	15	U.S. EPA 1991a (pg. 15)
BW_{res-a}	Resident Body Weight - adult (kg)	80	U.S. EPA 2011, Table 8-3; weighted mean values for adults 21 - 78
BW_{rec-c}	Recreator Body Weight - child (kg)	15	U.S. EPA 1991a (pg. 15)
BW_{rec-a}	Recreator Body Weight - adult (kg)	80	U.S. EPA 2011, Table 8-3; weighted mean values for adults 21 - 78
BW_{0-2}	Resident/Recreator Body Weight - age segment 0-2 (kg)	15	U.S. EPA 1991a (pg. 15)
BW_{2-6}	Resident/Recreator Body Weight - age segment 2-6 (kg)	15	U.S. EPA 1991a (pg. 15)
BW_{6-16}	Resident/Recreator Body Weight - age segment 6-16 (kg)	80	U.S. EPA 2011, Table 8-3; weighted mean values for adults 21 - 78
BW_{16-26}	Resident/Recreator Body Weight - age segment 16-26 (kg)	80	U.S. EPA 2011, Table 8-3; weighted mean values for adults 21 - 78
ABS_d	Fraction of contaminant absorbed dermally from soil (unitless)	Contaminant-specific Inorganic default = none VOC default = none SVOC default = 0.1	U.S. EPA 2004 (Exhibit 3-4 and section 3.2.2.4)
GIABS	Fraction of contaminant absorbed in gastrointestinal tract (unitless) Note: if the GIABS is >50% then it is set to 100% for the calculation of dermal toxicity values.	Contaminant-specific Inorganic default = 1.0 VOC default = 1.0 SVOC default = 1.0	U.S. EPA 2004 (Exhibit 4-1 and section 4.2)

DA_{event}	Absorbed dose per event (µg/cm^2 - event)	Contaminant-specific	U.S. EPA 2004 (Equation 3.2 and 3.3)
Exposure Frequency, Exposure Duration, and Exposure Time Variables			
EF_{rec}	Recreator Exposure Frequency (days/year)	Site-specific	Site-specific
EF_{rec-c}	Recreator Exposure Frequency - child (days/year)	Site-specific	Site-specific
EF_{rec-a}	Recreator Exposure Frequency - adult (days/year)	Site-specific	Site-specific
EF_{0-2}	Resident/Recreator Exposure Frequency - age segment 0-2 (days/year)	Resident - 350 Recreator - Site-specific	Resident - U.S. EPA 1991a (pg. 15) Recreator - Site-specific
EF_{2-6}	Resident/Recreator Exposure Frequency - age segment 2-6 (days/year)	Resident - 350 Recreator - Site-specific	Resident - U.S. EPA 1991a (pg. 15) Recreator - Site-specific
EF_{6-16}	Resident/Recreator Exposure Frequency - age segment 6-16 (days/year)	Resident - 350 Recreator - Site-specific	Resident - U.S. EPA 1991a (pg. 15) Recreator - Site-specific
EF_{16-26}	Resident/Recreator Exposure Frequency - age segment 16-26 (days/year)	Resident - 350 Recreator - Site-specific	Resident - U.S. EPA 1991a (pg. 15) Recreator - Site-specific
ED_{rec}	Recreator Exposure Duration (years)	26	EPA 2011, Table 16-108; 90th percentile for current residence time.
ED_{rec-c}	Recreator Exposure Duration - child (years)	6	U.S. EPA 1991a (pg. 15)
ED_{rec-a}	Recreator Exposure Duration - adult (years)	20	ED_{rec} (26 years) - ED_{rec-c} (6 years)
ED_{0-2}	Resident/Recreator Exposure Duration - age segment 0-2 (years)	2	U.S. EPA 2005 (pg. 37)

ED_{2-6}	Resident/Recreator Exposure Duration - age segment 2-6 (years)	4	U.S. EPA 2005 (pg. 37)
ED_{6-16}	Resident/Recreator Exposure Duration - age segment 6-16 (years)	10	U.S. EPA 2005 (pg. 37)
ED_{16-26}	Resident/Recreator Exposure Duration - age segment 16-26 (years)	10	U.S. EPA 2005 (pg. 37)
ET_{rec}	Recreator Exposure Time (hours/day)	Site-specific	Site-specific
ET_{rec-c}	Recreator Exposure Time - child (hours/day)	Site-specific	Site-specific
ET_{rec-a}	Recreator Exposure Time - adult (hours/day)	Site-specific	Site-specific
$ET_{event-rec-c}$	Recreator Surface Water Exposure Time - child (hours/event)	Site-specific	Site-specific
$ET_{event-rec-a}$	Recreator Surface Water Exposure Time - adult (hours/event)	Site-specific	Site-specific
$ET_{event-rec-adj}$	Recreator Exposure Time - age-adjusted (hours/event)	Site-specific	Calculated using the age adjusted intake factors equation
$ET_{event-rec(0-2)}$	Recreator Exposure Time - age segment 0-2 (hours/event)	Site-specific	Site-specific
$ET_{event-rec(2-6)}$	Recreator Exposure Time - age segment 2-6 (hours/event)	Site-specific	Site-specific
$ET_{event-rec(6-16)}$	Recreator Exposure Time - age segment 6-16 (hours/event)	Site-specific	Site-specific
$ET_{event-rec(16-26)}$	Recreator Exposure Time - age segment 16-26 (hours/event)	Site-specific	Site-specific

$ET_{event\text{-}rec\text{-}madj}$	Recreator Exposure Time - age-adjusted (hours/event)	Site-specific	Calculated using the age adjusted intake factors equation
$EV_{rec\text{-}c}$	Recreator Events - child (events/day)	Site-specific	Site-specific
$EV_{rec\text{-}a}$	Recreator Events - adult (events/day)	Site-specific	Site-specific
$EV_{0\text{-}2}$	Resident/Recreator Events - age segment 0-2 (events/day)	Resident - 1 Recreator - Site-specific	U.S. EPA 2004; Exhibit 3-2
$EV_{2\text{-}6}$	Resident/Recreator Events - age segment 2-6 (events/day)	Resident - 1 Recreator - Site-specific	U.S. EPA 2004; Exhibit 3-2
$EV_{6\text{-}16}$	Resident/Recreator Events - age segment 6-16 (events/day)	Resident - 1 Recreator - Site-specific	U.S. EPA 2004; Exhibit 3-2
$EV_{16\text{-}26}$	Resident/Recreator Events - age segment 16-26 (events/day)	Resident - 1 Recreator - Site-specific	U.S. EPA 2004; Exhibit 3-2

APPENDIX 6: SOCIOECONOMIC INFORMATION ON COMMUNITIES SURROUNDING PISCATAWAY CREEK

ID	Zip Code	Percent Minority	Percent Less Than High School	Percent Low Income	Percent Unemployed	Percent Linguistic Isolation
449	24033	44	1.2	24.40	2.9	0.8
389	24033	55.3	8.5	9.92	3.1	0
691	24033	78.4	5.3	4.69	5.4	2
702	24033	88.5	4.8	4.29	3.6	0.8
388	24033	93.1	2.1	4.61	3.1	0
655	24033	88.5	6.4	5.48	2.5	1.8
391	24033	92	5.5	4.74	1.8	1
701	24033	93.4	4.9	3.93	3.6	0
653	24033	89.3	5.4	5.94	5.2	0
579	24033	88.8	7.4	5.56	4.6	0
390	24033	89.4	4.7	6.93	5.9	0
573	24033	80.8	9.4	9.74	0.8	6.4
650	24033	94.5	3	8.36	2	0
450	24033	87.4	6.3	7.93	6.7	0
652	24033	87.5	10.1	4.94	5.1	1.3
396	24033	91.3	4.9	9.52	4.1	1.5
651	24033	90.8	10.3	7.05	4	0
842	24033	89.9	10.2	5.90	7	0
687	24033	94.7	4.6	14.85	1.5	0
692	24033	85	9.7	11.49	4.5	5.3
706	24033	92.6	7	10.08	2.2	4.2
394	24033	89	5.6	17.75	3.4	1.3
833	24033	93.8	10.1	7.67	3.6	2.4
704	24033	93.3	6.8	11.84	3.6	2.5
703	24033	92.6	8.5	14.68	2.2	1.7
733	24033	89.6	10.7	10.95	3.9	5.2
576	24033	79.6	12.6	19.20	5.3	5.2
841	24033	88.5	16.9	12.24	3.1	3.2
688	24033	95.1	14.3	8.04	5.4	2
414	24033	94.8	16	11.50	7.1	2.3
395	24033	90.8	10.7	23.61	5.4	6.1
474	24033	95.1	7	29.32	6.2	2.7
412	24033	84	19.8	28.80	4.2	4.7
705	24033	93.9	23.5	16.88	6	6.2

Socioeconomic information in the above Table is based on the following:

1. **Minority Population** - % of individuals who do not identify as non-Hispanic white

2. **Low Income** - % of households whose income is less than 200% of the federal poverty threshold (i.e., income less than twice the poverty level)

3. **Over 25 years old with less than High School** - % of individuals 25 years or older who do not have a high school diploma (they may have completed some high school, so long as they did not graduate)

4. **Unemployment** - % of individuals 16 years or older who are eligible for the labor force that are not employed

5. **Linguistic Isolation** - % of limited English-speaking households (i.e., one in which no member 14 years old and over (1) speaks only English or (2) speaks a non-English language and speaks English "very well." In other words, all members 14 years old and over have at least some difficulties with English)