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Distribution and Fate of Per- and Polyfluorinated Alkyl Substances (PFAS) in Wastewater Treatment Plants Discharging to Great Bay

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DISTRIBUTION AND FATE OF PER- AND POLYFLUORINATED ALKYL SUBSTANCES (PFAS) IN WASTEWATER TREATMENT PLANTS DISCHARGING TO GREAT BAY

BY

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Dedication

This thesis is dedicated to my Family and my husband, Masoud.

Acknowledgment

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Abstract

Per-and polyfluoroalkyl substances (PFAS) represent a major class of emerging contaminants composed of nearly 5000 human-made chemicals. PFAS have been used since the 1950s as surfactants in industrial and consumer products due to their unique water and oil repellency, high surface activity, and thermostability. These compounds can bioaccumulate and pose human and ecological health concerns; for example, PFAS intensive exposure can affect the liver, reproduction and development in humans and wildlife. Ubiquitous presence of these compounds in different environmental matrices, high persistency, and potential threats to human and environmental health, have made it critical to develop an understanding of how they are distributed in different matrices and how people get exposed. Previous studies have provided some understanding of how environmental conditions, chemical structures and properties affect PFAS distribution, fate, and their biotransformation. In addition, PFAS environmental exposure studies have been completed or are underway; and while it is clear that exposures are occurring, the effects associated with exposure are not fully understood and therefore there is significant uncertainty associated with evaluation of risks associated with PFAS in environment. Wastewater treatment facilities (WWTFs) are a conduit of PFAS which are not originally designed for the removal of these low level and diverse contaminants. In this study, PFAS distribution and fate in six WWTFs discharging their effluent into Great Bay Estuary in March and July 2019 were investigated. PFAS were detected in influent and effluent of WWTFs with up to 12 detected constituents out of 24 measured by standard analytical method (LC/MS/MS). In general, PFAS concentrations increased in effluent after biological treatment which supports the presence of unknown PFAS precursors in influent not measured during standard analytical method. Seasonal changes exhibited a significant influence on PFAS concentrations in effluent. Higher PFAS concentrations were detected in the warmer season, indicating the effect of temperature and higher microbial activities on PFAS precursor degradation. In addition, PFAS precursors were indirectly quantified by oxidizing precursors into terminal PFAAs compounds using the total oxidizable precursor assay (TOP assay). Higher perfluoroalkyl acids (PFAA) concentrations after oxidation compared to unoxidized samples confirmed the presence of PFAS precursors in WWTFs.

Chapter 1. Introduction

1.1. PFAS Background and Classification

Per-and polyfluoroalkyl substances (PFAS) represent a major class of contaminants of emerging concern (CEC) composed of nearly 5000 human-made chemicals[1]. They are a diverse class of chemicals with an aliphatic carbon backbone in which hydrogen atoms have been completely (prefix: per-) or partially (prefix: poly-) replaced by fluorine that are extremely biologically and chemically stable in the environment[2,3]. PFAS are divided into two primary categories: polymers and non-polymers (Figure 1.1). The non-polymer PFAS encompasses two major classes; (1) perfluoroalkyl substances with a fully fluorinated alkyl chain, and (2) polyfluoroalkyl substances with a partly fluorinated alkyl chain with at least 1 fluorine atom. Perfluoroalkyl substances include many subgroups of compounds, listed in Figure 1.1. Their chemical structure contains a tail of two or more carbon-fluorine bonds with a charged functional group head attached at one end. The functional group is typically a carboxylic or sulfonic acid, but other forms are also observed in environment. Their structure is written as $C_nF_{2n+1}R$, where C_nF_{2n+1} represents the length of the perfluoroalkyl chain tail, n is more than two, and R is defined as the attached functional group head[4,5]. Perfluoroalkyl acids (PFAAs) are a subgroup of perfluoroalkyl substances which currently are most commonly tested for in the environment. These compounds are defined as terminal PFAS, meaning that no further degradation will naturally occur from them[4,5]. Perfluoroalkyl carboxylic acids (PFCAs) and perfluoroalkane sulfonic acids (PFSAs) are the two main PFAAs compounds (i.e., PFAS terminals) detected in different matrices. Polyfluoroalkyl substances are the second subgroup of non-polymer PFAS distingushed from perfluoroalkyl substances by not being fully fluorinated. Their structure contain C_nF_{2n+1} and at least one carbon attached to a non-fluorine atom (typically hydrogen or oxygen). The carbon-non-fluorine bond creates a weak bond in carbon

chain which is susceptible to biotic or abiotic degradation under environmental conditions[4,5]. The degradable non-fluorine bonds in polyfluoroalkyl substances leads to formation of fully fluorinated chain of PFAAs. As a result, polyfluoroalkyl substances are considered precursors of PFAAs[5,6]. Polymers are large molecules formed by combining several repeating units that contain carbon and fluorine bonds. PFAS polymers can be fully or partially fluorinated without a functional group. PFAS polymers are comprosed of fluoropolymers, polymeric perfluoropolyethers, and side-chain fluorinated polymers. Side-chain fluorinated polymers can degrade to fully fluorinated PFAS and are therefore considered PFAAs precursors[5].

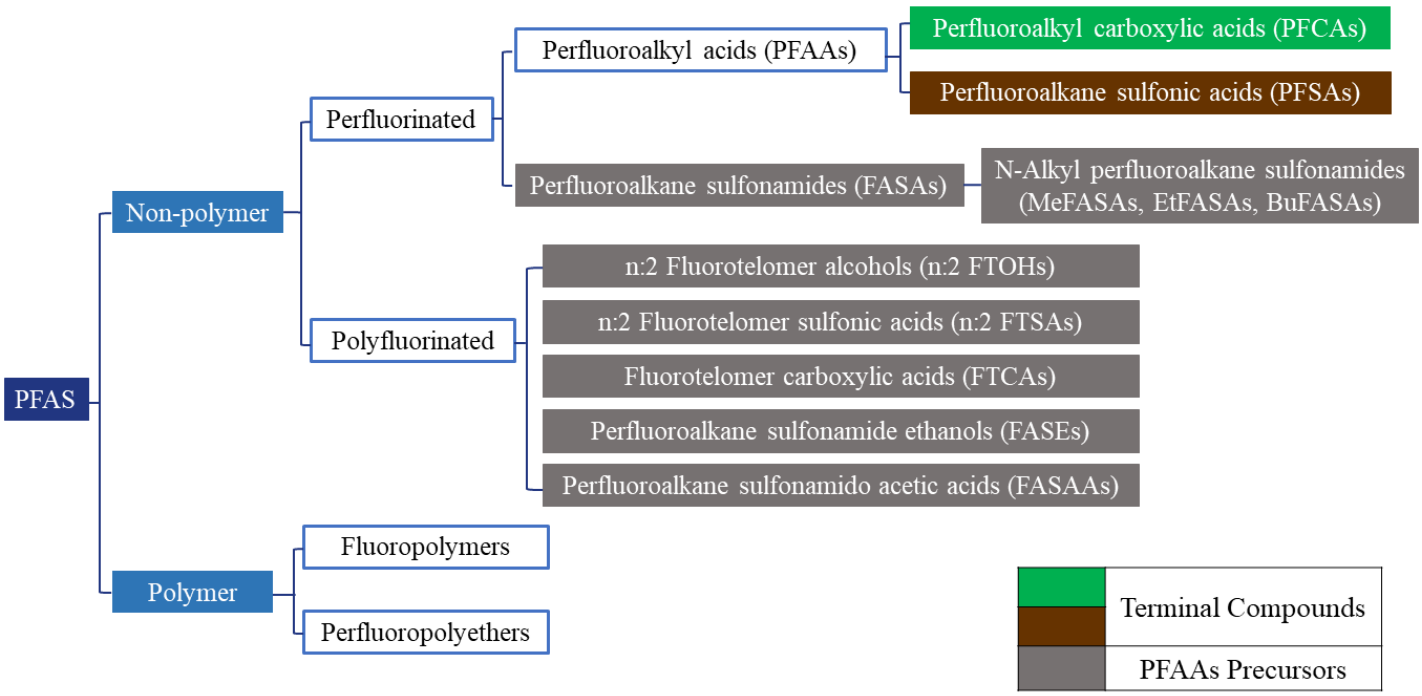

Figure 1.1 An overview of PFAS family and classification.

1.2. PFAS Physical and Chemical Properties

PFAS are mostly in solid form as a white powder or waxy substance, although some PFAS may be found in liquid forms depending on their chain length at room temperature[5]. PFAS physical and

chemical properties rely on their structures, applications, and their unique environmental behavior[5,7]. PFAS have strong C-F bonds due to the high electronegativity and small size of fluorine. Also, some PFAS have weak intermolecular interactions as a result of the low polarizability of fluorine[5]. Based on carbon chain length, PFAS can be hydrophobic or hydrophilic. Shorter chain PFAS are more hydrophilic and can interact more strongly with water molecules. Longer chain PFAS are more hydrophobic and are attracted to organic matter; these are mainly found in soil particles[3,8,9]. PFCAs and PFSAs have higher water solubility compared to their precursors such as FTOH, FOSA, and N-EtFOSE because they carry a charged functional group[10]. PFAS vapour pressure properties alter with the length of their carbon chain length where shorter PFCAs and PFSAs are potentially non-volatile, though the longer PFAAs precursors such as FASEs are much more volatile. Consequently, PFAAs cannot be removed by air stripping[11]. Some PFAAs are termed "terminal" compounds due to their thermally and chemically stability, and their resistance to biological degradation. PFAS thermal stability depends on the strength of C-F bonds and their chemical stability attributed to the covering of carbon by fluorine, small size of fluorine, and high electronegativity of fluorine[12]. These properties result in PFAS that are resistant to oxidative, reductive, and hydrolysis processes[5]. PFAS chemical characteristics make them useful compounds as: surfactants in many industries; aqueous film forming foam (AFFF); alkaline cleaners; paints; and consumer products such as non-stick cookware, carpets, food packaging, shampoos due to their unique water and oil repellency, high surface activity, and thermostability[13,14].

1.3. PFAS Measurement

The current standard analytical method for PFAS measurement is liquid chromatography-tandem mass spectrometry (LC/MS/MS) based on EPA method 537.1. The routine analytical method

(EPA method 537.1)[14], comprises PFCAs and PFSAs, was originally established for the analysis of drinking water where terminal PFAAs compounds are prevailing. Method 537.1 is not meant to be applied to PFAS quantification in non-potable water matrices[14,15]. Alternatively, LC/MS/MS isotope dilution technique is a modified method that has commonly been used to measure PFAS in non-drinking water and soil matrix extracts[15,16]. This method accounts for interferences as a result of complex matrices[16]. Both EPA method 537.1 and the isotope dilution method are designed to quantify between 20 to 30 PFAS, including most PFAAs and up to six precursors[15,16]. However, measuring PFAS in their emission matrices which contain potentially more PFAS precursors is a challenge by current methods because most precursors are unknown, few chemical standards exist, and even if chemical standards are available, standard analytical methods are not yet available[17].

The total oxidizable precursor assay (TOP) is another approach for measurement of PFAS and can be widely applied to all matrices (e.g., solids, biomass). It converts PFAAs precursors into terminal end products using a strong chemical oxidizing agent, making them easier to be measured in their ionizable form[18-21]. Although unknown PFAAs precursors can be indirectly measured by the TOP assay assuming they are oxidizable, this method has yet to be validated by EPA. Moreover, TOP assay results may not be comparable between different laboratories due to non-standardized numbers of detectable PFAS in LC/MS/MS analysis. In this study, in order to evaluate the fate of PFAS in WWTFs, PFAS quantification was performed through two approaches: (1) LC/MS/MS isotope dilution technique, and (2) TOP assay analysis. Although many other approaches have been used to identify and/or quantify PFAS, some of which are

currently in review by the EPA and/or undergoing external laboratory validation, they are outside the scope of this study and are not discussed here.

1.4. PFAS Distribution

PFAS have been observed in different environmental matrices, including surface water, wastewater, groundwater, air, and soil due to their widespread use and their resistance to degradation[13,22]. Additionally, PFAS have been measured in biota and human blood and tissue[123,24]. Extensive research has been conducted to identify and understand PFAS fate and distribution in different matrices. For example, PFOA was cited as the dominant compound in China's rivers receiving PFAS from fluoropolymer facilities with concentrations ranging from <1 to >4500 ng/L[25]. PFAS have been found in the Laurentian Great Lakes surface water and sediment[24]. The concentration and distribution of PFAS varied across the lakes in response to changes in PFAS sources, with longer chain constituents dominating in sediments[26]. PFAS distribution was evaluated in ten landfill sediments and leachates in Norway[27]. Short chain PFAS including PFBS, PFBA, PFPeA and PFHxA were found as the most abundant constituents in leachate of landfills, ranging in concentration from 68 to 6800 ng/L. On the other hand, long chain compounds (PFHxS, PFHpS, PFOS, PFDS, PFHpA, HPFHpA, PFOA, PFNA, PFDA, PFUnDA, PF-3,7-DMOA, PFDoA, PFTrA, PFTA and FHxDA) dominated in landfill sediments, ranging in concentration from 8.5 to 120 μg/kg. Based on these data, short chain loads were estimated 2.2 to 310 g/year from leachate while long chain loads were 5.9 to 130 g/year[27]. PFAS concentration and distribution were studied in freshwater at three Swedish sites[28] with the average total PFAS concentration 1920 ng/L. PFOS was identified as the dominant substance in water samples, accounting for 29–79% of total measured PFAS[28]. Additionally, PFAS have been distributed in ice cores and surface snow[27]. PFBA, PFOA and, PFNA dominated in ice core samples. Longer

chain PFAS showed higher concentrations in ice core samples while shorter chains were dominant in surface snow samples[29]. PFAS have also been observed in influent and effluent of wastewater treatment facilities (WWTFs)[19-21,23-36], as described in more detail in section 1.7.1.

In addition to environmental media, PFAS have been found in the biomass of many different biota including invertebrates, fish, rats, reptiles, birds, and mammals as a result of PFAS bioaccumulation and biomagnification[23,37-41]. Simonnet-Laprade et al., 2019 examined the trophic transfer of PFAS in biota (including biofilm, invertebrates, and fish), determining PFAAs to be dominant detected compounds, with precursors contributing 1-18% of total detected PFAS constituents[41]. Specifically, within invertebrates and fish, PFCAs and PFSAs were found as the most abundant compounds, suggesting biotransformation of PFAAs precursors up the trophic food web[41].

Due to the presence of PFAS across environmental matrices and biota, human exposure can occur via direct and indirect consumption including food, drinking water, consumer products, and ambient air[42]. As a result, PFAAs have been detected in human blood serum of different ages. Longer chain PFAAs were detected at higher concentrations ranging between 100 ng/L to 30,400 ng/L[24,43,44]. The human adult half-life of PFOA and PFOS are estimated as 5.4 and 8.5 years, respectively[52]. PFOA and PFOS concentrations in human blood serum have decreased after their phase out, however, due to their environmental persistence and prevalence in environmental matrices, PFOA and PFOS remain a source of human exposure[45]. Due to the ubiquitous presence

of PFAS across environmental matrices, biota and within the human body, it is critical to further characterize the sources, sinks, and exposure pathways for PFAS.

1.5. PFAS Sources, Conduits and Sinks

PFAS can be released to the environment through point and non-point sources[10,46]. PFAS point sources include industrial discharges, domestic sources including septic systems, AFFF usage sites, and pesticides application. Additionally, several engineered facilities act as major PFAS "conduits" to the environment, including WWTFs and landfills. Indirect sources of PFAS to the environment include dry and wet atmospheric deposition, runoff from contaminated soils, leaking landfills, and surface water runoff, and groundwater discharge from contaminated areas. Soil and surface water are detected as initial recipients of PFAS emission (Figure 1.2). PFAS discharge from industrial sources can be subsequently released to water bodies via industrial wastewater and atmospheric deposition to surface water. Followed by deposition to water bodies, they can run off into terrestrial surfaces and soil[46]. PFAS entering WWTFs can be released to surface water via effluent and sludge due to their resistance to degradation during the treatment process. Additionally, PFAS can be released to soil by their use in agriculture sites, AFFF, and biosolids of WWTFs transferred to landfill sites. Subsequently, PFAS can enter into groundwater via surface water seepage and soil leaching from their both main sources[47,48].

1.5.1. WWTFs are a main conduit of PFAS

WWTFs are considered as a main PFAS conduit to the environment due to receiving PFAS from several PFAS sources such as industrial, residential, and firefighting activities site and discharging PFAS to the environment via effluent and sludge[34,36,48]. PFOA and PFOS discharge through effluent of WWTFs accounts for more than 85% of their total discharge to water bodies[47].

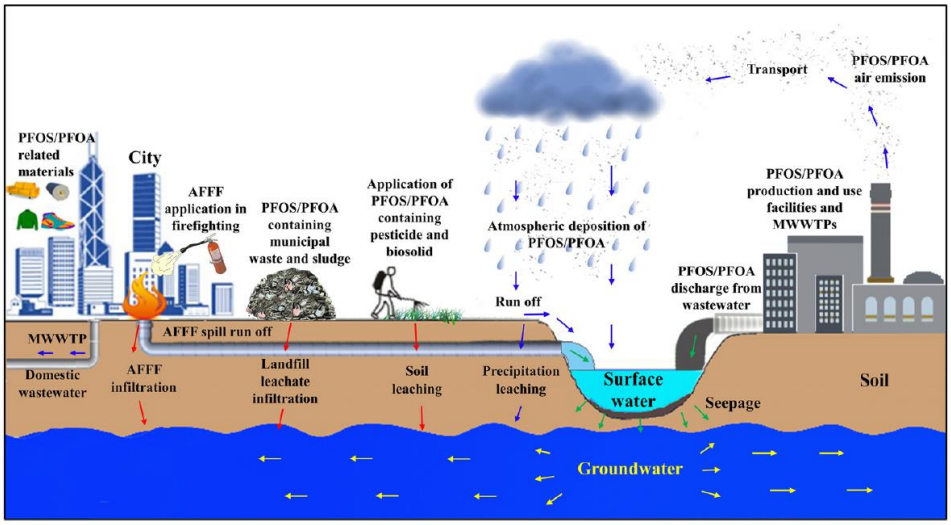

Figure 1.2. PFAS Schematic diagram of sources and pollution pathways (Liu et al., 2017).

Additionally, it has been suggested that significant PFAS mass may be adsorbed to organic matter in sludge solid particles, thereby accumulating in WWTF sludge[10,50]. Subsequently, PFAS are re-distributed to landfills by transferring biosolids from WWTFs to landfill sites. Discharge of landfill leachates to WWTFs and transfer of biosolids from WWTFs to landfills may lead to PFAS cycling and ultimately low-level discharge from WWTFs to downstream environments[33]. It has been reported that most PFAS removal and transformation occur during secondary treatment stage through biodegradation[20,47], among other stages of treatment (i.e., preliminary, primary, secondary, disinfection). However, due to their recalcitrance, many PFAS compounds are not completely removed by standard treatment methods[31,36]. As a result, some PFAS are released in effluent to receiving water bodies which can lead to contamination of surface water, ecosystems, and wildlife (Figure 1.3)[32].

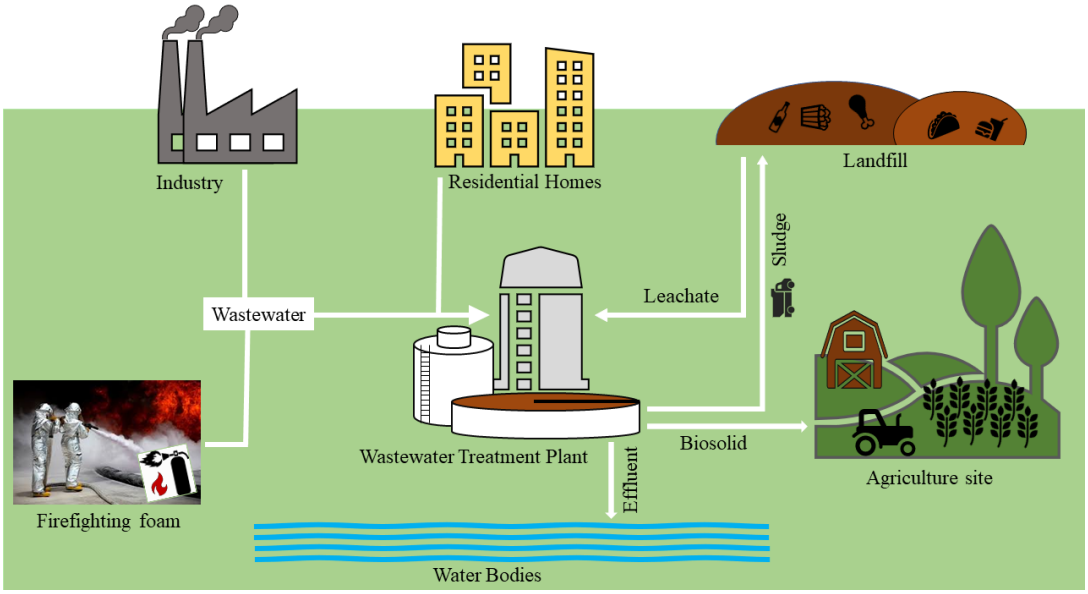

Figure 1.3. Sources, conduits, and sinks of PFAS in the environment.

1.6. PFAS Toxicity

PFAS exposure can occur through oral, inhalation, and dermal pathways in both humans and animals. Human PFAS exposure studies have typically occurred by determining relationships between environmental levels and PFAS in human serum[51,52]. PFOA and PFOS are well known to be moderately acute and slightly chronically toxic to marine and freshwater aquatic organisms[53]. Also, PFOA, PFNA, PFOS, and PFHxS have shown to have adverse impacts to both human and animals[54,55]. Previous studies have observed that PFAS cannot be metabolized and do not degrade under chemical reactions in both animals and human bodies[56,57].

1.6.1. Animal Studies

PFAS absorption by animals is estimated at approximately >50% for PFHxS and >95% for PFOA, PFBA, PFNA, PFDeA, PFUA, and PFDoA[52]. PFAS in animals can be detected in blood serum and plasma (distribution termed the serum:plasma ratio) and tissue samples. PFOA was primarily detected in the plasma fraction of rats' blood tests in different studies[58]. LD50 values (lethal dose,

50%) for PFOS of 233 and 271 mg/kg were estimated for male and female rats, respectively[59]. Animals studies have shown PFAS exposure may result in liver problems, immune suppression, reproductive, and developmental effects from oral exposure to PFOA, PFOS, PFHxS, PFNA, and PFBA[60-64].

1.6.2. Human Studies

PFAS have been widely detected in human bodies in the liver, kidneys, and blood as a result of oral and inhalation exposure[52]. PFHxS, PFOS, and PFOA were detected in human blood with a serum:plasma ratio of 1:1[65]. PFOA, PFOS, PFOSA, and PFHxA were quantified in serum and liver of human cadavers, but most of their concentrations were lower than analytical limits in liver[66]. The exposure of infants and children to PFAS may result in greater toxicity than adults, due to higher water content relative to adults and higher exposure risk from drinking water and breast milk sources. Moreover, the exposure of adolescents to PFAS may result in higher severity toxicity issues because immune systems are still developing, as compared to adults[67]. The exposure studies that have been conducted on PFAS to human health have suggested links between PFOA, PFOS, and PFHxS exposure and liver damage, hypertension, risk of thyroid disease, risk of asthma diagnosis, risk of decreased fertility, and birth weight effect[68-72].

1.6.3. PFAS Health Advisory and Regulation

Federal and state government agencies have responded to PFAS toxicity studies through new regulations that vary considerably by constituent and concentrations. The US EPA's lifetime health advisory (LHA) recommended perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), two of the most frequently detected PFAS, concentrations should not exceed 70 ng/L in drinking water[55]. However, this LHA serves as a guideline for drinking water treatment and

suppliers, not a maximum contamination level (MCL). On the other hand, some states have established more stringent regulations on specific PFAS in drinking water sources. State regulations are listed in Table 6.1 including New Hampshire, which recently proposed drinking water standards and ambient groundwater quality Standards (AGQS) for PFOA, PFNA, PFOS, and PFHxS of 12, 11, 15, and 18 ng/L respectively. However, the implementation of these standards in New Hampshire was delayed because of a lawsuit filed by 3M and others against the state claiming not accepted protocol were used for the proposed standards on November 2019 and not adequate cost-benefit analysis were conducted.

Table 1.6. State regulations for different PFAS.

State	Description	Compounds	Reference
Michigan[73]	Drinking water limits	PFOA=420 ng/L	Michigan, 2016
		PFOS=11 ng/L	
Minnesota[74]	Health-based value	PFOA=35 ng/L	MDH, 2017
		PFOS=27 ng/L	
		PFHxS=27 ng/L	
Vermont[75]	Recommended health advisory	PFOA=20 ng/L	Vermont DOH, 2017
		PFOS=20 ng/L	
New Hampshire[76]	Proposed Standard	PFOA=12 ng/L	NHDES, 2019
		PFNA=11 ng/L	
		PFOS=15 ng/L	
		PFHxS=18 ng/L	

1.7. PFAS in WWTFs

Several previous studies have assessed the occurrence and frequency of PFAS in influent, effluent, and sludge of different WWTFs. In addition, some studies have evaluated the effect of different treatment systems on PFAS removal. In this section, previous studies on PFAS fate and distribution in WWTFs are summarized.

1.7.1. PFAS Fate and Distribution in WWTFs

The role of WWTFs as a main conduit of PFAS discharging to water bodies and agriculture sites from their effluent and sludge/biosolids has been investigated[33]. A few select studies have assessed PFAS emissions at WWTFs and identified 6:2 FTOH, PFOS, and PFBA as dominant compounds in ambient air around WWTF. Shorter chain PFCAs were detected more than longer chains. PFAS concentrations were significantly higher in ambient air around secondary treatment than the primary treatment and clarifier[77]. This can be related to the increased volatilization during the aeration process in secondary treatment. Also, total PFAS concentrations in air around WWTF were 3-15 times higher compared to the nearby sites[77]. Based on historic emission data, PFAS emission into air measured lower than their release to aquatic environments[78].

PFAS have been frequently detected in the influent and effluent of WWTFs. Past studies reported that PFAS concentrations in influent of WWTFs are directly associated with PFAS sources discharging to WWTFs[30,35]. Comparison of PFAS constituent concentrations in both effluent and influent revealed a meaningful difference in concentration of each PFAS constituent. In general, higher total PFAS concentrations have been detected in effluent compared to influent in WWTFs[30,35]. Also, higher PFAS concentrations have been detected in WWTFs discharging from industrial sources compared to domestic sources and is associated with the type of industrial

activities[31]. Short chain PFAS were mainly identified as dominant compounds in the dissolved phase because short chain compounds are hydrophilic and tend to bond with water molecules[31,33]. PFOA, PFBS, and PFOS were identified as dominant detected compounds in effluent of WWTFs[30,35].

The distribution of PFAS in sludge and biosolids of WWTFs has been investigated in several studies. Transferring sludge from WWTFs to landfills and the application of biosolids as a soil amendment have resulted in transferring PFAS to soil, resulting in accumulation and subsequent uptake to food web. Longer chain PFAS were more frequently detected in sludge of WWTFs due to their hydrophobicity property and their adsorption to solid particles[31,33]. PFOS and PFDA were the predominant PFAS identified in biosolids[30,35]. Due to different chain length and functional groups, individual PFAS constituents have different mass distributions in WWTFs[30]. In general, higher annual mass load of total PFAS were reported in effluent than sludge[30].

Several studies have reported that PFAA concentrations (e.g., PFHxA, PFOA and PFOS) increase after secondary treatment in WWTFs. It is hypothesized that this behavior may be due to PFAS precursor degradation during biological treatment which results in their transformation to PFAAs[21,31,33]. Higher PFAS concentrations in conventional WWTF effluent relative to influent indicates poor PFAS removal inefficiency [33,34,79-81]. However, PFAS precursors distribution and fate is not well understood due to lack of the capability of standard analytical method to measure PFAS precursors.

1.7.2. PFAS Precursors Fate in WWTFs

Previous research utilized TOP assay analysis to better understand the effect of wastewater treatment on PFAS precursor degradation and their transformation to terminal compounds. TOP

assay analysis indirectly measures different PFAS precursors, however, this approach does not capture all PFAS precursors. Only 65% to 75% of PFCA products are captured using this approach, while the rest of the precursors remain undetected[20,82]. Several studies reported the presence of PFAS precursors in WWTF influent measured through TOP assay analysis[19-21]. Results indicated higher PFAA concentrations after TOP assay analysis compared to the standard analytical method. This shows that the TOP assay analysis can oxidize PFAS precursors containing hydroxyl radicals which results in their indirect quantification. Precursors accounted for 30% to 60% of total PFAS molar concentrations in WWTFs[19,21]. PFAS precursor degradation and their transformations to short chain PFCAs from influent to effluent of WWTFs were identified through TOP assay analysis, supporting the hypothesis that increasing PFAA concentrations from influent to effluent is due to precursor degradation[20].

1.7.3. The Effect of WWTFs Design on PFAS Degradation

WWTF design seems to have some effect on PFAS distribution and fractionation into effluent and biosolids. Previous studies in WWTFs have observed an increase of PFAAs after treatment due to PFAS precursors degradation during biological treatment[21,31,33]. As a result, conventional WWTFs are described as ineffective for PFAS removal[33,35]. Differences in aerobic and anaerobic biological treatment approaches may influence PFAS distribution and fate due to microbial activity during in secondary treatment[21,34-36]. For example, long chain PFCAs were eliminated with 50% removal with membrane bio-reactor (MBR) and Unitank processes in one WWTF study[35]. In another study, the effect of cyclic activated sludge, orbital oxidation ditch, and anaeroxic-anoxic-oxic (A^2/O) on PFAS removal were investigated[36]. Cyclic activated sludge removed PFAS significantly (32.2%)[36] while oxidation ditch and A^2/O resulted in 17.5% and 1.49% removal, respectively. Higher microbial activities under aerobic treatment combined with longer sludge retention time may

improve PFAS removal during activated sludge processes[21,34]. On the other hand, longer sludge retention time may increase the adsorption of longer chain PFAS to solid particles[21]. As a result, PFAS may be carried into sludge, thereby removed from aqueous phase[21]. Seasonal changes and PFAS flow may also indirectly influence PFAS concentrations in WWTF effluent[36]. To this end, lower PFAS concentrations in influent (especially during fall) were associated with lower concentrations in effluent as compared to other seasons[34]. Even though conventional wastewater treatments were not found to be effective for PFAS removal, PFAS profiles in effluent and sludge were primarily related to the treatment processes.

1.8. Biotransformation Pathways for PFAS

Limited studies investigated biotransformation of PFAS precursors and their pathways in aerobic and anaerobic digesters in WWTFs[83-86]. Aerobic biotransformation of 6:2 Fluorotelomer sulfonate (6:2 FTS) in activated sludge was evaluated in previous research[85]. Results indicated that microbial activities in WWTFs[85] can lead to biotransformation of 6:2 FTS to PFBA, PFPeA, and PFHxA (i.e., PFCA compounds). This illustrated that 6:2 FTS was a precursor of PFCAs[85]. Dehydrogenase, hydratase, monooxygenase, and decarboxylase were speculated as the potential enzymes involved in converting 6:2 FTS to shorter metabolites by removing fluorine and carbon[85]. The anaerobic biotransformation of FTOHs was investigated in a WWTF digester sludge under methanogenic conditions[86]. Results indicated reformation of 6:2 FTOH and 8:2 FTCA to 6:2 FTCA and 6:2 FTUCA, and 8:2 FTOH, respectively, under anaerobic conditions. 6:2 FTOH and 8:2 FTOH biotransformation were found inefficient for reduction of C-F bond to form PFCAs. This indicated that FTOHs may not be the precursors of PFCAs in anaerobic digester sludge of WWTF[86]. Results also indicated that anaerobic biotransformation of 6:2 FTOH occurs at significantly slower rates in comparison with aerobic biotransformation. Further studies on PFAS

precursors biotransformation are required to understand and develop biotransformation pathways involved in PFAS degradation.

1.9. Research Motivation

WWTFs act as a main conduit of PFAS to the environment, receiving these compounds from point and non-point sources, ultimately discharging PFAS through effluent and biosolids to water bodies and landfills/agriculture sites. Subsequently, PFAS that are not completely removed in WWTFs as well as PFAS metabolites generated as a result of their precursor degradation and biotransformation are transferred into water bodies, where they may accumulate in soil, be re-used for drinking water, or enter into the food chain. Therefore, there is a pressing need to study and understand PFAS fate and transformation in WWTFs. Although a number of studies investigated the presence and concentrations of PFAS in WWTFs, the impact of treatment process and temporal and spatial variations on PFAS fate and transformation has received little attention and deserves further investigation. Through qualitative and quantitative assessment of influential factors, such an investigation sheds light on factors affecting degradation and distribution of PFAS in WWTFs. This provides valuable information for environmental planning agencies as well as WWTFs to develop effective protocols and measures to reduce the risk of PFAS discharge to environment and its exposure to people.

1.9.1 Research Objectives

The objective of this research was to characterize the impact of biological treatment approaches, and temporal and spatial variations PFAS concentrations and occurrence in six WWTFs that discharge their effluent into the Great Bay Estuary, NH. For a subset of these facilities, we further assessed PFAS distribution along a treatment train that considered secondary and disinfection unit

processes. Additionally, we assessed fractionation between aqueous and solid phases. Finally, we assessed the distribution and concentration of PFAS in Great Bay Estuary surface water samples. We identified the following four hypotheses:

1. Previous studies have suggested WWTF effluent contains more terminal PFAS than influent, indicating transformation occurs during secondary treatment. We hypothesize that a higher number of PFAS will be detected and a higher concentration of total PFAS will be measured in WWTF effluent as compared to influent.
2. Previous research has suggested seasonal changes may influence PFAS behavior and distribution in WWTFs. We hypothesize that increased temperature in the summer season and the resulting increase in microbial activities during secondary treatment will increase PFAS precursor degradation from influent to effluent. This effect will be measured with an increase in PFAS terminal metabolite concentrations in WWTF effluent.
3. Previous studies have suggested PFAS distribution in WWTFs and different matrices is related to their physical and chemical properties and their C-F chain length. We hypothesized that longer chain PFAS will be the predominantly detected constituents in sludge and shorter chains will dominate in influent and effluent.
4. A few studies have proposed that the TOP assay analysis can indirectly quantify PFAS precursors by oxidizing them to PFAAs, resulting in a better understanding of their distribution in WWTFs. We hypothesize that the presence of PFAS precursors in WWTFs will be confirmed by the increase of PFAA concentrations after oxidation by TOP assay analysis. This effect will be measured by the ratio of PFAS after oxidation and before oxidation, with a ratio greater than one indicating the presence of PFAS precursors.

In Chapter 2, our research objectives and hypothesis are addressed by explaining the method and sampling goals, PFAS analysis, and presenting the obtained results and conclusions. In Chapter 3, the overall research conclusions are summarized, and potential future directions of this work are discussed.

1.10. Reference

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Chapter 2. Distribution and Fate of Per- and Polyfluorinated Alkyl Substances (PFAS) in Wastewater Treatment Plants with Different Biological Treatment

This chapter will be submitted to the journal *Environmental Science: Processes and Impacts*.

Abstract

Anthropogenic compounds known as per-and polyfluorinated alkyl substances (PFAS) represent a major class of contaminants of emerging concern composed of nearly 5000 human-made chemicals. PFAS widespread use, broad environmental distribution, recalcitrance in the environment, and potential toxicity to humans and ecosystems have resulted in the considerable growing concern. PFAS are moderately toxic to marine and freshwater aquatic organisms and can bioaccumulate posing human and ecological health concerns. Wastewater treatment facilities (WWTFs) are a conduit of PFAS to surface waters because of their direct tie to common household products in municipal sewage, and their acceptance of industrial wastewater sources, septic materials, and firefighting wastewaters. This study investigated the distribution and fate of twenty-four PFAS within six New Hampshire WWTFs that apply different biological and disinfection unit processes. PFAS quantification was conducted using two approaches: (1) direct LC/MS/MS analysis of 24 known compounds and (2) a total oxidizable precursor assay (TOP Assay) followed by LC/MS/MS to determine the total potential PFAS concentration. The TOP Assay uses a strong chemical oxidizing agent to convert larger fluorinated precursor compounds into their terminal end products that can be quantified by the 24-PFAS direct analysis method. Therefore, TOP Assay expands our limited compound specific analytical techniques by providing an overall quantifiable estimate of the oxidizable PFAS present. Of the 24 PFAS analyzed, up to 7 and 12 constituents were detected in influent and effluent of WWTFs, respectively, with concentrations ranging from 30 to 128 ng/L in March. Total PFAS concentration increased in effluents of WWTFs during July,

with concentrations between 70 to 198 ng/L for the same detected constituents. Short-chain compounds such as PFHxA, PFPeA, PFBA, PFHxS, and PFBS were detected as dominant compounds in both influent and effluents. In contrast, long-chain compounds such as PFNA, PFDA, PFOS, NEtFOSAA, and NMeFOSAA dominated in WWTF sludge. The increase in PFAA concentrations after TOP assay analysis suggests the presence of unknown PFAS precursors, particularly in WWTF influent, which can oxidize to measurable PFAAs compounds. A reduction in TOP constituents for effluents suggests precursors degradation during biological treatment in WWTFs. These results provide new insight into PFAS fate in municipal wastewater treatment facilities in New England.

1. Introduction

Per-and polyfluoroalkyl substances (PFAS) represent a major class of contaminants of emerging concern (CEC), comprised of nearly 5000 human-synthesized chemicals[1]. The unique properties of PFAS products, including their thermal- and chemical-stability, has led to their use in a variety of consumer and industrial applications since the 1940s, including surfactants, firefighting foams, clothing and cookware coatings, and food packaging products, among others[2-4]. However, there is growing awareness that these "forever chemicals" have a broad environmental distribution[5,6], are environmentally recalcitrant[7], and pose potential toxicity to humans[8-11] and ecosystems[12-14]. Understanding the sources, conduits, and sinks for PFAS is therefore important to characterizing possible exposures in the environment.

Release of PFAS to freshwater environments can occur through point and non-point sources[15]. Well-characterized point sources include discharge from poorly-treated industrial facilities, wastewater treatment facilities (WWTFs), landfills, and sites where application of AFFF has

occurred. PFAS distribution in water bodies is directly related to their sources. For example, higher PFAS concentrations are detected in areas which are exposed to manufacturing areas, WWTFs discharges, and landfills runoff[20-23]. Indirect sources of PFAS to the environment include dry and wet atmospheric deposition, runoff from contaminated soils, leaking landfills, and surface water runoff, and groundwater discharge from contaminated areas[15.24.25-28]. WWTFs represent the major conduit between industrial and commercial sources to environmental discharge into aquatic systems[16,17]. WWTF effluent is considered one of the main routes for introducing PFAS into water bodies[45]. Although WWTFs are highly effective at removal of chemical oxygen demand, recent research suggests conventional treatment systems are ineffective at removing certain emerging contaminants, especially PFAS[18,19].

WWTFs act as a main conduit of PFAS to the environment, receiving these constituents from point and non-point sources, ultimately discharging PFAS through effluent and biosolids to water bodies and landfills/agriculture sites. Subsequently, PFAS that are not completely removed in WWTFs due to their recalcitrance as well as PFAS metabolites generated as a result of precursor degradation and biotransformation move into water bodies[31-34]. Incomplete PFAS removal and new generated short-chain PFAS metabolites through their precursors degradation discharge to water bodies via effluent outflows and can potentially enter to drinking water[35] have been observed in previous studies[33-35]. In addition, accumulated long-chain PFAS in landfills have been described as a result of their adsorption to sludge solids, contributing to subsequent contamination of groundwater and food chain[36-38]. Previous studies illustrated PFAAs precursors transformation during biological treatment[40,41,45]. The observed increase in PFAAs concentrations from influent to effluent supports the presence of precursors in influent and their biodegradation through different biological treatment processes[31-33,39,40]. The increase of PFAS concentrations after

secondary treatment demonstrate PFAA precursor biodegradation and transformation to terminal metabolites[41-45]. Biological treatment was identified to have an important impact on PFAS distribution and fate in WWTF[18,46].

One of the major challenges in closing the mass balance of PFAS in WWTFs results from analytical limitations. Although new analytical methods are under development or undergoing lab validation testing through the EPA[47], the current standard method (EPA 537.1 Rev 1) measures up to 24 PFAS compounds using solid phase extraction and liquid chromatography-tandem mass spectrometry (LC/MS/MS), with the current list comprised of terminal PFAAs (18 constituents) and up to six precursors.[48-50] However, this method is strictly for drinking water matrix; therefore modifications to this method have been made (e.g., isotope dilution) for other sample types, including wastewater and biosolids[50]. One approach that has been used to quantify other PFAS not included in the aforementioned constituent lists is the total oxidizable precursor assay (TOP)[51]. The presence of PFAS precursors in influent of WWTFs was indirectly evaluated through TOP assay analysis[19-21]. Higher PFAAs concentrations after TOP assay analysis represented PFAS precursors which were oxidized with hydroxyl radicals. The TOP assay uses a strong chemical oxidizing agent to convert larger fluorinated compounds for which no analytical standards exist into terminal end products that can be quantified by LC/MS/MS[1,22,52,53]. However, not all PFAS are chemically oxidizable, and oxidation may convert precursors into other unknown metabolites. The indirectly measured PFAS precursors accounted for 30% to 60% of total PFAS molar concentrations in WWTFs in one study[22]. Although TOP assay analysis helps to indirectly quantify PFAS precursors, the measured total PFAS concentrations are still underreported by TOP assay due to capturing approximately 65% to 75% of generated PFCAs through the oxidation process[40].

Given our current lack of understanding of PFAS composition and fractionation in WWTFs, this study characterized PFAS in influents, effluents and biosolids of WWTFs discharging into the Great Bay Estuary, New Hampshire, USA. The Great Bay Estuary is a multifaceted convergence zone with 21 square miles of tidal waters located in southeastern New Hampshire. The estuary is surrounded by rural communities and is increasingly impacted by industrial and urbanization activities. Great Bay's position at the confluence of land, rivers, and the sea creates an ecosystem which support the growth and livelihood of different bird, fish, and plant spices[54]. In addition, we assessed the removal of PFAS in four different secondary treatment designs and two disinfection processes. In order to better close the mass balance between PFAS entering and leaving the facility, quantification was conducted using two approaches: 1) LC/MS/MS isotope dilution technique and 2) TOP assay. This work improves our understanding of PFAS distribution and removal in WWTFs discharging to coastal ecosystems.

2. Material and Methods

A total of 37 samples were collected in 2019 from WWTFs, receiving water bodies, and the Great Bay Estuary (Figure S1, Table S1). Twelve samples were collected in March from six WWTFs (two per facility) to screen for PFAS entering and leaving the facilities. During this sampling event, one sample was taken immediately after primary treatment at a highly turbulent discrete location to ensure good mixing[55] (Figure S2) while the second sample was collected after disinfection before discharge to a receiving water body (Figure S2). In addition, one surface water sample was collected during low tide downstream of several facilities (Hilton Point). Based on the results of these data, four WWTFs containing differing secondary treatment designs but the same disinfection strategies were chosen for a more detailed PFAS characterization. Follow up sampling was conducted in July (n=20) where five samples were collected per facility after primary

treatment, after secondary treatment, after chlorination, after dechlorination and in the dewatered sludge (Figure S3). Additionally, five surface water samples were collected during low tide in downstream receiving water bodies and the Great Bay Estuary (Figure S1). During both WWTF sampling events, a field blank was collected at one treatment facility to assess possible sources of PFAS contamination during sampling. A field blank was also collected during Great Bay sampling. Samples were placed in Ziplock bags on ice and held at 4˚C until delivered to a commercial laboratory within 48 hours. Samples were analyzed at Alpha Analytical Laboratory (Portsmouth, NH) LC/MS/MS using isotope dilution and total oxidizable precursor assay (see Appendix A).

Field analysis including pH, temperature, dissolved oxygen (DO), conductivity, and redox potential were conducted using a Thermo Scientific Orion Star A329 meter during sampling (Table S2). To better understand the water quality and the effect of different matrices on PFAS analysis, total suspended solids (TSS), dissolved organic carbon (DOC), total dissolved nitrogen (TDN), COD, and anions (fluoride, chloride, nitrate, nitrite, and sulfate) were measured in Gregg Hall at the University of New Hampshire for each sampling location (Table S3). Wastewater samples for DOC and TDN measurements were syringe filtered through a 0.45 μm pore size filter into pre-baked borosilicate volatile organic analysis vials with Teflon-lined septa. DOC and TDN were determined following EPA Method 415.1 and ASTM D8083 using a Shimadzu TOC-VCHS instrument with 680°C combustion catalytic oxidation detection method, respectively[56,57]. Filtered wastewater samples were used for anions measurements. Anions were analyzed using an ion chromatograph Thermo Integrion equipped with an autosampler (AS40, Dionex) and AS11-HC-4μm column[58]. Experimental data were statistically evaluated by t-test (for two factors) and oneway ANOVA (for three or more factors). Statistical analyses were performed using JMP Pro.14.

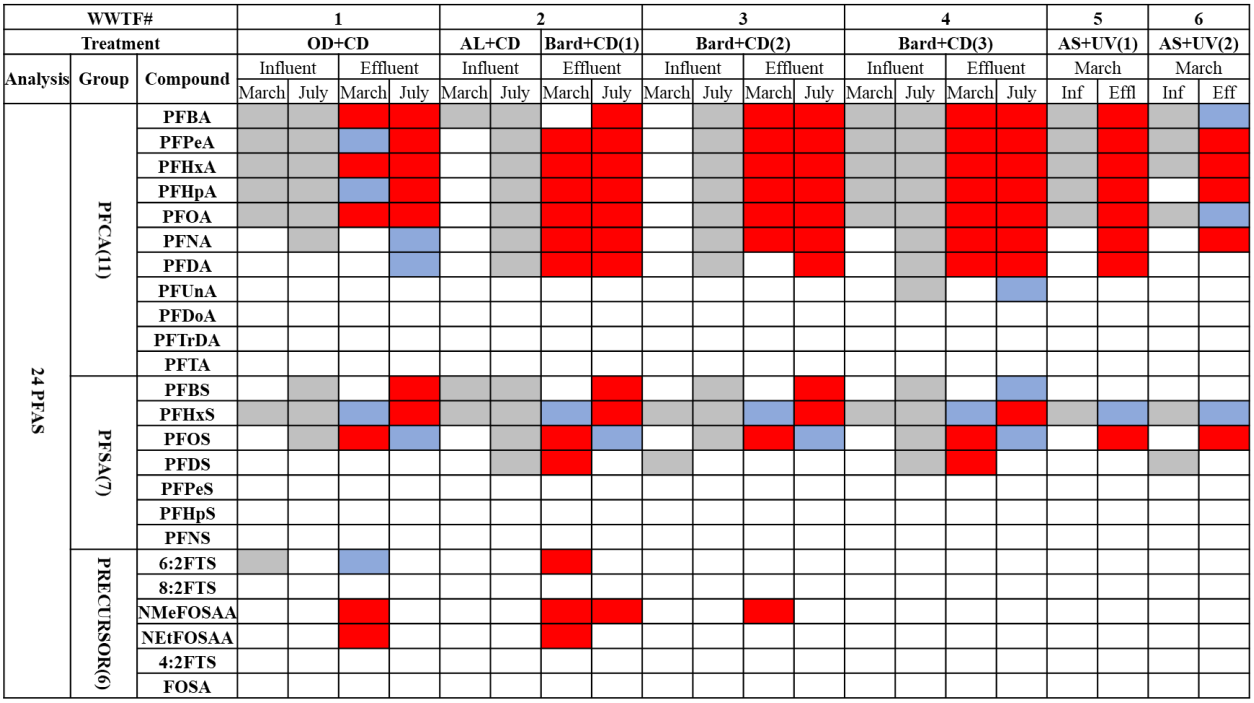
3. Results

3.1. Similar PFAS diversity and abundance observed across WWTFs

We assessed PFAS detection in influent and effluent of all WWTFs (Table 2.1). Of the 24 PFAS compounds analyzed, 2-7 constituents were detected in influent while 8-12 constituents were detected in the effluents. PFCAs were the most abundant compounds, with up to 8 detected constituents out of 11 measured compounds. PFSAs and precursors were less abundant with up to 4 and 3 detection out of 7 and 6 measured compounds, respectively. Generally, PFCA concentrations increased after wastewater treatment. PFSAs compounds distribution varied from influent to effluent. The detection of PFAS precursors in effluent while no detection recorded in influent may be as a result of the presence of unknown PFAS precursors in influent not measured by standard analytical method.

PFAS concentrations and distributions in WWTFs are displayed in Figure 2.1. Total PFAS concentrations in influents and effluent of WWTFs ranged from 36-104 ng/L and 30-128 ng/L during March (Figure 2.1a) and 30-130 ng/L and 70-198 ng/L during July (Figure 2.1b), respectively. The effluent concentrations of total detected constituents in July were elevated compared to influent by 50 to 270%. In March, the effluent concentrations were varied. Total PFAS concentrations at Bard+CD (3) and AS+UV (1) increased in March by14% and 62%, respectively. In contrast to the increases observed, the effluent total PFAS concentrations declined relative to influent at OD+CD (4%), Bard+CD(2) (8%), AL+CD (16%), and AS+UV(2) (18%). Although these PFAS reductions in the effluent may be related to their removal during treatment, such values are more likely indicative of analytical error and/or differences in matrices, and do not represent true reductions from treatment processes.

Table 2.1. PFAS detection summary in influent and effluent of WWTFs. White represents non detected, gray means detected, blue means influent > effluent, and red means effluent > influent.



The dominant constituents identified in influent were PFHxA and PFHxS while PFHxA, PFPeA, and PFBA were consistently detected in effluents of both seasons. We observed higher concentrations in July for PFPeA, PFBS, and PFOS compared to March (paired t-test, $p<0.05$). In addition, PFHxA, PFPeA, and NMeFOSAA concentrations were significantly higher in effluent than their respective influent samples for both seasons ($P<0.05$). Interestingly, PFHXs was the only detected constituent with a higher concentration in the influent than effluent for both seasons with ($P<0.05$). We also assessed differences from treatment. PFOA, PFHpA, and 6:2FTS concentrations were significantly higher at the facility using a AS+UV (1) treatment train, as compared to other facilities (1-way ANOVA, $P<0.005$).

3.2. PFAS effluent concentrations are higher during warmer season

In addition to assessing differences in PFAS diversity and abundance at individual WWTFs, we evaluated concentrations during a colder/wetter season (March) versus a warmer/dryer season (July). We observed no difference in total PFAS concentrations for WWTF influent regardless of season (t-test, p-value=0.91). Total PFAS in influent of OD+CD and Bard+CD (2) was 15 to 60% lower in July relative to March, while influent PFAS concentrations in Bard+CD (1) and Bard+CD (3) were 1.5 and 181% higher in July, respectively. In contrast, total PFAS concentration in effluent during the warmer season (July) were significantly higher than the colder season (March) (p-value=0.03) (Figure 2.2a) with OD+CD increasing 10%, Bard+CD (1) increasing 352%, Bard+CD (2) increasing 111%, and Bard+CD (3) increasing 270% (Figure.S4). Secondary treatment basin temperatures ranged from 4ºC to 11ºC in March and 20ºC to 23ºC in July (Figure 2.1). Given that influent concentrations were unchanged while effluent concentrations increased across all four WWTFs during July, this suggests higher basin temperature may promote PFAS degradation, a trend noted previously[46].

We were interested in calculating PFAS loads from individual WWTFs to the Great Bay Estuary. The annual PFAS mass load was calculated by multiplying total PFAS influent or effluent concentrations in July by the actual flow rate at each WWTF (Figure 2.2b). The annual mass load in effluent from Bard+CD (3) and Bard+CD (1) are approximately equal while PFAS concentrations of Bard+CD (3) is 3.7 time higher than Bard+CD (1) (Figure 1b). The PFAS annual load in effluent of OD+CD was the lower than Bard+CD (2) although total PFAS concentrations in OD+CD were higher than Bard+CD (2) (Figure 1b, Figure 2b). Considering total effluent PFAS concentrations observed across WWTFs only varied by a factor of 2, these results highlight the direct effect of flow rate on annual PFAS load delivered to the Great Bay Estuary.

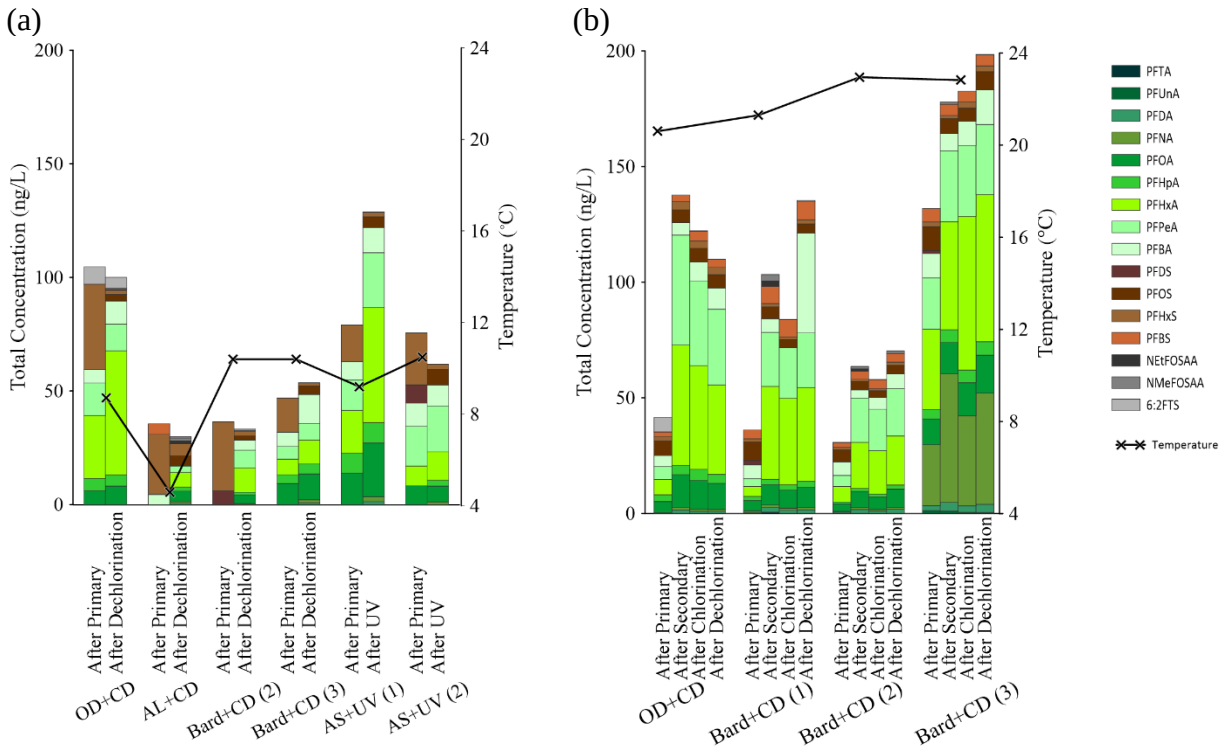


Figure 2.1. PFAS concentrations and detected constituents from influent to effluent for all WWTFs in a) March b) July. Green shading denotes PFCAs, brown denotes PFSAs, and grey denotes precursors. Darker shading within each color indicates longer carbon chain length.

3.3. Sludge dominated by long chain PFAS while effluent contains shorter chain PFAS

We next compared PFAS fractionation across influent, effluent, and sludge phases (Figure 2.3a). Short chain PFCAs with 4 to 7 CF_2 moieties comprised 58-92% of total mass in both influent and effluent samples. Short chain PFSAs (PFBS and PFHxS, with of 4 and 6 CF_2 moieties) contributed an additional 4-14% of influent and effluent. In contrast, long chain PFAS (PFNA, PFDA, PFOS, PFDA, PFDS, PFUnA, PFDoA, PFTrDA, and PFTA) dominated in sludge samples. PFAS precursors including NMeFOSAA, NEtFOSAA, 6:2 FTS and FOSA comprised 14-36% of total mass in sludge samples but only 0-15% of total mass in influent. The results showed that shorter chain PFCAs and PFSAs with fewer than 8 CF_2 moieties are more abundant in the aqueous phase due to their lower hydrophobicity.

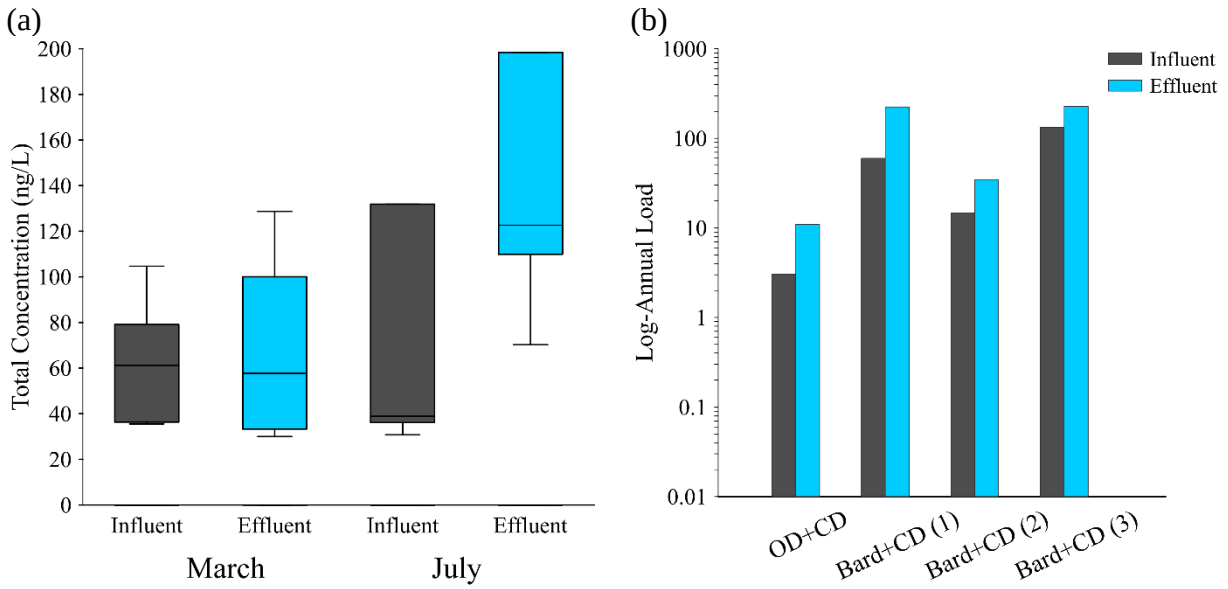


Figure 2.2. a) Boxplot of total influent and effluent PFAS concentrations from WWTFs by season. b) Annual mass load of PFAS in influent and effluent.

The higher abundance of longer-chain constituents, including more than 8 CF_2 moieties, in sludge is in agreement with previous studies, which showed more hydrophobic PFAS tend to partition more strongly to organic matter and solid particles[34,41,60]. The relative abundance of PFAS analytes are shown in Figure 2.3b in influent, effluent, and sludge of WWTFs for July. For WWTFs only sampled in March, sludge samples were not collected so only March influent and effluent are shown. The sludge concentration in ng/L was calculated using % solid content and mass of water in sludge (table S4), multiplying the detected mass in ng per sludge mass (calculation details provided in the appendix). PFAS concentrations were significantly higher in sludge compared to influent (10 to 760-fold) and effluent (6 to 300-fold) relative to aqueous phases. Specifically, sludge concentrations were 300-fold higher in OD+CD, 100-fold higher in Bard+CD (1), 65-fold higher in Bard+CD (2), and 6-fold higher in Bard-CD (3) than effluent concentrations. The results support the accumulation of PFAS in biosolids at levels considerably higher than effluents. Higher concentrations of precursors in biosolids may have improved their detection in this phase.

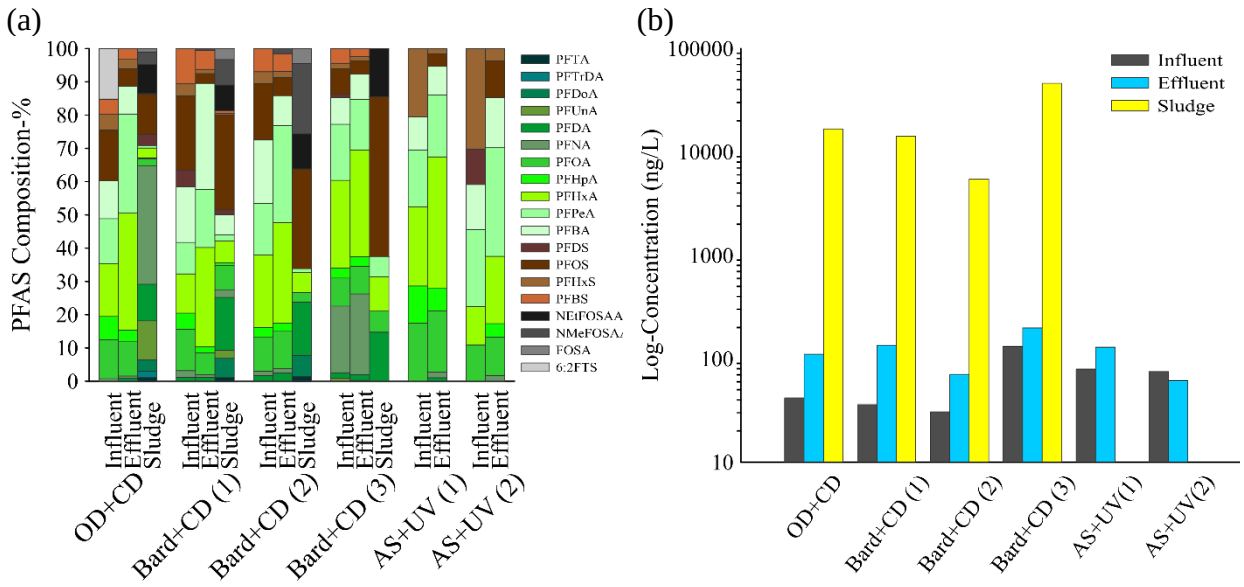


Figure 2.3. a) PFAS relative abundance in influent, effluent of both seasons and sludge of July for all WWTFs, and b) Total PFAS concentrations in influent, effluent, and sludge of WWTFs in March and July.

3.4. Unmeasured PFAS precursors decrease with treatment

We were interested in assessing how closely PFAS concentrations measured for individual constituents matched concentrations after TOP assay oxidation. We applied the TOP assay to all aqueous samples collected during both seasons and calculated the ratio between PFAS concentrations before and after oxidation for 8 different terminal constituents in influent, effluent, and Great Bay samples (Figure 2.4). The highest ratios were observed in influent samples, with PFPeA and PFBA measuring 29- and 47-fold higher after oxidation, respectively. The ratios of these two constituents decreased to <3 in the effluent and <1 in surface water samples, suggesting other compounds present in influent samples may have generated these metabolites through oxidation. Similarly, PFHxA was 8 times higher in influent samples through TOP analysis, (Figure 2.4a), diminishing to <2 in effluent and surface water samples. On the other hand, the ratios for PFOA increased after biological treatment in effluent 1.5 times more than influent, suggesting further liberation of this metabolite or the presence of other precursors in effluent or surface water samples.

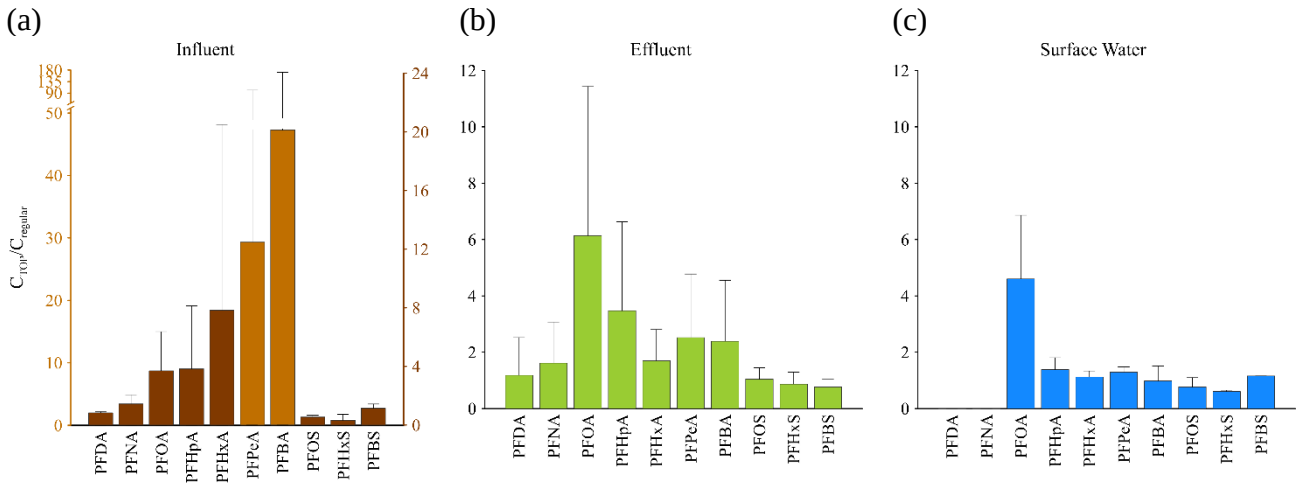


Figure 2.4. portion of PFAS concentrations after oxidation in TOP assay and before oxidation in a) influent, b) effluent, and c) Great Bay.

3.5. WWTFs separate PFAS into constituents that dominate in aqueous and solid phases

We attempted to combine our quantitative PFAS data for aqueous and biosolid WWTF samples into a conceptual image that represented PFAS distribution and fraction in all WWTFs. The PFAS distribution during different treatment in WWTFs was averagely summarized in Figure 2.5. We determined the ratio between the concentration of PFAS precursors, short and long chain PFAAs in influent versus effluent or sludge. The highest ratio was observed for PFAS precursors which measured >2000-fold higher in sludge than influent. The increase of PFAAs precursors in sludge may be attributed to their accumulation to sludge solids over time as a result of recycling to secondary treatment. Higher PFCAs were detected in effluent with 2-3 time and sludge with 93-417 time compared to influent. The same trend was observed for long chain PFSAs with up to 12 time higher in sludge samples. In contrast, the ratio of PFAS precursors and long chain PFSAs were diminished in effluent, indicating precursors and long chain PFAS transfer to sludge by adsorbing to sludge solid particles. The observed discharge of terminal PFAAs compounds from effluent and sludge to water bodies and landfills which are potentially the source of drinking water and soil amendment, emphasize the effect of WWTFs role in PFAS fate and distribution.

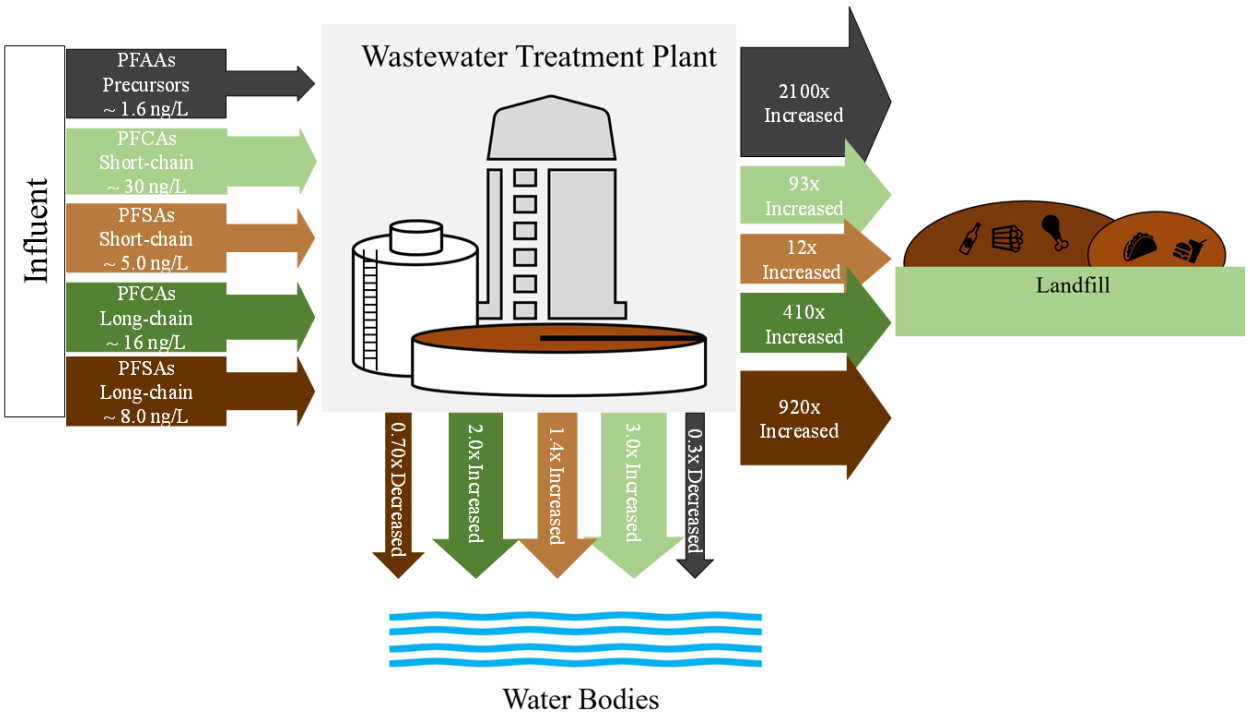


Figure 5. average PFAS fate and distribution in WWTFs.

3.6. PFAS Distribution across WWTFs in New Hampshire

Because our study was only able to assess 6 treatment facilities around the Great Bay Estuary, we were interested in assessing whether similar trends could be seen in other New Hampshire WWTFs. Using data collected between 2017-2019 by the New Hampshire Department of Environmental Service (NHDES), we compared total PFAS concentrations in influent and effluent for ten other WWTFs in New Hampshire. Our influent data (total PFAS ranging from 30 to 130 ng/L) was on par with that collected at a larger scale by NHDES, which varied between 10 and 200 ng/L. Similarly, effluent concentrations in our smaller study (30 ng/L- 200 ng/L) were with the range reported by NHDES (40 to 230 ng/L). Average PFAS concentrations for both influent and effluents were not statistically different between our data and that collected by the NHDES data ($p=0.61$, $p=0.45$, respectively). On the other hand, total PFAS concentrations detected in Great

Bay surface water samples were considerably lower, (6 to 17 ng/L) and differed significantly for the influent and effluent samples for both data sets (p-value=0.02).

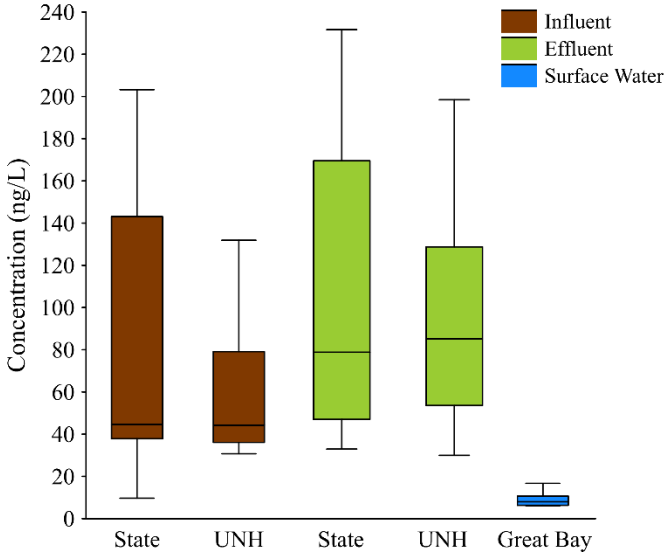


Figure 6. A comparison of PFAS concentrations for New Hampshire WWTF influent and effluent samples in this study (UNH) and collected by the NHDES (state).

4. Conclusion

The results from this study demonstrated that PFAS were ubiquitously detected in WWTFs. Higher PFAS concentrations were detected after secondary treatment and effluent of WWTFs especially during warmer season emphasize the effect of biological treatment on PFAS precursors degradation and transformation to terminal PFAAs metabolites[45,59-61]. Higher temperature and consequently microbial activities in secondary treatment during July resulted in the acceleration of PFAS precursor degradation and their transformation to terminal compounds. The general elevated PFAS concentrations in effluent is in agreement with previous studies[23,46,62,63]. In addition, higher microbial activity in the upgraded secondary treatment from aerated lagoon to 4-stage bardenpho may accelerate PFAAs precursors degradation in the system and support the elevated PFAAs concentrations observed in the effluent.

Long chain PFAS were more abundance than short chain PFAS in sludge due to their higher adsorption potential to solid particles. The increase in the partition coefficient (Kd) with the number of CF_2 moieties results in higher adsorption ability of PFAS constituents[42,45]. In addition, the results showed that short chain PFAS were more abundant in the aqueous phase due to having lower C-F bonds and their high solubility in water[34,42,45]. PFAS concentrations in sludge samples were measured up to 300-fold greater than effluent concentrations and can be related to the sludge retention time (SRT) as a result of recycling activated sludge to secondary treatment. PFAS compounds may have more time to be trapped by solid particles as a result of higher SRT, suggesting their accumulation in sludge phase. Consequently, biological treatment can directly influence PFAS distribution in effluent and sludge. Higher PFAS concentrations in sludge were observed in the upgraded facility from aerated lagoon to 4-stage bardenpho with a constant influent concentration, supporting the effect of higher SRT on transferring PFAS to sludge phase.

After oxidation to before oxidation PFAS concentration ratio in influent was significantly higher than effluent and surface water. This revealed the possible role of biological treatment process in degradation of PFAS precursors and their transformation to PFAAs compounds. Also, the increase of PFAS concentrations from influent to effluent especially after secondary treatment support the presence of unknown PFAS precursors degraded during biological treatment and transformed to terminal PFAAs compounds[22,40,45,51]. The detection of PFAS in effluent and sludge of WWTFs and understanding their precursors fate during treatment in this study, emphasize the role of WWTFs as a main conduit of PFAS to the environment. The results of this study highlight that further research is required to modify the efficiency of PFAS analytical method and evaluate the mechanism of PFAS distribution in WWTFs.

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Chapter 3. Future Research

In this study, we investigated PFAS distribution, removal, and fate from WWTFs discharging to Great Bay Estuary in two seasons using a standard analytical method (LC/MS/MS) and a novel approach that oxidizes unmeasured PFAS precursors before analysis. The results from this study demonstrated that select PFAS were detected in the influent, effluent, and sludge of all WWTFs, and showed that total measured PFAS increased after treatment during the warm season. We hypothesized that observed increase of total PFAS in WWTF effluent during July could be due to higher water/air temperature, resulting in greater microbial activity in secondary treatment which accelerated PFAAs precursors biotransformation to terminal products, but this was not something we were able to prove with our sampling approach. We also observed that higher PFAS concentrations were measured in sludge as compared to influent and effluent, and loosely associated this with the longer retention of sludge within secondary treatment (sludge retention time (SRT)). Longer chain PFAS dominated in sludge due to their hydrophobicity, while shorter chain PFAS are less hydrophobic, and were more prevalent. We further observed an increase in several PFAAs after oxidation from the TOP assay, which supports the theory that other PFAS (e.g., precursors not measured using standard LC-MS/MS) are present in WWTF influents. Additionally, there was a decrease in the ratio of PFAS measured after oxidation to before oxidation with progression in treatment, suggesting removal and/or some biological or chemical transformations of PFAS within the WWTFs. PFAS concentrations measured in this work were in line with concentrations reported for other WWTFs across NH. Combined, results of this study highlight the important role WWTFs serve as a conduit of PFAS from industrial and municipal sources to the environment. This work further emphasizes the need for further research in this field

evaluate the mechanisms of PFAS transformations within WWTFs and their fate after discharge or disposal.

This research could be expanded in several ways:

1. Measuring PFAS concentrations from a greater number of WWTFs would improve our ability to test the effect of WWTF design on PFAS distribution and fate. Also, collecting more sample from different processes at each facility might help to better understand PFAS fate within the WWTFs themselves.
2. Understanding the main sources of PFAS discharging to WWTFs (septic systems, landfills, industrial facilities) and the timing of these discharges with respect to influent, effluent, and sludge concentrations would improve our understanding of PFAS fate within the treatment facility. It could also lead to improved pretreatment requirements before PFAS enter WWTFs, thus decreasing overall concentrations discharged to downstream water bodies.
3. Secondary treatment, be it via sorption to microbial cells or biotransformation, plays a very important role in PFAS distribution and abundance in the WWTF. Evaluating the effect of secondary treatment design (e.g., sludge retention time) on PFAS trends might help develop predictive models as to where PFAS will end up in the facility. To this end, longer chain PFAS compounds are accumulating in sludge, and with continued recycling may undergo repeated transformations or sequestration. Understanding the conditions for which long and short PFAS absorb to sludge is also important for predicting the fate of these compounds within WWTFs.

Appendix A. Supporting Information for Chapter 2

Details of Materials and Methods

1. Total Oxidizable Precursor Assay

Each sample was aliquoted into subsamples to be oxidized for indirect PFAA precursors quantification which cannot be measured by direct analysis[22,51,53]. Samples were diluted in a prepared persulfate and sodium hydroxide solution and thermalized at 85˚C in a water bath using HDPE vessels for 6 hours. Sulfate radicals produced as a result of persulfate decomposition and hydroxyl radicals created by hydroxide scavenging subsequently. Following oxidation, samples were neutralized to pH ranging from 5 to 9 using concentrated hydrochloric acid.

2. Instrumental Analysis

Water samples and oxidized samples were fortified by adding extracted internal standards (EIS) used for quantitation prior to extraction and monitor the efficiency of extraction[64]. The entire sample was sent through solid phase extraction (SPE) cartridge. Samples were extracted using weak anion exchange (WAX) SPE cartridges to separate the method analytes and isotopically-labeled compounds. Samples were eluted from the solid phase cartridge in two steps using 12 mL methanol followed by a 12 mL methanol solution with 2% ammonium hydroxide rinse. The extracted samples were concentrated to dryness under nitrogen steam in a heated water bath (60-65˚C) to remove all water/methanol mix. The concentrated samples were adjusted to a 1 mL volume with 80:20 (vol/vol) methanol:water solution and 20 µL isotope dilution recovery with 500ng/mL concentration. Eventually, a 3 µL sample was injected into a liquid chromatography equipped with a C18 column coupled to a tandem mass spectrometry (LC/MS/MS)[64-67].

3. Sludge Concentration Calculation

Sludge concentrations in ng/L were calculated using the mass of water in sludge determined using equation S1. By multiplying the mass of PFAS in sludge (ng/kg) with the mass of water in sludge and considering water density equals one, we can convert sludge concentration from ng/kg to ng/L.

$$\frac{100}{SC} = M_w \qquad \text{Equation S1}$$

Where, SC is % sludge content, M_w is mass of water in sludge. The calculated % sludge solids are listed in table S4.

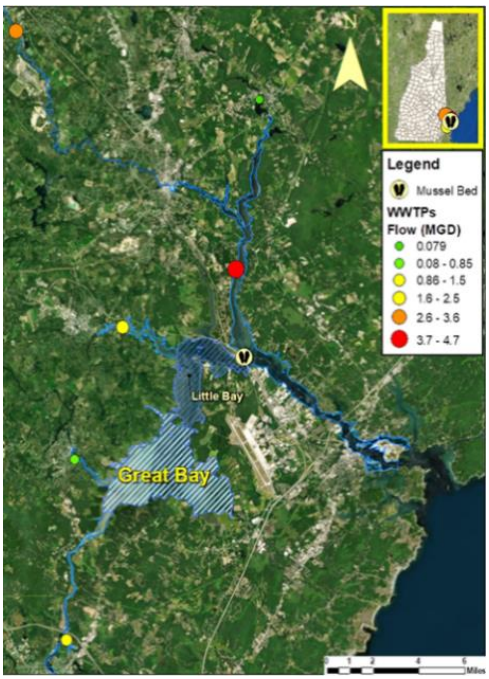


Figure S1. WWTF sampling locations discharging to Great Bay estuary.

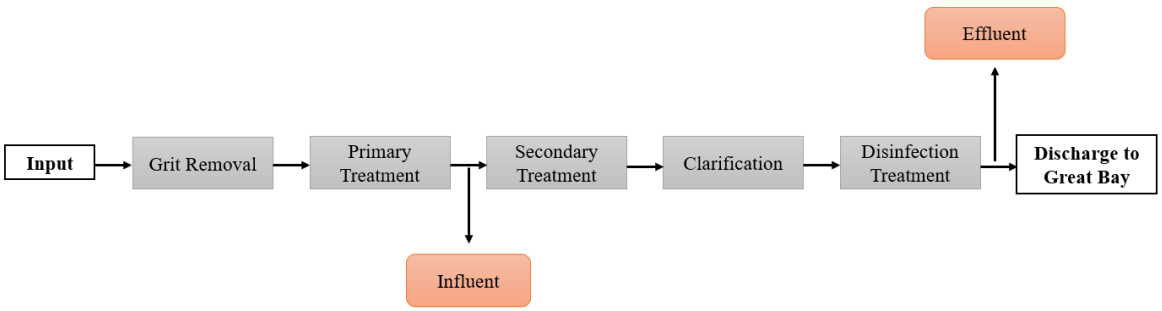


Figure S2. PFAS sampling location during March sampling campaign.

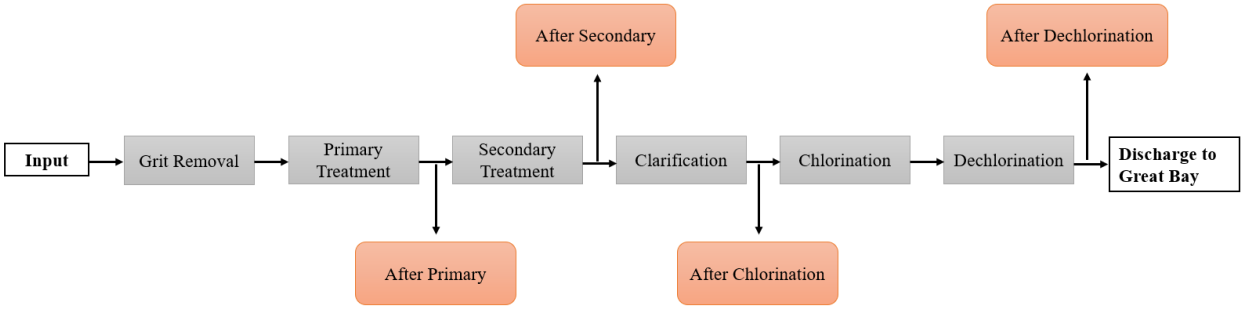


Figure S3. PFAS sampling locations during July sampling campaign.

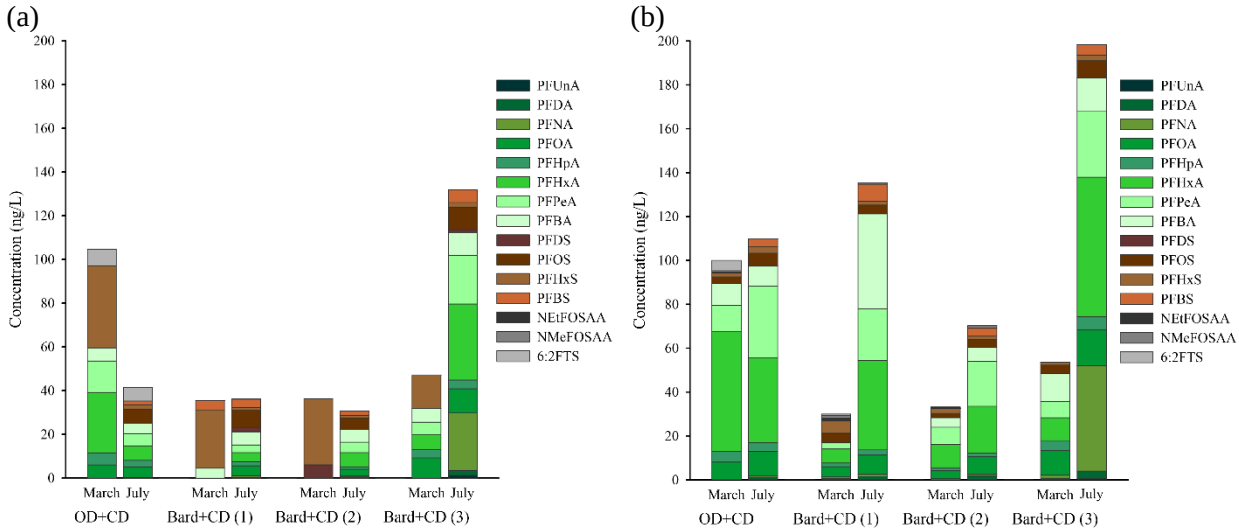


Figure S4. PFAS concentrations in a) influent and b) effluent of all WWTPs in two seasons.

Table S1. Selected WWTPs treatment processes

WWTPs:	Secondary treatment	Disinfection	Acronym
WWTP #1	Aerated Lagoons (March) Bardenpho-4(Upgraded-July)	Chlorination/Dechlorination	AL+CD Bard+CD (1)
WWTP #2	Bardenpho-4	Chlorination/Dechlorination	Bard+CD (2)
WWTP #3	Bardenpho-4	Chlorination/Dechlorination	Bard+CD (3)
WWTP #4	Activated Sludge	Ultraviolet	AS+UV (1)
WWTP #5	Oxidation Ditch	Chlorination/Dechlorination	OD+CD
WWTP #6	Activated Sludge	Ultraviolet	AS+UV (2)

Table S2. Measured field parameters for all WWTFs in both seasons.

WWTF	Location	pH		Conductivity		DO		REDOX		Temperature	
		March	July	March	July	March	July	March	July	March	July
WWTF #1	Influent	7.3	7.7	1091.5	885.1	9.7	4.4	-18.0	-34.4	4.6	20.6
	Effluent	7.6	7.0	1213.0	779.6	6.3	7.2	-33.1	0.3	9.4	23.0
WWTF #2	Influent	7.2	7.3	1463.5	1124.0	10.2	2.1	-11.2	-22.1	10.4	23.0
	Effluent	7.8	7.2	1553.5	829.6	6.8	7.9	-44.1	-14.9	10.1	23.7
WWTF #3	Influent	6.7	7.3	1334.0	839.2	6.5	4.2	15.2	-22.5	10.4	22.8
	Effluent	7.6	6.7	1441.0	744.0	7.0	3.7	-36.8	12.7	10.2	24.6
WWTF #4	Influent	7.2	ND	1076.5	ND	10.2	ND	-15.4	ND	9.2	ND
	Effluent	7.5	ND	1182.5	ND	5.4	ND	-29.7	ND	9.6	ND
WWTF #5	Influent	6.9	7.7	1235.0	885.1	4.6	4.4	1.8	-34.4	8.7	20.6
	Effluent	8.0	7.1	1176.0	802.0	8.2	4.2	-54.9	-10.9	10.7	22.5
WWTF #6	Influent	6.7	ND	1395.0	ND	7.6	ND	13.4	ND	10.5	ND
	Effluent	7.3	ND	1544.5	ND	2.2	ND	-18.4	ND	10.1	ND

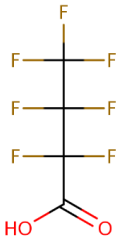
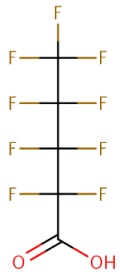
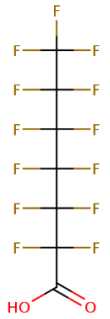
Table S3. Laboratory analyses at each WWTFs.

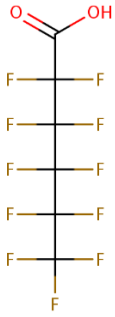
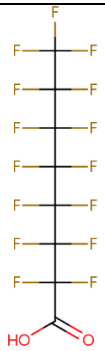
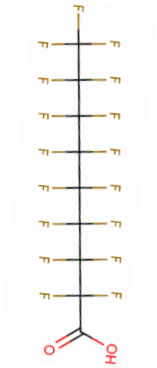
Analysis	Location	WWTP#1	WWTP#2	WWTP#3	WWTP#4	WWTP#5	WWTP#6
TSS (mg/L)	Influent	88.3	66.2	85.7	98.6	226.7	52.0
	Effluent	19.0	3.0	1.0	2.0	7.0	5.0
TOC (mg/L)	Influent	27.8	53.5	30.0	28.4	66.4	60.2
	Effluent	16.0	8.1	6.4	6.6	7.8	6.9
TDN (mg/L)	Influent	29.5	37.5	28.2	32.8	35.3	35.7
	Effluent	22.6	9.5	6.3	7.6	1.5	6.9
COD (mg/L)	Influent	116.0	245.4	95.4	149.4	312.2	246.2
	Effluent	76.1	14.2	2.0	13.2	15.7	9.8
Fluoride (mg/L)	Influent	0.5	0.5	0.3	0.1	0.1	0.2
	Effluent	0.1	0.1	0.1	0.1	0.1	0.1
Chloride (mg/L)	Influent	21.7	30.4	31.0	18.5	17.3	29.7
	Effluent	17.3	33.4	31.0	19.7	24.6	31.9
Sulfate (mg/L)	Influent	4.9	3.3	2.6	5.3	2.4	4.1
	Effluent	3.0	3.6	3.9	4.6	3.4	4.0
Nitrate (mg/L)	Influent	2.1	2.1	2.2	2.1	2.2	2.0
	Effluent	2.0	2.7	3.4	3.7	2.3	3.4
Phosphate (mg/L)	Influent	4.6	4.7	4.8	4.6	4.6	5.1
	Effluent	4.5	4.3	4.4	4.3	4.5	4.4

Table S4. Calculated % solid content and mass of water in sludge for WWTFs.

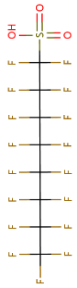
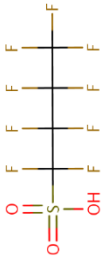
WWTPs	Solid Content (%)	M_w (Kg)
OD+CD	9.12	9.96
Bard+CD (1)	17.53	4.70
Bard+CD (2)	25.38	2.94
Bard+CD (3)	18.41	4.43

Table S5. Physical and chemical properties and elimination half-life of PFAS constituents.

Acronym	Chemical Name	Chemical Formula	Chemical Structure	Water Solubility at 25˚C (mg/L)	Elimination half-life: Rat	Molecular weight	Melting point	Boiling point	Log Koc
PFBA	Perfluorobutyric acid	$C_4HF_7O_2$		$2.14x10^5$	9.22 hours	214.039	-17.5°C	121°C	2.17 ±1.10 (soil)
PFPeA	Perfluoropentanoic acid	$C_5HF_9O_2$		ND	ND	264.05	ND	ND	1.37 ± 0.46 (soil)
PFHpA	Perfluoroheptanoic acid	$C_7HF_{13}O_2$		$4.37x10^5$	2.4 hours	364.06	24–30°C	175°C at 742 mm Hg	2.04 ± 0.48 (soil)

Acronym	Chemical Name	Chemical Formula	Chemical Structure	Water Solubility at 25˚C (mg/L)	Elimination half-life: Rat	Molecular weight	Melting point	Boiling point	Log Koc
PFHxA	Perfluorohexanoic acid	$C_6HF_{11}O_2$		15,700	1.0 hour	314.06	168°C at 742 mm Hg	1.789	2.06 ± 0.67 (soil)
PFOA	Perfluorooctanoic acid	$C_8HF_{15}O_2$		$9.5x10^3$	115 hours	414.069	54.3°C	188°C	2.22 ± 0.71 (soil)
PFNA	Perfluorononanoic acid	$C_9HF_{17}O_2$		ND	974 hours	464.08	ND	ND	2.0 ±0.1 (soil)

Acronym	Chemical Name	Chemical Formula	Chemical Structure	Water Solubility at 25˚C (mg/L)	Elimination half-life: Rat	Molecular weight	Melting point	Boiling point	Log Koc
PFDA	Perfluorodecanoic acid	$C_{10}HF_{19}O_2$		ND	40 days	ND	ND	ND	2.6± 0.2 (soil)
PFUnA	Perfluoroundecanoic acid	$C_{11}HF_{21}O_2$		ND	ND	ND	ND	ND	4.7 ± 0.1 (soil)
PFDoA	Perfluorododecanoic acid	$C_{12}HF_{23}O_2$		ND	ND	614.1	ND	ND	5.6 ± 0.2 (soil)

Acronym	Chemical Name	Chemical Formula	Chemical Structure	Water Solubility at 25˚C (mg/L)	Elimination Half-Life: Rat	Molecular weight	Melting point	Boiling point	Log Koc
PFTrDA	Perfluorotridecanoic acid	$C_{13}HF_{25}O_2$		ND	ND	664.1	ND	ND	ND
PFOS	Perfluorooctane sulfonic acid	$C_8HF_{17}O_3S$		570	179 hours	500.03	≥400°C (potassium salt)	ND	3.14 ± 0.66 (soil)
PFBS	Perfluorobutanesulfonic acid	$C_4HF_9O_3S$		344	2.1 hour	300.1	ND	211.0°C	2.06 ± 0.77 (Soil)

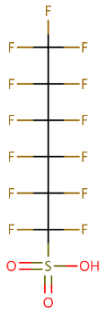
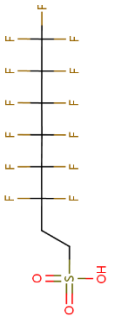
Acronym	Chemical Name	Chemical Formula	Chemical Structure	Water Solubility at 25˚C (mg/L)	Elimination half-life: Rat	Molecular weight	Melting point	Boiling point	Log Koc
P FHxS	Perfluorohexane sulfonic acid	$C_6HF_{13}O_3S$		ND	382 hours	400.12	ND	ND	2.28 ± 0.70 (soil)
PFPeS	Perfluoropentanesulfonic acid	$C_5HF_{11}O_3S$		ND	ND	350.11	ND	225.0°C	ND
6:2 FTS	1H,1H,2H,2H-Perfluorooctanesulfonic acid	$C_8H_5F_{13}O_3S$		ND	ND	428.17	ND	ND	ND

Table S6. Detected PFAS concentration in March.

	SAMPLE ID:			EX-WWTP, INFL #1,2				NM-WWTP, INFL #1,2	
	LAB ID:			L1910226-01				L1910226-02	
	COLLECTION DATE:			3/13/2019				3/13/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00451	J	0.0189	0.00353	ND		0.0201	0.00375
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ND		0.0189	0.00439	ND		0.0201	0.00466
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00466	J	0.0189	0.0036	ND		0.0201	0.00382
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.0189	0.00462	ND		0.0201	0.0049
Perfluorohexanoic Acid (PFHxA)	307-24-4	ND		0.0189	0.00466	ND		0.0201	0.00494
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.0189	0.00225	ND		0.0201	0.00239
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ND		0.0189	0.00352	ND		0.0201	0.00373
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.0264		0.0189	0.00413	0.0303		0.0201	0.00438
Perfluorooctanoic Acid (PFOA)	335-67-1	ND		0.0189	0.00436	ND		0.0201	0.00462
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ND		0.0189	0.00184	ND		0.0201	0.00195
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.0189	0.00492	ND		0.0201	0.00522
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.0189	0.00413	ND		0.0201	0.00438
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ND		0.0189	0.0053	ND		0.0201	0.00562
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.0189	0.00587	ND		0.0201	0.00622
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.0189	0.00275	ND		0.0201	0.00292
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.0189	0.00508	ND		0.0201	0.00538
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.0189	0.00237	ND		0.0201	0.00251
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.0189	0.00402	ND		0.0201	0.00426
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.0189	0.00366	0.00606	J	0.0201	0.00388
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.0189	0.00526	ND		0.0201	0.00558
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.0189	0.00353	ND		0.0201	0.00374
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.0189	0.00561	ND		0.0201	0.00594
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.0189	0.00297	ND		0.0201	0.00315
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.0189	0.00936	ND		0.0201	0.00992
PFOA/PFOS, Total		ND		0.0189	0.00436	ND		0.0201	0.00462
PFAS, Total (5)		0.0264		0.0189	0.00352	0.0303		0.0201	0.00373

	SAMPLE ID:			DU-WWTP, INFL #1,2				RC-WWTP, INFL #1,2	
	LAB ID:			L1910226-03				L1910226-04	
	COLLECTION DATE:			3/13/2019				3/14/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00622	J	0.0194	0.00363	0.00797	J	0.0199	0.00372
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0056	J	0.0194	0.00451	0.0135	J	0.0199	0.00462
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.0194	0.0037	ND		0.0199	0.00378
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.0194	0.00475	ND		0.0199	0.00486
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.00681	J	0.0194	0.00478	0.0188	J	0.0199	0.0049
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.0194	0.00232	ND		0.0199	0.00237
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00393	J	0.0194	0.00362	0.00884	J	0.0199	0.0037
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.0151	J	0.0194	0.00424	0.0162	J	0.0199	0.00434
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00926	J	0.0194	0.00447	0.0138	J	0.0199	0.00458
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ND		0.0194	0.00189	ND		0.0199	0.00193
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.0194	0.00506	ND		0.0199	0.00518
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.0194	0.00424	ND		0.0199	0.00434
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ND		0.0194	0.00545	ND		0.0199	0.00558
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.0194	0.00603	ND		0.0199	0.00618
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.0194	0.00283	ND		0.0199	0.0029
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.0194	0.00521	ND		0.0199	0.00534
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.0194	0.00244	ND		0.0199	0.00249
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.0194	0.00412	ND		0.0199	0.00422
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.0194	0.00375	ND		0.0199	0.00384
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.0194	0.00541	ND		0.0199	0.00554
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.0194	0.00363	ND		0.0199	0.00371
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.0194	0.00576	ND		0.0199	0.0059
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.0194	0.00305	ND		0.0199	0.00313
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.0194	0.00961	ND		0.0199	0.00984
PFOA/PFOS, Total		0.00926	J	0.0194	0.00447	0.0138	J	0.0199	0.00458
PFAS, Total (5)		0.0283	J	0.0194	0.00362	0.0388	J	0.0199	0.0037

	SAMPLE ID:			RF-WWTP, INFL #1,2				DO-WWTP, INFL #1,2	
	LAB ID:			L1910226-05				L1910226-06	
	COLLECTION DATE:			3/14/2019				3/14/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00592	J	0.0196	0.00366	0.0102	J	0.0196	0.00366
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0143	J	0.0196	0.00455	0.0175	J	0.0196	0.00455
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.0196	0.00372	ND		0.0196	0.00372
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.0196	0.00478	ND		0.0196	0.00478
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0277		0.0196	0.00482	0.00867	J	0.0196	0.00482
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.0196	0.00233	ND		0.0196	0.00233
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00545	J	0.0196	0.00365	ND		0.0196	0.00365
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.0376		0.0196	0.00427	0.0228		0.0196	0.00427
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00604	J	0.0196	0.00451	0.00827	J	0.0196	0.00451
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.00765	J	0.0196	0.0019	ND		0.0196	0.0019
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.0196	0.0051	ND		0.0196	0.0051
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.0196	0.00427	ND		0.0196	0.00427
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ND		0.0196	0.00549	ND		0.0196	0.00549
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.0196	0.00608	ND		0.0196	0.00608
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.0196	0.00285	ND		0.0196	0.00285
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.0196	0.00525	ND		0.0196	0.00525
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.0196	0.00245	ND		0.0196	0.00245
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.0196	0.00416	ND		0.0196	0.00416
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.0196	0.00378	0.00808	J	0.0196	0.00378
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.0196	0.00545	ND		0.0196	0.00545
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.0196	0.00365	ND		0.0196	0.00365
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.0196	0.0058	ND		0.0196	0.0058
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.0196	0.00308	ND		0.0196	0.00308
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.0196	0.00969	ND		0.0196	0.00969
PFOA/PFOS, Total		0.00604	J	0.0196	0.00451	0.00827	J	0.0196	0.00451
PFAS, Total (5)		0.0491	J	0.0196	0.00365	0.0311	J	0.0196	0.00365

	SAMPLE ID:			EX-WWTP, EFFL #1,2				NM-WWTP, EFFL #1,2	
	LAB ID:			L1910226-07				L1910226-08	
	COLLECTION DATE:			3/13/2019				3/13/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	ND		0.00194	0.000362	0.00438		0.00189	0.000353
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.00283		0.00194	0.00045	0.00783		0.00189	0.000439
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00194	0.000368	ND		0.00189	0.00036
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.00194	0.000473	ND		0.00189	0.000462
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.00654		0.00194	0.000477	0.0106		0.00189	0.000466
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00194	0.000231	ND		0.00189	0.000225
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00171	J	0.00194	0.00036	0.0013	J	0.00189	0.000352
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00534		0.00194	0.000422	0.00217		0.00189	0.000413
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00462		0.00194	0.000446	0.00377		0.00189	0.000436
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.000601	J	0.00194	0.000188	0.000458	J	0.00189	0.000184
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00194	0.000504	ND		0.00189	0.000492
Perfluorononanoic Acid (PFNA)	375-95-1	0.000698	J	0.00194	0.000422	0.000439	J	0.00189	0.000413
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00442		0.00194	0.000543	0.00195		0.00189	0.00053
Perfluorodecanoic Acid (PFDA)	335-76-2	0.000624	J	0.00194	0.000601	ND		0.00189	0.000587
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.00194	0.000282	ND		0.00189	0.000275
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00194	0.000519	ND		0.00189	0.000508
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	0.00127	J	0.00194	0.000243	0.000402	J	0.00189	0.000237
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00194	0.000411	ND		0.00189	0.000402
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00194	0.000374	ND		0.00189	0.000366
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.00194	0.000539	ND		0.00189	0.000526
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	0.00131	J	0.00194	0.000361	ND		0.00189	0.000353
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00194	0.000574	ND		0.00189	0.000561
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00194	0.000304	ND		0.00189	0.000297
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00194	0.000957	ND		0.00189	0.000936
PFOA/PFOS, Total		0.00904		0.00194	0.000446	0.00572		0.00189	0.000436
PFAS, Total (5)		0.0168	J	0.00194	0.00036	0.00963	J	0.00189	0.000352

	SAMPLE ID:			DU-WWTP, EFFL #1,2				RC-WWTP, EFFL #1,2	
	LAB ID:			L1910226-09				L1910226-10	
	COLLECTION DATE:			3/13/2019				3/14/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0129		0.00188	0.000351	0.011		0.00188	0.000351
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0073		0.00188	0.000436	0.0241		0.00188	0.000436
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00188	0.000357	ND		0.00188	0.000357
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.00188	0.000459	ND		0.00188	0.000459
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0104		0.00188	0.000462	0.0506		0.00188	0.000462
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00188	0.000224	ND		0.00188	0.000224
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00446		0.00188	0.00035	0.00898		0.00188	0.00035
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00132	J	0.00188	0.00041	0.002		0.00188	0.00041
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0113		0.00188	0.000432	0.0237		0.00188	0.000432
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ND		0.00188	0.000182	ND		0.00188	0.000182
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00188	0.000489	ND		0.00188	0.000489
Perfluorononanoic Acid (PFNA)	375-95-1	0.00141	J	0.00188	0.00041	0.00211		0.00188	0.00041
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00375		0.00188	0.000526	0.00491		0.00188	0.000526
Perfluorodecanoic Acid (PFDA)	335-76-2	0.000737	J	0.00188	0.000583	0.00132	J	0.00188	0.000583
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.00188	0.000273	ND		0.00188	0.000273
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00188	0.000504	ND		0.00188	0.000504
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.00188	0.000235	ND		0.00188	0.000235
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00188	0.000398	ND		0.00188	0.000398
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00188	0.000363	ND		0.00188	0.000363
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.00188	0.000522	ND		0.00188	0.000522
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.00188	0.00035	ND		0.00188	0.00035
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00188	0.000556	ND		0.00188	0.000556
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00188	0.000295	ND		0.00188	0.000295
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00188	0.000928	ND		0.00188	0.000928
PFOA/PFOS, Total		0.0151		0.00188	0.000432	0.0286		0.00188	0.000432
PFAS, Total (5)		0.0222	J	0.00188	0.00035	0.0417		0.00188	0.00035

	SAMPLE ID:			RF-WWTP, EFFL #1,2				DO-WWTP, EFFL #1,2	
	LAB ID:			L1910226-11				L1910226-12	
	COLLECTION DATE:			3/14/2019				3/14/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	**CAS**	**Conc**	**Q**	**RL**	**MDL**	**Conc**	**Q**	**RL**	**MDL**
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0101		0.00188	0.000351	0.00928		0.00187	0.000349
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0118		0.00188	0.000436	0.0202		0.00187	0.000434
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00188	0.000357	ND		0.00187	0.000356
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.00188	0.000459	ND		0.00187	0.000457
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0546		0.00188	0.000462	0.0125		0.00187	0.000461
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00188	0.000224	ND		0.00187	0.000223
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00493		0.00188	0.00035	0.00253		0.00187	0.000348
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00184	J	0.00188	0.00041	0.00229		0.00187	0.000408
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00814		0.00188	0.000432	0.00715		0.00187	0.000431
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.00473		0.00188	0.000182	ND		0.00187	0.000182
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00188	0.000489	ND		0.00187	0.000487
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.00188	0.00041	0.00103	J	0.00187	0.000408
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00291		0.00188	0.000526	0.00686		0.00187	0.000524
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.00188	0.000583	ND		0.00187	0.00058
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.00188	0.000273	ND		0.00187	0.000272
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00188	0.000504	ND		0.00187	0.000502
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	0.000609	J	0.00188	0.000235	ND		0.00187	0.000234
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00188	0.000398	ND		0.00187	0.000397
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00188	0.000363	ND		0.00187	0.000361
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.00188	0.000522	ND		0.00187	0.00052
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	0.000368	J	0.00188	0.00035	ND		0.00187	0.000349
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00188	0.000556	ND		0.00187	0.000554
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00188	0.000295	ND		0.00187	0.000294
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00188	0.000928	ND		0.00187	0.000925
PFOA/PFOS, Total		0.0111		0.00188	0.000432	0.014		0.00187	0.000431
PFAS, Total (5)		0.0178	J	0.00188	0.00035	0.0199	J	0.00187	0.000348

	SAMPLE ID:			EX-WWTP, BLANK FIELD	
	LAB ID:			L1910226-13	
	COLLECTION DATE:			3/13/2019	
	SAMPLE DEPTH:				
	SAMPLE MATRIX:			WATER	
	(ug/l)				
ANALYTE	CAS	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution					
Perfluorobutanoic Acid (PFBA)	375-22-4	ND		0.00185	0.000346
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ND		0.00185	0.00043
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00185	0.000352
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.00185	0.000452
Perfluorohexanoic Acid (PFHxA)	307-24-4	ND		0.00185	0.000456
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00185	0.00022
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ND		0.00185	0.000344
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ND		0.00185	0.000404
Perfluorooctanoic Acid (PFOA)	335-67-1	ND		0.00185	0.000426
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ND		0.00185	0.00018
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00185	0.000481
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.00185	0.000404
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ND		0.00185	0.000518
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.00185	0.000574
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.00185	0.000269
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00185	0.000496
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.00185	0.000232
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00185	0.000392
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00185	0.000357
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.00185	0.000515
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.00185	0.000345
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00185	0.000548
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00185	0.000291
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00185	0.000915
PFOA/PFOS, Total		ND		0.00185	0.000426
PFAS, Total (5)		ND		0.00185	0.000344

Table S7. Detected PFAS concentration by TOP assay analysis in March.

	SAMPLE ID:			EX_WWTP(INFL) #1,2				NM_WWTP(INFL) #1,2	
	LAB ID:			L1918867-01				L1918867-02	
	COLLECTION DATE:			3/13/2019				3/13/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0324		0.00197	0.000402	0.0639		0.0019	0.000388
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0303		0.00197	0.00039	0.0294		0.0019	0.000376
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00565		0.00197	0.000234	0.0043		0.0019	0.000226
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0266		0.00197	0.000323	0.0249		0.0019	0.000312
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.000335	J	0.00197	0.000241	ND		0.0019	0.000233
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.0172		0.00197	0.000222	0.0141		0.0019	0.000214
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00167	J	0.00197	0.00037	0.00122	J	0.0019	0.000357
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0468		0.00197	0.000232	0.0491		0.0019	0.000224
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00197	0.000677	ND		0.0019	0.000654
Perfluorononanoic Acid (PFNA)	375-95-1	0.00313		0.00197	0.000307	0.0031		0.0019	0.000296
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00551		0.00197	0.000496	0.00354		0.0019	0.000479
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00188	J	0.00197	0.000299	0.00205		0.0019	0.000289
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00197	0.0011	ND		0.0019	0.00106
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.000736	J	0.00197	0.000256	0.000715	J	0.0019	0.000247
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00197	0.000964	ND		0.0019	0.000932
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00052	J	0.00197	0.000366	0.000578	J	0.0019	0.000354
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00197	0.000322	ND		0.0019	0.000311
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.000346	J	0.00197	0.000244	0.000304	J	0.0019	0.000236
PFOA/PFOS, Total		0.0523		0.00197	0.000232	0.0526		0.0019	0.000224

	SAMPLE ID:			DU_WWTP(INFL) #1,2				RC_WWTP(INFL) #1,2	
	LAB ID:			L1918867-03				L1918867-04	
	COLLECTION DATE:			3/13/2019				3/13/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	**CAS**	**Conc**	**Q**	**RL**	**MDL**	**Conc**	**Q**	**RL**	**MDL**
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0497		0.00187	0.000382	0.0695		0.00188	0.000383
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0644		0.00187	0.000371	0.111		0.00188	0.000372
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00532		0.00187	0.000223	0.00646		0.00188	0.000224
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0595		0.00187	0.000307	0.121		0.00188	0.000308
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00033	J	0.00187	0.00023	0.00107	J	0.00188	0.00023
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.0238		0.00187	0.000211	0.0438		0.00188	0.000212
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00231		0.00187	0.000352	0.00304		0.00188	0.000353
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0527		0.00187	0.000221	0.0658		0.00188	0.000222
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00187	0.000644	ND		0.00188	0.000647
Perfluorononanoic Acid (PFNA)	375-95-1	0.00562		0.00187	0.000292	0.0065		0.00188	0.000293
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00667		0.00187	0.000472	0.0094		0.00188	0.000474
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00291		0.00187	0.000285	0.00515		0.00188	0.000286
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00187	0.00105	ND		0.00188	0.00105
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00114	J	0.00187	0.000243	0.00138	J	0.00188	0.000244
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00187	0.000918	ND		0.00188	0.000921
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.0011	J	0.00187	0.000348	0.00136	J	0.00188	0.00035
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.000326	J	0.00187	0.000306	0.0005	J	0.00188	0.000308
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.000449	J	0.00187	0.000232	0.000515	J	0.00188	0.000233
PFOA/PFOS, Total		0.0594		0.00187	0.000221	0.0752		0.00188	0.000222

	SAMPLE ID:			RF_WWTP(INFL) #1,2				RF_WWTP(INFL) #1,2	
	LAB ID:			L1918867-05				L1918867-05 R1	
	COLLECTION DATE:			3/13/2019				3/13/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	3.11	E	0.00183	0.000374	2.23		0.00916	0.00187
Perfluoropentanoic Acid (PFPeA)	2706-90-3	4.1	E	0.00183	0.000363	2.96		0.00916	0.00181
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.0185		0.00183	0.000218	-		-	-
Perfluorohexanoic Acid (PFHxA)	307-24-4	1.06		0.00183	0.0003	-		-	-
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00304		0.00183	0.000224	-		-	-
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.0665		0.00183	0.000206	-		-	-
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00264		0.00183	0.000344	-		-	-
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0378		0.00183	0.000216	-		-	-
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00183	0.00063	-		-	-
Perfluorononanoic Acid (PFNA)	375-95-1	0.00174	J	0.00183	0.000286	-		-	-
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.0085		0.00183	0.000462	-		-	-
Perfluorodecanoic Acid (PFDA)	335-76-2	0.000839	J	0.00183	0.000278	-		-	-
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00183	0.00102	-		-	-
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.000256	J	0.00183	0.000238	-		-	-
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00183	0.000897	-		-	-
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00183	0.000341	-		-	-
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00183	0.0003	-		-	-
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00183	0.000227	-		-	-
PFOA/PFOS, Total		0.0463		0.00183	0.000216	-		-	-

	SAMPLE ID:			DO_WWTP(INFL) #1,2				EX_WWTP(EFFL) #1,2	
	LAB ID:			L1918867-06				L1918867-07	
	COLLECTION DATE:			3/13/2019				3/13/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0431		0.00185	0.000378	0.0258		0.00188	0.000383
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0597		0.00185	0.000367	0.0231		0.00188	0.000372
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00514		0.00185	0.00022	0.00572		0.00188	0.000224
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0475		0.00185	0.000304	0.0262		0.00188	0.000308
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.000811	J	0.00185	0.000227	0.000252	J	0.00188	0.00023
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.0241		0.00185	0.000208	0.0163		0.00188	0.000212
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.0047		0.00185	0.000348	0.00197		0.00188	0.000353
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0624		0.00185	0.000218	0.0538		0.00188	0.000222
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00185	0.000637	ND		0.00188	0.000647
Perfluorononanoic Acid (PFNA)	375-95-1	0.00617		0.00185	0.000289	0.00357		0.00188	0.000293
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.0172		0.00185	0.000467	0.00557		0.00188	0.000474
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00493		0.00185	0.000281	0.0026		0.00188	0.000286
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00185	0.00104	ND		0.00188	0.00105
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00111	J	0.00185	0.000241	0.000895	J	0.00188	0.000244
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00185	0.000907	ND		0.00188	0.000921
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00108	J	0.00185	0.000344	0.000511	J	0.00188	0.00035
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00185	0.000303	ND		0.00188	0.000308
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.000318	J	0.00185	0.00023	ND		0.00188	0.000233
PFOA/PFOS, Total		0.0796		0.00185	0.000218	0.0594		0.00188	0.000222

	SAMPLE ID:			NM_WWTP(EFFL) #1,2				DU_WWTP(EFFL) #1,2	
	LAB ID:			L1918867-08				L1918867-09	
	COLLECTION DATE:			3/13/2019				3/13/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	**CAS**	**Conc**	**Q**	**RL**	**MDL**	**Conc**	**Q**	**RL**	**MDL**
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0281		0.00189	0.000385	0.0196		0.00185	0.000378
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0225		0.00189	0.000374	0.0185		0.00185	0.000367
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00228		0.00189	0.000224	0.00367		0.00185	0.00022
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0234		0.00189	0.000309	0.0237		0.00185	0.000304
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00189	0.000231	0.000296	J	0.00185	0.000227
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.0101		0.00189	0.000212	0.0134		0.00185	0.000208
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00148	J	0.00189	0.000355	0.00208		0.00185	0.000348
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0497		0.00189	0.000223	0.0637		0.00185	0.000218
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00189	0.000649	ND		0.00185	0.000637
Perfluorononanoic Acid (PFNA)	375-95-1	0.00116	J	0.00189	0.000294	0.00166	J	0.00185	0.000289
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00287		0.00189	0.000475	0.00458		0.00185	0.000467
Perfluorodecanoic Acid (PFDA)	335-76-2	0.000509	J	0.00189	0.000287	0.000815	J	0.00185	0.000281
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00189	0.00106	ND		0.00185	0.00104
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00189	0.000245	ND		0.00185	0.000241
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00189	0.000924	ND		0.00185	0.000907
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00189	0.000351	ND		0.00185	0.000344
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00189	0.000309	ND		0.00185	0.000303
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00189	0.000234	ND		0.00185	0.00023
PFOA/PFOS, Total		0.0526		0.00189	0.000223	0.0683		0.00185	0.000218

	SAMPLE ID:			RC_WWTP(EFFL) #1,2				RF_WWTP(EFFL) #1,2	
	LAB ID:			L1918867-10				L1918867-11	
	COLLECTION DATE:			3/13/2019				3/13/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	(ug/l)								
ANALYTE	**CAS**	**Conc**	**Q**	**RL**	**MDL**	**Conc**	**Q**	**RL**	**MDL**
Perfluorinated Alkyl Acids by Isotope Dilution									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0496		0.00184	0.000375	0.0392		0.00183	0.000374
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0653		0.00184	0.000364	0.0441		0.00183	0.000363
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00516		0.00184	0.000219	0.00311		0.00183	0.000218
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0895		0.00184	0.000301	0.0901		0.00183	0.0003
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.000695	J	0.00184	0.000225	0.00033	J	0.00183	0.000224
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.0252		0.00184	0.000207	0.0206		0.00183	0.000206
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00224		0.00184	0.000346	0.00248		0.00183	0.000344
Perfluorooctanoic Acid (PFOA)	335-67-1	0.119		0.00184	0.000217	0.111		0.00183	0.000216
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00184	0.000632	ND		0.00183	0.00063
Perfluorononanoic Acid (PFNA)	375-95-1	0.00232		0.00184	0.000287	0.000773	J	0.00183	0.000286
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00604		0.00184	0.000463	0.00389		0.00183	0.000462
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00113	J	0.00184	0.000279	0.000652	J	0.00183	0.000278
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00184	0.00103	ND		0.00183	0.00102
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00184	0.000239	ND		0.00183	0.000238
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00184	0.000901	ND		0.00183	0.000897
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00184	0.000342	ND		0.00183	0.000341
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00184	0.000301	ND		0.00183	0.0003
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00184	0.000228	ND		0.00183	0.000227
PFOA/PFOS, Total		0.125		0.00184	0.000217	0.115		0.00183	0.000216

	SAMPLE ID:			DO_WWTP(EFFL) #1,2	
	LAB ID:			L1918867-12	
	COLLECTION DATE:			3/13/2019	
	SAMPLE DEPTH:				
	SAMPLE MATRIX:			WATER	
	(ug/l)				
ANALYTE	CAS	Conc	Q	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution					
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0271		0.00184	0.000376
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0411		0.00184	0.000365
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00351		0.00184	0.00022
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0307		0.00184	0.000302
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00052	J	0.00184	0.000226
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.012		0.00184	0.000208
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00259		0.00184	0.000347
Perfluorooctanoic Acid (PFOA)	335-67-1	0.061		0.00184	0.000218
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00184	0.000635
Perfluorononanoic Acid (PFNA)	375-95-1	0.0016	J	0.00184	0.000288
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.0103		0.00184	0.000465
Perfluorodecanoic Acid (PFDA)	335-76-2	0.000694	J	0.00184	0.00028
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00184	0.00103
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00184	0.00024
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00184	0.000904
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00184	0.000343
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00184	0.000302
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00184	0.000229
PFOA/PFOS, Total		0.0713		0.00184	0.000218

Table S8. Detected PFAS concentration in July.

LOCATION		DU, CHL #1,2		RF, CHL #1,2	
SAMPLING DATE		7/16/2019		7/16/2019	
LAB SAMPLE ID		L1933265-01		L1933265-02	
SAMPLE TYPE		WATER		WATER	
SAMPLE DEPTH (ft.)		ug/l			
	CasNum	Results	Qual	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution					
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0106		0.00816	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0306		0.0367	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00471		0.00432	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	0.00186	U	0.00182	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0664		0.0448	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00186	U	0.00046	J
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00549		0.00482	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00259		0.00315	
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0143		0.0124	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.00186	U	0.00182	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00186	U	0.00182	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.0389		0.000898	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00568		0.00594	
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00287		0.00096	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	0.00186	U	0.00182	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00186	U	0.00182	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	0.00186	U	0.00182	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.000463	J	0.00182	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00186	U	0.00182	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	0.00186	U	0.00182	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	0.00186	U	0.00182	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00186	U	0.00182	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00186	U	0.00182	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00186	U	0.00182	U
PFOA/PFOS, Total	null	0.02		0.0183	
PFAS, Total (5)	null	0.067		0.0272	J

LOCATION		DU, DCHL #1,2		RF, DCHL #1,2	
SAMPLING DATE		7/16/2019		7/16/2019	
LAB SAMPLE ID		L1933265-05		L1933265-06	
SAMPLE TYPE		WATER		WATER	
SAMPLE DEPTH (ft.)		ug/l			
	CasNum	Results	Qual	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution					
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0149		0.00917	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0303		0.0328	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00488		0.00359	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	0.00182	U	0.00184	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0636		0.0386	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00182	U	0.00184	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00582		0.00393	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00252		0.00306	
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0164		0.0113	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.00182	U	0.00184	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00182	U	0.00184	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.0481		0.00079	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00794		0.00578	
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00351		0.000904	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	0.00182	U	0.00184	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00182	U	0.00184	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	0.00182	U	0.00184	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.000451	J	0.00184	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00182	U	0.00184	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	0.00182	U	0.00184	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	0.00182	U	0.00184	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00182	U	0.00184	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00182	U	0.00184	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00182	U	0.00184	U
PFOA/PFOS, Total	null	0.0243		0.0171	
PFAS, Total (5)	null	0.0808		0.0249	J

LOCATION		DU, SIN #1,2		RF, SIN #1,2	
SAMPLING DATE		7/16/2019		7/16/2019	
LAB SAMPLE ID		L1933265-13		L1933265-14	
SAMPLE TYPE		WATER		WATER	
SAMPLE DEPTH (ft.)		ug/l			
	CasNum	Results	Qual	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution					
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0105		0.00471	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0222		0.00566	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00582		0.00192	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	0.00211	U	0.00185	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0348		0.00656	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00211	U	0.00185	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.004		0.00293	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00208	J	0.00196	
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0111		0.00485	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.00211	U	0.00631	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00211	U	0.00185	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.0264		0.000311	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.0103		0.00636	
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00209	J	0.00185	U
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	0.00211	U	0.00185	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00211	U	0.00185	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	0.00211	U	0.00185	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00126	J	0.00185	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00132	J	0.00185	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	0.00211	U	0.00185	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	0.00211	U	0.00185	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00211	U	0.00185	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00211	U	0.00185	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00211	U	0.00185	U
PFOA/PFOS, Total	null	0.0214		0.0112	
PFAS, Total (5)	null	0.0539	J	0.0164	J

LOCATION		DU, SOUT #1,2		RF, SOUT #1,2	
SAMPLING DATE		7/16/2019		7/16/2019	
LAB SAMPLE ID		L1933265-17		L1933265-18	
SAMPLE TYPE		WATER		WATER	
SAMPLE DEPTH (ft.)		ug/l			
	CasNum	Results	Qual	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution					
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00733		0.00537	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0307		0.0475	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00485		0.00288	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	0.00212	U	0.00246	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0467		0.0521	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00212	U	0.00246	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00551		0.00398	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00128	J	0.0035	
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0136		0.0143	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.00212	U	0.00246	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00212	U	0.00246	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.0556		0.00101	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00665		0.0056	
Perfluorodecanoic Acid (PFDA)	335-76-2	0.0037		0.00145	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	0.00212	U	0.00246	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00212	U	0.00246	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	0.000958	J	0.00246	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00103	J	0.00246	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00212	U	0.00246	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	0.00212	U	0.00246	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	0.00212	U	0.00246	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00212	U	0.00246	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00212	U	0.00246	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00212	U	0.00246	U
PFOA/PFOS, Total	null	0.0203		0.0199	
PFAS, Total (5)	null	0.0826	J	0.0284	J

LOCATION		SW, LT #1,2		RF, FIELD BLANK	
SAMPLING DATE		7/16/2019		7/16/2019	
LAB SAMPLE ID		L1933265-21		L1933265-22	
SAMPLE TYPE		WATER		WATER	
SAMPLE DEPTH (ft.)		ug/l			
	CasNum	Results	Qual	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution					
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00087	J	0.00178	U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0012	J	0.00178	U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.000428	J	0.00178	U
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	0.00175	U	0.00178	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.00147	J	0.00178	U
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00175	U	0.00178	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000775	J	0.00178	U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.000333	J	0.00178	U
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00148	J	0.00178	U
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.00175	U	0.00178	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00175	U	0.00178	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.00175	U	0.00178	U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00142	J	0.00178	U
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00175	U	0.00178	U
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	0.00175	U	0.00178	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00175	U	0.00178	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	0.00175	U	0.00178	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00175	U	0.00178	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00175	U	0.00178	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	0.00175	U	0.00178	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	0.00175	U	0.00178	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00175	U	0.00178	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00175	U	0.00178	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00175	U	0.00178	U
PFOA/PFOS, Total	null	0.0029	J	0.00178	U
PFAS, Total (5)	null	0.00401	J	0.00178	U

Table S9. Detected PFAS concentration by TOP assay analysis in July.

LOCATION		DU, CHL #1,2		RF, CHL #1,2		EX, DCHL #1,2	
SAMPLING DATE		7/16/2019		7/16/2019		7/17/2019	
LAB SAMPLE ID		L1933265-01		L1933265-02		L1933265-03	
SAMPLE TYPE		WATER		WATER		WATER	
Unit		Ug/l		Ug/l		Ug/l	
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)	CasNum	Results	Qual	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00804		0.0109		0.0088	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.023		0.0431		0.0276	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00316		0.00608		0.0091	
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0351		0.0421		0.0406	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00182	U	0.00181	U	0.00179	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00312		0.00432		0.00251	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00102	J	0.00329		0.00167	J
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0106		0.0163		0.0131	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00182	U	0.00181	U	0.00179	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.03		0.000902	J	0.00102	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00346		0.00542		0.00343	
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00132	J	0.00104	J	0.00115	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00182	U	0.00181	U	0.00179	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00182	U	0.00181	U	0.00179	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00182	U	0.00181	U	0.00179	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00182	U	0.00181	U	0.00179	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00182	U	0.00181	U	0.00179	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00182	U	0.00181	U	0.00179	U

LOCATION		NM, DCHL #1,2		DU, DCHL #1,2	
SAMPLING DATE		7/17/2019		7/16/2019	
LAB SAMPLE ID		L1933265-04		L1933265-05	
SAMPLE TYPE		WATER		WATER	
Unit		ug/l		ug/l	
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)	CasNum	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00622		0.00747	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.013		0.0217	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00232		0.00313	
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0118		0.0336	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00185	U	0.00186	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000981	J	0.00319	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.000711	J	0.000959	J
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00678		0.0112	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00185	U	0.00186	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.000492	J	0.042	
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00208		0.00424	
Perfluorodecanoic Acid (PFDA)	335-76-2	0.000648	J	0.00179	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00185	U	0.00186	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00185	U	0.000466	J
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00185	U	0.00186	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00185	U	0.00186	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00185	U	0.00186	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00185	U	0.00186	U

LOCATION		RF, DCHL #1,2		EX, SIN #1,2		NM, SIN #1,2	
SAMPLING DATE		7/16/2019		7/17/2019		7/17/2019	
LAB SAMPLE ID		L1933265-06		L1933265-11		L1933265-12	
SAMPLE TYPE		WATER		WATER		WATER	
Unit		ug/l		ug/l		ug/l	
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)	CasNum	Results	Qual	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00522		0.0464		0.0417	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0202		0.00412		0.00554	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.0023		0.00476		0.00277	
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0209		0.00434		0.0056	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00183	U	0.00184	U	0.00185	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00238		0.0019		0.000852	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00177	J	0.00184	U	0.00185	U
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00815		0.00997		0.00413	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00183	U	0.00184	U	0.00185	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.000377	J	0.000893	J	0.000363	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00297		0.00535		0.00333	
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00048	J	0.000373	J	0.000459	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00183	U	0.00184	U	0.00185	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00183	U	0.00184	U	0.00185	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00183	U	0.00184	U	0.00185	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00183	U	0.00184	U	0.00185	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00183	U	0.00184	U	0.00185	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00183	U	0.00184	U	0.00185	U

LOCATION		DU, SIN #1,2		RF, SIN #1,2		EX, SOUT #1,2	
SAMPLING DATE		7/16/2019		7/16/2019		7/17/2019	
LAB SAMPLE ID		L1933265-13		L1933265-14		L1933265-15	
SAMPLE TYPE		WATER		WATER		WATER	
Unit		ug/l		ug/l		ug/l	
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)	CasNum	Results	Qual	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0524		0.00474		0.103	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0298		0.00377		0.0227	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00785		0.00127	J	0.0084	
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0446		0.00418		0.0443	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.0214		0.00254	U	0.0142	
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00407		0.00182	J	0.00128	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00229		0.00162	J	0.0144	
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0114		0.00382		0.00492	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00199	U	0.00254	U	0.00212	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.0566		0.00254	U	0.00212	U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00434		0.00289		0.0078	
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00158	J	0.00254	U	0.00061	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00199	U	0.00254	U	0.00212	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00524		0.00254	U	0.00212	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00199	U	0.00254	U	0.00212	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00199	U	0.00254	U	0.00212	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00129	J	0.00254	U	0.00212	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00199	U	0.00254	U	0.00212	U

LOCATION		NM, SOUT #1,2		DU, SOUT #1,2		RF, SOUT #1,2	
SAMPLING DATE		7/17/2019		7/16/2019		7/16/2019	
LAB SAMPLE ID		L1933265-16		L1933265-17		L1933265-18	
SAMPLE TYPE		WATER		WATER		WATER	
Unit		ug/l		ug/l		ug/l	
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)	CasNum	Results	Qual	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	0.0263		0.0258		0.0242	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.0117		0.0178		0.0277	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00185	J	0.00248		0.00207	J
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0159		0.058		0.0316	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.06		0.0328		0.0117	
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000918	J	0.00261		0.00177	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00484		0.00422		0.00299	
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00366		0.00496		0.00387	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00196	U	0.00189	U	0.00218	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.000314	J	0.0272		0.00218	U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00298		0.00422		0.00293	
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00178	J	0.00225		0.000603	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00196	U	0.00189	U	0.00218	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00196	U	0.0063		0.00218	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00196	U	0.00216		0.00218	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.000447	J	0.000746	J	0.00218	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00196	U	0.00212		0.00218	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00196	U	0.00189	U	0.00218	U

LOCATION		EX, CHL #1,2		NM, CHL #1,2	
SAMPLING DATE		7/17/2019		7/17/2019	
LAB SAMPLE ID		L1933265-19		L1933265-20	
SAMPLE TYPE		WATER		WATER	
Unit		ug/l		ug/l	
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)	CasNum	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00745		0.00771	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.015		0.0137	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00413		0.00171	J
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.0225		0.0121	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00187	U	0.00184	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.00158	J	0.00106	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.000772	J	0.000629	J
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00819		0.00826	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00187	U	0.00184	U
Perfluorononanoic Acid (PFNA)	375-95-1	0.000614	J	0.000353	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00208		0.00135	J
Perfluorodecanoic Acid (PFDA)	335-76-2	0.000753	J	0.000614	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00187	U	0.00184	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00187	U	0.00184	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00187	U	0.00184	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00187	U	0.00184	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00187	U	0.00184	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00187	U	0.00184	U

LOCATION		SW, LT #1,2		RF, FIELD BLANK	
SAMPLING DATE		7/16/2019		7/16/2019	
LAB SAMPLE ID		L1933265-21		L1933265-22	
SAMPLE TYPE		WATER		WATER	
Unit		ug/l		ug/l	
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)	CasNum	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00088	J	-	-
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.00114	J	-	-
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.00182	U	-	-
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.00135	J	-	-
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.00182	U	-	-
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000858	J	-	-
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.00182	U	-	-
Perfluorooctanoic Acid (PFOA)	335-67-1	0.0125		-	-
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.00182	U	-	-
Perfluorononanoic Acid (PFNA)	375-95-1	0.00182	U	-	-
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.000571	J	-	-
Perfluorodecanoic Acid (PFDA)	335-76-2	0.00182	U	-	-
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.00182	U	-	-
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.00182	U	-	-
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.00182	U	-	-
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.00182	U	-	-
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.00182	U	-	-
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.00182	U	-	-

Table S10. Detected PFAS concentration in sludge samples in July.

LOCATION			EX, SLG		NM, SLG	
SAMPLING DATE			7/17/2019		7/17/2019	
LAB SAMPLE ID			L1933265-07		L1933265-08	
SAMPLE TYPE			SLUDGE		SLUDGE	
General Chemistry	CasNum	Units	Results	Qual	Results	Qual
Solids, Total	NONE	%	18		26.3	
Perfluorinated Alkyl Acids by Isotope Dilution						
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/kg	4.05	J	3.38	U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/kg	1.23	J	0.191	J
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/kg	0.528	J	3.38	U
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/kg	5.45	U	3.38	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/kg	4.41	J	0.963	J
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/kg	5.45	U	3.38	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/kg	0.452	J	3.38	U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/kg	0.384	J	3.38	U
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/kg	4.9	J	0.456	J
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/kg	5.45	U	3.38	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/kg	5.45	U	3.38	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/kg	1.56	J	3.38	U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/kg	19		4.82	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/kg	10.6		2.59	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/kg	5.45	U	3.38	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/kg	5.45	U	3.38	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/kg	5.11	J	3.4	
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/kg	1.64	J	3.38	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/kg	0.969	J	3.38	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/kg	2.2	J	0.72	J
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/kg	5.13	J	1.69	J
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/kg	3.86	J	1.02	J
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/kg	5.45	U	3.38	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/kg	0.711	J	0.218	J
PFOA/PFOS, Total	null	ug/kg	23.9	J	5.28	J

LOCATION			DU, SLG		RF, SLG	
SAMPLING DATE			7/17/2019		7/16/2019	
LAB SAMPLE ID			L1933265-09		L1933265-10	
SAMPLE TYPE			SLUDGE		SLUDGE	
General Chemistry	CasNum	Units	Results	Qual	Results	Qual
Solids, Total	NONE	%	0.54		17.3	
Perfluorinated Alkyl Acids by Isotope Dilution						
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/kg	178	U	5.07	U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/kg	12.4	J	1.27	J
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/kg	178	U	0.4	J
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/kg	178	U	5.07	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/kg	21.2	J	5.02	J
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/kg	178	U	5.07	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/kg	178	U	0.276	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/kg	178	U	5.07	U
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/kg	12.9	J	3.72	J
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/kg	178	U	5.07	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/kg	178	U	5.07	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/kg	178	U	59.1	
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/kg	98	J	20.1	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/kg	30	J	18.3	
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/kg	178	U	5.07	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/kg	178	U	5.07	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/kg	178	U	6.4	
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/kg	178	U	19.4	
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/kg	178	U	5.48	
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/kg	178	U	1.64	J
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/kg	29.5	J	14.4	
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/kg	178	U	5.84	
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/kg	178	U	3.1	J
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/kg	178	U	1.79	J
PFOA/PFOS, Total	null	ug/kg	111	J	23.8	J

Table S11. Detected PFAS concentration in Great Bay surface water.

	SAMPLE ID:	SW-MP #1, 2				SW-AP #1, 2			
	LAB ID:	L1935189-01				L1935189-02			
	COLLECTION DATE:	8/6/2019				8/6/2019			
	SAMPLE MATRIX:	WATER				WATER			
	Unit	ug/l				ug/l			
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.000466	J	0.0018	0.000368	0.00121	J	0.00182	0.000371
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.000646	J	0.0018	0.000357	0.000811	J	0.00182	0.00036
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.0018	0.000215	ND		0.00182	0.000216
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.0018	0.000408	ND		0.00182	0.000411
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.000913	J	0.0018	0.000296	0.00108	J	0.00182	0.000298
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.0018	0.000221	ND		0.00182	0.000223
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000444	J	0.0018	0.000203	0.000345	J	0.00182	0.000205
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.000686	J	0.0018	0.000339	0.000473	J	0.00182	0.000342
Perfluorooctanoic Acid (PFOA)	335-67-1	0.000606	J	0.0018	0.000213	0.000804	J	0.00182	0.000214
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ND		0.0018	0.0012	ND		0.00182	0.00121
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.0018	0.000621	ND		0.00182	0.000625
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.0018	0.000282	ND		0.00182	0.000284
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00255		0.0018	0.000455	0.0014	J	0.00182	0.000458
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.0018	0.000274	ND		0.00182	0.000276
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.0018	0.00109	ND		0.00182	0.0011
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.0018	0.00101	ND		0.00182	0.00102
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.0018	0.000585	ND		0.00182	0.000589
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.0018	0.000235	ND		0.00182	0.000236
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.0018	0.000884	ND		0.00182	0.000891
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.0018	0.000523	ND		0.00182	0.000527
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.0018	0.000726	ND		0.00182	0.000731
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.0018	0.000336	ND		0.00182	0.000338
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.0018	0.000295	ND		0.00182	0.000297
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.0018	0.000224	ND		0.00182	0.000225
PFOA/PFOS, Total		0.00316	J	0.0018	0.000213	0.0022	J	0.00182	0.000214
PFAS, Total (5)		0.00429	J	0.0018	0.000203	0.00302	J	0.00182	0.000205

	SAMPLE ID:	SW-GB #1, 2				SW-SP #1, 2			
	LAB ID:	L1935189-03				L1935189-04			
	COLLECTION DATE:	8/6/2019				8/6/2019			
	SAMPLE MATRIX:	WATER				WATER			
	Unit	ug/l				ug/l			
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00214		0.00179	0.000366	0.00277		0.00184	0.000376
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.00101	J	0.00179	0.000355	0.00186		0.00184	0.000365
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00179	0.000213	0.00127	J	0.00184	0.00022
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.00179	0.000405	ND		0.00184	0.000417
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.00127	J	0.00179	0.000294	0.00246		0.00184	0.000302
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00179	0.00022	ND		0.00184	0.000226
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000405	J	0.00179	0.000202	0.00101	J	0.00184	0.000208
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.000728	J	0.00179	0.000337	0.00101	J	0.00184	0.000347
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00142	J	0.00179	0.000211	0.00212		0.00184	0.000218
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ND		0.00179	0.00119	ND		0.00184	0.00123
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00179	0.000616	ND		0.00184	0.000635
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.00179	0.00028	ND		0.00184	0.000288
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00363		0.00179	0.000452	0.00419		0.00184	0.000465
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.00179	0.000272	ND		0.00184	0.00028
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.00179	0.00109	ND		0.00184	0.00112
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00179	0.001	ND		0.00184	0.00103
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.00179	0.000581	ND		0.00184	0.000598
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00179	0.000233	ND		0.00184	0.00024
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00179	0.000878	ND		0.00184	0.000904
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.00179	0.00052	ND		0.00184	0.000535
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.00179	0.00072	ND		0.00184	0.000742
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00179	0.000333	ND		0.00184	0.000343
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00179	0.000293	ND		0.00184	0.000302
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00179	0.000222	ND		0.00184	0.000229
PFOA/PFOS, Total		0.00505	J	0.00179	0.000211	0.00631		0.00184	0.000218
PFAS, Total (5)		0.00618	J	0.00179	0.000202	0.00833	J	0.00184	0.000208

	SAMPLE ID:	BLANK-MP			
	LAB ID:	L1935189-05			
	COLLECTION DATE:	8/6/2019			
	SAMPLE MATRIX:	WATER			
	Unit	ug/l			
ANALYTE	**CAS**	**Conc**	**Q**	**RL**	**MDL**
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION					
Perfluorobutanoic Acid (PFBA)	375-22-4	ND		0.00186	0.00038
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ND		0.00186	0.000369
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00186	0.000222
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.00186	0.000422
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.000358	J	0.00186	0.000306
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00186	0.000229
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ND		0.00186	0.00021
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ND		0.00186	0.000351
Perfluorooctanoic Acid (PFOA)	335-67-1	ND		0.00186	0.00022
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ND		0.00186	0.00124
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00186	0.000642
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.00186	0.000291
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ND		0.00186	0.00047
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.00186	0.000284
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.00186	0.00113
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00186	0.00104
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.00186	0.000604
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00186	0.000242
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00186	0.000914
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.00186	0.000541
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.00186	0.00075
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00186	0.000347
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00186	0.000305
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00186	0.000231
PFOA/PFOS, Total		ND		0.00186	0.00022
PFAS, Total (5)		ND		0.00186	0.00021

Table S12. Detected PFAS concentration by TOP assay analysis in Great Bay surface water.

	SAMPLE ID:	SW-MP #1, 2				SW-AP #1, 2			
	LAB ID:	L1935189-01				L1935189-02			
	COLLECTION DATE:	8/6/2019				8/6/2019			
	SAMPLE MATRIX:	WATER				WATER			
	Unit	ug/l				ug/l			
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION (POST-TREATMENT)									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00088	J	0.00182	0.000372	0.000882	J	0.00184	0.000376
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.000912	J	0.00182	0.000361	0.00111	J	0.00184	0.000365
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00182	0.000217	ND		0.00184	0.00022
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.000949	J	0.00182	0.000299	0.0012	J	0.00184	0.000302
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00182	0.000224	ND		0.00184	0.000226
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000445	J	0.00182	0.000205	0.000605	J	0.00184	0.000208
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ND		0.00182	0.000343	ND		0.00184	0.000347
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00262		0.00182	0.000215	0.0034		0.00184	0.000218
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00182	0.000628	ND		0.00184	0.000635
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.00182	0.000285	ND		0.00184	0.000288
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00189		0.00182	0.00046	0.0013	J	0.00184	0.000465
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.00182	0.000277	ND		0.00184	0.00028
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00182	0.00102	ND		0.00184	0.00103
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00182	0.000237	ND		0.00184	0.00024
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00182	0.000894	ND		0.00184	0.000904
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00182	0.000339	ND		0.00184	0.000343
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00182	0.000298	ND		0.00184	0.000302
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00182	0.000226	ND		0.00184	0.000229

	SAMPLE ID:	SW-GB #1, 2				SW-SP #1, 2			
	LAB ID:	L1935189-03				L1935189-04			
	COLLECTION DATE:	8/6/2019				8/6/2019			
	SAMPLE MATRIX:	WATER				WATER			
	Unit	ug/l				ug/l			
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION (POST-TREATMENT)									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00114	J	0.00182	0.000371	0.002		0.00184	0.000376
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.00142	J	0.00182	0.00036	0.00244		0.00184	0.000365
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00182	0.000216	0.00147	J	0.00184	0.00022
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.00188		0.00182	0.000298	0.00263		0.00184	0.000302
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00182	0.000223	ND		0.00184	0.000226
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000778	J	0.00182	0.000205	0.00114	J	0.00184	0.000208
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.000465	J	0.00182	0.000342	0.000572	J	0.00184	0.000347
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00486		0.00182	0.000214	0.0055		0.00184	0.000218
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00182	0.000625	ND		0.00184	0.000635
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.00182	0.000284	0.000697	J	0.00184	0.000288
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00191		0.00182	0.000458	0.00518		0.00184	0.000465
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.00182	0.000276	0.00048	J	0.00184	0.00028
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00182	0.00102	ND		0.00184	0.00103
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00182	0.000236	ND		0.00184	0.00024
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00182	0.000891	ND		0.00184	0.000904
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00182	0.000338	ND		0.00184	0.000343
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00182	0.000297	ND		0.00184	0.000302
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00182	0.000225	ND		0.00184	0.000229

	SAMPLE ID:	BLANK-MP			
	LAB ID:	L1935189-05			
	COLLECTION DATE:	8/6/2019			
	SAMPLE MATRIX:	WATER			
	Unit	ug/l			
ANALYTE	CAS	Conc	Q	RL	MDL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION (POST-TREATMENT)					
Perfluorobutanoic Acid (PFBA)	375-22-4	-	-	-	-
Perfluoropentanoic Acid (PFPeA)	2706-90-3	-	-	-	-
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	-	-	-	-
Perfluorohexanoic Acid (PFHxA)	307-24-4	-	-	-	-
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	-	-	-	-
Perfluoroheptanoic Acid (PFHpA)	375-85-9	-	-	-	-
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	-	-	-	-
Perfluorooctanoic Acid (PFOA)	335-67-1	-	-	-	-
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	-	-	-	-
Perfluorononanoic Acid (PFNA)	375-95-1	-	-	-	-
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	-	-	-	-
Perfluorodecanoic Acid (PFDA)	335-76-2	-	-	-	-
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	-	-	-	-
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	-	-	-	-
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	-	-	-	-
Perfluorododecanoic Acid (PFDoA)	307-55-1	-	-	-	-
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	-	-	-	-
Perfluorotetradecanoic Acid (PFTA)	376-06-7	-	-	-	-

Table S13. Detected PFAS concentration in March.

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-01 D	Date Collected:	03/13/19 08:00
Client ID:	EX-WWTP, INFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/22/19 14:58		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	18.9	--	10
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	18.9	--	10
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	18.9	--	10
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	18.9	--	10
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	18.9	--	10
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	18.9	--	10
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	18.9	--	10
Perfluorohexanesulfonic Acid (PFHxS)	26.4		ng/l	18.9	--	10
Perfluorooctanoic Acid (PFOA)	ND		ng/l	18.9	--	10
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	18.9	--	10
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	18.9	--	10
Perfluorononanoic Acid (PFNA)	ND		ng/l	18.9	--	10
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	18.9	--	10
Perfluorodecanoic Acid (PFDA)	ND		ng/l	18.9	--	10
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	18.9	--	10
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	18.9	--	10
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	18.9	--	10
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	18.9	--	10
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	18.9	--	10
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	18.9	--	10
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	18.9	--	10
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	18.9	--	10
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	18.9	--	10
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	18.9	--	10
PFOA/PFOS, Total	ND		ng/l	18.9	--	10
PFAS, Total (5)	26.4		ng/l	18.9	--	10

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-02 D	Date Collected:	03/13/19 11:30
Client ID:	NM-WWTP, INFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/22/19 15:15		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	20.1	--	10
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	20.1	--	10
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	20.1	--	10
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	20.1	--	10
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	20.1	--	10
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	20.1	--	10
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	20.1	--	10
Perfluorohexanesulfonic Acid (PFHxS)	30.3		ng/l	20.1	--	10
Perfluorooctanoic Acid (PFOA)	ND		ng/l	20.1	--	10
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	20.1	--	10
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	20.1	--	10
Perfluorononanoic Acid (PFNA)	ND		ng/l	20.1	--	10
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	20.1	--	10
Perfluorodecanoic Acid (PFDA)	ND		ng/l	20.1	--	10
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	20.1	--	10
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	20.1	--	10
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	20.1	--	10
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	20.1	--	10
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	20.1	--	10
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	20.1	--	10
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	20.1	--	10
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	20.1	--	10
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	20.1	--	10
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	20.1	--	10
PFOA/PFOS, Total	ND		ng/l	20.1	--	10
PFAS, Total (5)	30.3		ng/l	20.1	--	10

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-03 D	Date Collected:	03/13/19 14:30
Client ID:	DU-WWTP, INFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/22/19 15:31		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	19.4	--	10
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	19.4	--	10
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	19.4	--	10
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	19.4	--	10
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	19.4	--	10
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	19.4	--	10
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	19.4	--	10
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	19.4	--	10
Perfluorooctanoic Acid (PFOA)	ND		ng/l	19.4	--	10
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	19.4	--	10
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	19.4	--	10
Perfluorononanoic Acid (PFNA)	ND		ng/l	19.4	--	10
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	19.4	--	10
Perfluorodecanoic Acid (PFDA)	ND		ng/l	19.4	--	10
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	19.4	--	10
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	19.4	--	10
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	19.4	--	10
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	19.4	--	10
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	19.4	--	10
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	19.4	--	10
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	19.4	--	10
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	19.4	--	10
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	19.4	--	10
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	19.4	--	10
PFOA/PFOS, Total	ND		ng/l	19.4	--	10
PFAS, Total (5)	ND		ng/l	19.4	--	10

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-04 D	Date Collected:	03/14/19 10:00
Client ID:	RC-WWTP, INFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/22/19 15:48		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	19.9	--	10
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	19.9	--	10
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	19.9	--	10
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	19.9	--	10
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	19.9	--	10
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	19.9	--	10
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	19.9	--	10
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	19.9	--	10
Perfluorooctanoic Acid (PFOA)	ND		ng/l	19.9	--	10
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	19.9	--	10
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	19.9	--	10
Perfluorononanoic Acid (PFNA)	ND		ng/l	19.9	--	10
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	19.9	--	10
Perfluorodecanoic Acid (PFDA)	ND		ng/l	19.9	--	10
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	19.9	--	10
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	19.9	--	10
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	19.9	--	10
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	19.9	--	10
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	19.9	--	10
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	19.9	--	10
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	19.9	--	10
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	19.9	--	10
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	19.9	--	10
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	19.9	--	10
PFOA/PFOS, Total	ND		ng/l	19.9	--	10
PFAS, Total (5)	ND		ng/l	19.9	--	10

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-05 D	Date Collected:	03/14/19 11:30
Client ID:	RF-WWTP, INFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/22/19 16:04		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	19.6	--	10
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	19.6	--	10
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	19.6	--	10
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	19.6	--	10
Perfluorohexanoic Acid (PFHxA)	27.7		ng/l	19.6	--	10
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	19.6	--	10
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	19.6	--	10
Perfluorohexanesulfonic Acid (PFHxS)	37.6		ng/l	19.6	--	10
Perfluorooctanoic Acid (PFOA)	ND		ng/l	19.6	--	10
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	19.6	--	10
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	19.6	--	10
Perfluorononanoic Acid (PFNA)	ND		ng/l	19.6	--	10
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	19.6	--	10
Perfluorodecanoic Acid (PFDA)	ND		ng/l	19.6	--	10
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	19.6	--	10
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	19.6	--	10
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	19.6	--	10
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	19.6	--	10
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	19.6	--	10
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	19.6	--	10
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	19.6	--	10
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	19.6	--	10
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	19.6	--	10
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	19.6	--	10
PFOA/PFOS, Total	ND		ng/l	19.6	--	10
PFAS, Total (5)	37.6		ng/l	19.6	--	10

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-06 D	Date Collected:	03/14/19 13:00
Client ID:	DO-WWTP, INFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/22/19 16:21		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	19.6	--	10
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	19.6	--	10
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	19.6	--	10
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	19.6	--	10
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	19.6	--	10
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	19.6	--	10
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	19.6	--	10
Perfluorohexanesulfonic Acid (PFHxS)	22.8		ng/l	19.6	--	10
Perfluorooctanoic Acid (PFOA)	ND		ng/l	19.6	--	10
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	19.6	--	10
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	19.6	--	10
Perfluorononanoic Acid (PFNA)	ND		ng/l	19.6	--	10
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	19.6	--	10
Perfluorodecanoic Acid (PFDA)	ND		ng/l	19.6	--	10
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	19.6	--	10
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	19.6	--	10
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	19.6	--	10
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	19.6	--	10
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	19.6	--	10
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	19.6	--	10
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	19.6	--	10
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	19.6	--	10
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	19.6	--	10
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	19.6	--	10
PFOA/PFOS, Total	ND		ng/l	19.6	--	10
PFAS, Total (5)	22.8		ng/l	19.6	--	10

Project Name: SNH-WWTP
Project Number: Not Specified

Lab Number: L1910226
Report Date: 03/29/19

SAMPLE RESULTS

Lab ID: L1910226-07
Client ID: EX-WWTP, EFFL #1,2
Sample Location: Not Specified

Date Collected: 03/13/19 09:00
Date Received: 03/15/19
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 122,537(M)
Analytical Date: 03/22/19 17:27
Analyst: JW

Extraction Method: EPA 537
Extraction Date: 03/21/19 09:15

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	1.94	--	1
Perfluoropentanoic Acid (PFPeA)	2.83		ng/l	1.94	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.94	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.94	--	1
Perfluorohexanoic Acid (PFHxA)	6.54		ng/l	1.94	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.94	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.94	--	1
Perfluorohexanesulfonic Acid (PFHxS)	5.34		ng/l	1.94	--	1
Perfluorooctanoic Acid (PFOA)	4.62		ng/l	1.94	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.94	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.94	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.94	--	1
Perfluorooctanesulfonic Acid (PFOS)	4.42		ng/l	1.94	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.94	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.94	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.94	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.94	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.94	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.94	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.94	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.94	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.94	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.94	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.94	--	1
PFOA/PFOS, Total	9.04		ng/l	1.94	--	1
PFAS, Total (5)	14.4		ng/l	1.94	--	1

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-08	Date Collected:	03/13/19 12:30
Client ID:	NM-WWTP, EFFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/22/19 18:01		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	4.38		ng/l	1.89	--	1
Perfluoropentanoic Acid (PFPeA)	7.83		ng/l	1.89	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.89	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.89	--	1
Perfluorohexanoic Acid (PFHxA)	10.6		ng/l	1.89	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.89	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.89	--	1
Perfluorohexanesulfonic Acid (PFHxS)	2.17		ng/l	1.89	--	1
Perfluorooctanoic Acid (PFOA)	3.77		ng/l	1.89	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.89	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.89	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.89	--	1
Perfluorooctanesulfonic Acid (PFOS)	1.95		ng/l	1.89	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.89	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.89	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.89	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.89	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.89	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.89	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.89	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.89	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.89	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.89	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.89	--	1
PFOA/PFOS, Total	5.72		ng/l	1.89	--	1
PFAS, Total (5)	7.89		ng/l	1.89	--	1

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-09	Date Collected:	03/13/19 15:15
Client ID:	DU-WWTP, EFFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/22/19 18:17		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	12.9		ng/l	1.88	--	1
Perfluoropentanoic Acid (PFPeA)	7.30		ng/l	1.88	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.88	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.88	--	1
Perfluorohexanoic Acid (PFHxA)	10.4		ng/l	1.88	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.88	--	1
Perfluoroheptanoic Acid (PFHpA)	4.46		ng/l	1.88	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.88	--	1
Perfluorooctanoic Acid (PFOA)	11.3		ng/l	1.88	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.88	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.88	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.88	--	1
Perfluorooctanesulfonic Acid (PFOS)	3.75		ng/l	1.88	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.88	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.88	--	1
Perfluorononanesulfonic Acid (PFNS)	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
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.88	--	1
Perfluorooctanesulfonamide (FOSA)	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
PFOA/PFOS, Total	15.1		ng/l	1.88	--	1
PFAS, Total (5)	19.5		ng/l	1.88	--	1

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-10	Date Collected:	03/14/19 10:50
Client ID:	RC-WWTP, EFFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/22/19 18:34		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	11.0		ng/l	1.88	--	1
Perfluoropentanoic Acid (PFPeA)	24.1		ng/l	1.88	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.88	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.88	--	1
Perfluorohexanoic Acid (PFHxA)	50.6		ng/l	1.88	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.88	--	1
Perfluoroheptanoic Acid (PFHpA)	8.98		ng/l	1.88	--	1
Perfluorohexanesulfonic Acid (PFHxS)	2.00		ng/l	1.88	--	1
Perfluorooctanoic Acid (PFOA)	23.7		ng/l	1.88	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.88	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.88	--	1
Perfluorononanoic Acid (PFNA)	2.11		ng/l	1.88	--	1
Perfluorooctanesulfonic Acid (PFOS)	4.91		ng/l	1.88	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.88	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.88	--	1
Perfluorononanesulfonic Acid (PFNS)	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
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.88	--	1
Perfluorooctanesulfonamide (FOSA)	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
PFOA/PFOS, Total	28.6		ng/l	1.88	--	1
PFAS, Total (5)	41.7		ng/l	1.88	--	1

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-11	Date Collected:	03/14/19 12:15
Client ID:	RF-WWTP, EFFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/23/19 10:36		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	10.1		ng/l	1.88	--	1
Perfluoropentanoic Acid (PFPeA)	11.8		ng/l	1.88	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.88	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.88	--	1
Perfluorohexanoic Acid (PFHxA)	54.6		ng/l	1.88	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.88	--	1
Perfluoroheptanoic Acid (PFHpA)	4.93		ng/l	1.88	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.88	--	1
Perfluorooctanoic Acid (PFOA)	8.14		ng/l	1.88	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	4.73		ng/l	1.88	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.88	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.88	--	1
Perfluorooctanesulfonic Acid (PFOS)	2.91		ng/l	1.88	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.88	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.88	--	1
Perfluorononanesulfonic Acid (PFNS)	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
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.88	--	1
Perfluorooctanesulfonamide (FOSA)	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
PFOA/PFOS, Total	11.1		ng/l	1.88	--	1
PFAS, Total (5)	16.0		ng/l	1.88	--	1

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-12	Date Collected:	03/14/19 14:00
Client ID:	DO-WWTP, EFFL #1,2	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/23/19 10:54		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	9.28		ng/l	1.87	--	1
Perfluoropentanoic Acid (PFPeA)	20.2		ng/l	1.87	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.87	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.87	--	1
Perfluorohexanoic Acid (PFHxA)	12.5		ng/l	1.87	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.87	--	1
Perfluoroheptanoic Acid (PFHpA)	2.53		ng/l	1.87	--	1
Perfluorohexanesulfonic Acid (PFHxS)	2.29		ng/l	1.87	--	1
Perfluorooctanoic Acid (PFOA)	7.15		ng/l	1.87	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.87	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.87	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.87	--	1
Perfluorooctanesulfonic Acid (PFOS)	6.86		ng/l	1.87	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.87	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.87	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.87	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.87	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.87	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.87	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.87	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.87	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.87	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.87	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.87	--	1
PFOA/PFOS, Total	14.0		ng/l	1.87	--	1
PFAS, Total (5)	18.8		ng/l	1.87	--	1

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

SAMPLE RESULTS

Lab ID:	L1910226-13	Date Collected:	03/13/19 10:30
Client ID:	EX-WWTP, BLANK FIELD	Date Received:	03/15/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	03/21/19 09:15
Analytical Date:	03/23/19 11:12		
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	1.85	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	1.85	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.85	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.85	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.85	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.85	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.85	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.85	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.85	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.85	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.85	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.85	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.85	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.85	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.85	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.85	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.85	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.85	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.85	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.85	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.85	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.85	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.85	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.85	--	1
PFOA/PFOS, Total	ND		ng/l	1.85	--	1
PFAS, Total (5)	ND		ng/l	1.85	--	1

Project Name:	SNH-WWTP	**Lab Number:**	L1910226
Project Number:	Not Specified	**Report Date:**	03/29/19

Method Blank Analysis
Batch Quality Control

Analytical Method:	122,537(M)	Extraction Method:	EPA 537
Analytical Date:	03/22/19 13:35	Extraction Date:	03/21/19 09:15
Analyst:	JW		

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-13 Batch: WG1217957-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/l	2.00	--
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	2.00	--
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	2.00	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--
Perfluoropentanesulfonic Acid (PFPeS)	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	--
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	2.00	--
Perfluoroheptanesulfonic Acid (PFHpS)	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	--
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	2.00	--
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	2.00	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	2.00	--
Perfluorooctanesulfonamide (FOSA)	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	--
PFOA/PFOS, Total	ND		ng/l	2.00	--
PFAS, Total (5)	ND		ng/l	2.00	--

Table S14. Detected PFAS concentration by TOP assay analysis in March.

Project Name:	SNH_WWTP SAMPLING	**Lab Number:**	L1918867
Project Number:	Not Specified	**Report Date:**	06/04/19

SAMPLE RESULTS

Lab ID:	L1918867-01	Date Collected:	03/13/19 00:00
Client ID:	EX_WWTP(INFL) #1,2	Date Received:	05/07/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	05/31/19 07:15
Analytical Date:	05/31/19 20:19		
Analyst:	AJ		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	32.4		ng/l	1.97	0.402	1
Perfluoropentanoic Acid (PFPeA)	30.3		ng/l	1.97	0.390	1
Perfluorobutanesulfonic Acid (PFBS)	5.65		ng/l	1.97	0.234	1
Perfluorohexanoic Acid (PFHxA)	26.6		ng/l	1.97	0.323	1
Perfluoropentanesulfonic Acid (PFPeS)	0.335	J	ng/l	1.97	0.241	1
Perfluoroheptanoic Acid (PFHpA)	17.2		ng/l	1.97	0.222	1
Perfluorohexanesulfonic Acid (PFHxS)	1.67	J	ng/l	1.97	0.370	1
Perfluorooctanoic Acid (PFOA)	46.8		ng/l	1.97	0.232	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.97	0.677	1
Perfluorononanoic Acid (PFNA)	3.13		ng/l	1.97	0.307	1
Perfluorooctanesulfonic Acid (PFOS)	5.51		ng/l	1.97	0.496	1
Perfluorodecanoic Acid (PFDA)	1.88	J	ng/l	1.97	0.299	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.97	1.10	1
Perfluoroundecanoic Acid (PFUnA)	0.736	J	ng/l	1.97	0.256	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.97	0.964	1
Perfluorododecanoic Acid (PFDoA)	0.520	J	ng/l	1.97	0.366	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.97	0.322	1
Perfluorotetradecanoic Acid (PFTA)	0.346	J	ng/l	1.97	0.244	1
PFOA/PFOS, Total	52.3		ng/l	1.97	0.232	1

Project Name:	SNH_WWTP SAMPLING	**Lab Number:**	L1918867
Project Number:	Not Specified	**Report Date:**	06/04/19

SAMPLE RESULTS

Lab ID:	L1918867-02	Date Collected:	03/13/19 00:00
Client ID:	NM_WWTP(INFL) #1,2	Date Received:	05/07/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	05/31/19 07:15
Analytical Date:	05/31/19 20:52		
Analyst:	AJ		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	63.9		ng/l	1.90	0.388	1
Perfluoropentanoic Acid (PFPeA)	29.4		ng/l	1.90	0.376	1
Perfluorobutanesulfonic Acid (PFBS)	4.30		ng/l	1.90	0.226	1
Perfluorohexanoic Acid (PFHxA)	24.9		ng/l	1.90	0.312	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.90	0.233	1
Perfluoroheptanoic Acid (PFHpA)	14.1		ng/l	1.90	0.214	1
Perfluorohexanesulfonic Acid (PFHxS)	1.22	J	ng/l	1.90	0.357	1
Perfluorooctanoic Acid (PFOA)	49.1		ng/l	1.90	0.224	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.90	0.654	1
Perfluorononanoic Acid (PFNA)	3.10		ng/l	1.90	0.296	1
Perfluorooctanesulfonic Acid (PFOS)	3.54		ng/l	1.90	0.479	1
Perfluorodecanoic Acid (PFDA)	2.05		ng/l	1.90	0.289	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.90	1.06	1
Perfluoroundecanoic Acid (PFUnA)	0.715	J	ng/l	1.90	0.247	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.90	0.932	1
Perfluorododecanoic Acid (PFDoA)	0.578	J	ng/l	1.90	0.354	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.90	0.311	1
Perfluorotetradecanoic Acid (PFTA)	0.304	J	ng/l	1.90	0.236	1
PFOA/PFOS, Total	52.6		ng/l	1.90	0.224	1

Project Name:	SNH_WWTP SAMPLING	**Lab Number:**	L1918867
Project Number:	Not Specified	**Report Date:**	06/04/19

SAMPLE RESULTS

Lab ID:	L1918867-03	Date Collected:	03/13/19 00:00
Client ID:	DU_WWTP(INFL) #1,2	Date Received:	05/07/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	05/31/19 07:15
Analytical Date:	05/31/19 21:25		
Analyst:	AJ		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	49.7		ng/l	1.87	0.382	1
Perfluoropentanoic Acid (PFPeA)	64.4		ng/l	1.87	0.371	1
Perfluorobutanesulfonic Acid (PFBS)	5.32		ng/l	1.87	0.223	1
Perfluorohexanoic Acid (PFHxA)	59.5		ng/l	1.87	0.307	1
Perfluoropentanesulfonic Acid (PFPeS)	0.330	J	ng/l	1.87	0.230	1
Perfluoroheptanoic Acid (PFHpA)	23.8		ng/l	1.87	0.211	1
Perfluorohexanesulfonic Acid (PFHxS)	2.31		ng/l	1.87	0.352	1
Perfluorooctanoic Acid (PFOA)	52.7		ng/l	1.87	0.221	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.87	0.644	1
Perfluorononanoic Acid (PFNA)	5.62		ng/l	1.87	0.292	1
Perfluorooctanesulfonic Acid (PFOS)	6.67		ng/l	1.87	0.472	1
Perfluorodecanoic Acid (PFDA)	2.91		ng/l	1.87	0.285	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.87	1.05	1
Perfluoroundecanoic Acid (PFUnA)	1.14	J	ng/l	1.87	0.243	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.87	0.918	1
Perfluorododecanoic Acid (PFDoA)	1.10	J	ng/l	1.87	0.348	1
Perfluorotridecanoic Acid (PFTrDA)	0.326	J	ng/l	1.87	0.306	1
Perfluorotetradecanoic Acid (PFTA)	0.449	J	ng/l	1.87	0.232	1
PFOA/PFOS, Total	59.4		ng/l	1.87	0.221	1

Project Name:	SNH_WWTP SAMPLING	**Lab Number:**	L1918867
Project Number:	Not Specified	**Report Date:**	06/04/19

SAMPLE RESULTS

Lab ID:	L1918867-05	Date Collected:	03/13/19 00:00
Client ID:	RF_WWTP(INFL) #1,2	Date Received:	05/07/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	05/31/19 07:15
Analytical Date:	05/31/19 21:58		
Analyst:	AJ		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	3110	E	ng/l	1.83	0.374	1
Perfluoropentanoic Acid (PFPeA)	4100	E	ng/l	1.83	0.363	1
Perfluorobutanesulfonic Acid (PFBS)	18.5		ng/l	1.83	0.218	1
Perfluorohexanoic Acid (PFHxA)	1060		ng/l	1.83	0.300	1
Perfluoropentanesulfonic Acid (PFPeS)	3.04		ng/l	1.83	0.224	1
Perfluoroheptanoic Acid (PFHpA)	66.5		ng/l	1.83	0.206	1
Perfluorohexanesulfonic Acid (PFHxS)	2.64		ng/l	1.83	0.344	1
Perfluorooctanoic Acid (PFOA)	37.8		ng/l	1.83	0.216	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.83	0.630	1
Perfluorononanoic Acid (PFNA)	1.74	J	ng/l	1.83	0.286	1
Perfluorooctanesulfonic Acid (PFOS)	8.50		ng/l	1.83	0.462	1
Perfluorodecanoic Acid (PFDA)	0.839	J	ng/l	1.83	0.278	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.83	1.02	1
Perfluoroundecanoic Acid (PFUnA)	0.256	J	ng/l	1.83	0.238	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.83	0.897	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.83	0.341	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.83	0.300	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.83	0.227	1
PFOA/PFOS, Total	46.3		ng/l	1.83	0.216	1

Project Name:	SNH_WWTP SAMPLING	**Lab Number:**	L1918867
Project Number:	Not Specified	**Report Date:**	06/04/19

SAMPLE RESULTS

Lab ID:	L1918867-04	Date Collected:	03/13/19 00:00
Client ID:	RC_WWTP(INFL) #1,2	Date Received:	05/07/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	05/31/19 07:15
Analytical Date:	05/31/19 21:41		
Analyst:	AJ		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	69.5		ng/l	1.88	0.383	1
Perfluoropentanoic Acid (PFPeA)	111		ng/l	1.88	0.372	1
Perfluorobutanesulfonic Acid (PFBS)	6.46		ng/l	1.88	0.224	1
Perfluorohexanoic Acid (PFHxA)	121		ng/l	1.88	0.308	1
Perfluoropentanesulfonic Acid (PFPeS)	1.07	J	ng/l	1.88	0.230	1
Perfluoroheptanoic Acid (PFHpA)	43.8		ng/l	1.88	0.212	1
Perfluorohexanesulfonic Acid (PFHxS)	3.04		ng/l	1.88	0.353	1
Perfluorooctanoic Acid (PFOA)	65.8		ng/l	1.88	0.222	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.88	0.647	1
Perfluorononanoic Acid (PFNA)	6.50		ng/l	1.88	0.293	1
Perfluorooctanesulfonic Acid (PFOS)	9.40		ng/l	1.88	0.474	1
Perfluorodecanoic Acid (PFDA)	5.15		ng/l	1.88	0.286	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.88	1.05	1
Perfluoroundecanoic Acid (PFUnA)	1.38	J	ng/l	1.88	0.244	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.88	0.921	1
Perfluorododecanoic Acid (PFDoA)	1.36	J	ng/l	1.88	0.350	1
Perfluorotridecanoic Acid (PFTrDA)	0.500	J	ng/l	1.88	0.308	1
Perfluorotetradecanoic Acid (PFTA)	0.515	J	ng/l	1.88	0.233	1
PFOA/PFOS, Total	75.2		ng/l	1.88	0.222	1

Project Name:	SNH_WWTP SAMPLING	**Lab Number:**	L1918867
Project Number:	Not Specified	**Report Date:**	06/04/19

SAMPLE RESULTS

Lab ID:	L1918867-06	Date Collected:	03/13/19 00:00
Client ID:	DO_WWTP(INFL) #1,2	Date Received:	05/07/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	05/31/19 07:15
Analytical Date:	05/31/19 22:14		
Analyst:	AJ		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	43.1		ng/l	1.85	0.378	1
Perfluoropentanoic Acid (PFPeA)	59.7		ng/l	1.85	0.367	1
Perfluorobutanesulfonic Acid (PFBS)	5.14		ng/l	1.85	0.220	1
Perfluorohexanoic Acid (PFHxA)	47.5		ng/l	1.85	0.304	1
Perfluoropentanesulfonic Acid (PFPeS)	0.811	J	ng/l	1.85	0.227	1
Perfluoroheptanoic Acid (PFHpA)	24.1		ng/l	1.85	0.208	1
Perfluorohexanesulfonic Acid (PFHxS)	4.70		ng/l	1.85	0.348	1
Perfluorooctanoic Acid (PFOA)	62.4		ng/l	1.85	0.218	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.85	0.637	1
Perfluorononanoic Acid (PFNA)	6.17		ng/l	1.85	0.289	1
Perfluorooctanesulfonic Acid (PFOS)	17.2		ng/l	1.85	0.467	1
Perfluorodecanoic Acid (PFDA)	4.83		ng/l	1.85	0.281	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.85	1.04	1
Perfluoroundecanoic Acid (PFUnA)	1.11	J	ng/l	1.85	0.241	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.85	0.907	1
Perfluorododecanoic Acid (PFDoA)	1.08	J	ng/l	1.85	0.344	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.85	0.303	1
Perfluorotetradecanoic Acid (PFTA)	0.318	J	ng/l	1.85	0.230	1
PFOA/PFOS, Total	79.6		ng/l	1.85	0.218	1

Project Name:	SNH_WWTP SAMPLING	**Lab Number:**	L1918867
Project Number:	Not Specified	**Report Date:**	06/04/19

SAMPLE RESULTS

Lab ID:	L1918867-07	Date Collected:	03/13/19 00:00
Client ID:	EX_WWTP(EFFL) #1,2	Date Received:	05/07/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	05/31/19 07:15
Analytical Date:	05/31/19 22:48		
Analyst:	AJ		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	25.8		ng/l	1.88	0.383	1
Perfluoropentanoic Acid (PFPeA)	23.1		ng/l	1.88	0.372	1
Perfluorobutanesulfonic Acid (PFBS)	5.72		ng/l	1.88	0.224	1
Perfluorohexanoic Acid (PFHxA)	26.2		ng/l	1.88	0.308	1
Perfluoropentanesulfonic Acid (PFPeS)	0.252	J	ng/l	1.88	0.230	1
Perfluoroheptanoic Acid (PFHpA)	16.3		ng/l	1.88	0.212	1
Perfluorohexanesulfonic Acid (PFHxS)	1.97		ng/l	1.88	0.353	1
Perfluorooctanoic Acid (PFOA)	53.8		ng/l	1.88	0.222	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.88	0.647	1
Perfluorononanoic Acid (PFNA)	3.57		ng/l	1.88	0.293	1
Perfluorooctanesulfonic Acid (PFOS)	5.57		ng/l	1.88	0.474	1
Perfluorodecanoic Acid (PFDA)	2.60		ng/l	1.88	0.286	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.88	1.05	1
Perfluoroundecanoic Acid (PFUnA)	0.895	J	ng/l	1.88	0.244	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.88	0.921	1
Perfluorododecanoic Acid (PFDoA)	0.511	J	ng/l	1.88	0.350	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.88	0.308	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.88	0.233	1
PFOA/PFOS, Total	59.4		ng/l	1.88	0.222	1

Project Name:	SNH_WWTP SAMPLING	**Lab Number:**	L1918867
Project Number:	Not Specified	**Report Date:**	06/04/19

SAMPLE RESULTS

Lab ID:	L1918867-08	Date Collected:	03/13/19 00:00
Client ID:	NM_WWTP(EFFL) #1,2	Date Received:	05/07/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	05/31/19 07:15
Analytical Date:	05/31/19 23:04		
Analyst:	AJ		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	28.1		ng/l	1.89	0.385	1
Perfluoropentanoic Acid (PFPeA)	22.5		ng/l	1.89	0.374	1
Perfluorobutanesulfonic Acid (PFBS)	2.28		ng/l	1.89	0.224	1
Perfluorohexanoic Acid (PFHxA)	23.4		ng/l	1.89	0.309	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.89	0.231	1
Perfluoroheptanoic Acid (PFHpA)	10.1		ng/l	1.89	0.212	1
Perfluorohexanesulfonic Acid (PFHxS)	1.48	J	ng/l	1.89	0.355	1
Perfluorooctanoic Acid (PFOA)	49.7		ng/l	1.89	0.223	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.89	0.649	1
Perfluorononanoic Acid (PFNA)	1.16	J	ng/l	1.89	0.294	1
Perfluorooctanesulfonic Acid (PFOS)	2.87		ng/l	1.89	0.475	1
Perfluorodecanoic Acid (PFDA)	0.509	J	ng/l	1.89	0.287	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.89	1.06	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.89	0.245	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.89	0.924	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.89	0.351	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.89	0.309	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.89	0.234	1
PFOA/PFOS, Total	52.6		ng/l	1.89	0.223	1

Project Name: SNH_WWTP SAMPLING
Project Number: Not Specified

Lab Number: L1918867
Report Date: 06/04/19

SAMPLE RESULTS

Lab ID: L1918867-09
Client ID: DU_WWTP(EFFL) #1,2
Sample Location: Not Specified

Date Collected: 03/13/19 00:00
Date Received: 05/07/19
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 122,537(M)
Analytical Date: 05/31/19 23:21
Analyst: AJ

Extraction Method: EPA 537
Extraction Date: 05/31/19 07:15

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	19.6		ng/l	1.85	0.378	1
Perfluoropentanoic Acid (PFPeA)	18.5		ng/l	1.85	0.367	1
Perfluorobutanesulfonic Acid (PFBS)	3.67		ng/l	1.85	0.220	1
Perfluorohexanoic Acid (PFHxA)	23.7		ng/l	1.85	0.304	1
Perfluoropentanesulfonic Acid (PFPeS)	0.296	J	ng/l	1.85	0.227	1
Perfluoroheptanoic Acid (PFHpA)	13.4		ng/l	1.85	0.208	1
Perfluorohexanesulfonic Acid (PFHxS)	2.08		ng/l	1.85	0.348	1
Perfluorooctanoic Acid (PFOA)	63.7		ng/l	1.85	0.218	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.85	0.637	1
Perfluorononanoic Acid (PFNA)	1.66	J	ng/l	1.85	0.289	1
Perfluorooctanesulfonic Acid (PFOS)	4.58		ng/l	1.85	0.467	1
Perfluorodecanoic Acid (PFDA)	0.815	J	ng/l	1.85	0.281	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.85	1.04	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.85	0.241	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.85	0.907	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.85	0.344	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.85	0.303	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.85	0.230	1
PFOA/PFOS, Total	68.3		ng/l	1.85	0.218	1

Project Name:	SNH_WWTP SAMPLING	**Lab Number:**	L1918867
Project Number:	Not Specified	**Report Date:**	06/04/19

SAMPLE RESULTS

Lab ID:	L1918867-10	Date Collected:	03/13/19 00:00
Client ID:	RC_WWTP(EFFL) #1,2	Date Received:	05/07/19
Sample Location:	Not Specified	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Water	Extraction Method:	EPA 537
Analytical Method:	122,537(M)	Extraction Date:	05/31/19 07:15
Analytical Date:	05/31/19 23:37		
Analyst:	AJ		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	49.6		ng/l	1.84	0.375	1
Perfluoropentanoic Acid (PFPeA)	65.3		ng/l	1.84	0.364	1
Perfluorobutanesulfonic Acid (PFBS)	5.16		ng/l	1.84	0.219	1
Perfluorohexanoic Acid (PFHxA)	89.5		ng/l	1.84	0.301	1
Perfluoropentanesulfonic Acid (PFPeS)	0.695	J	ng/l	1.84	0.225	1
Perfluoroheptanoic Acid (PFHpA)	25.2		ng/l	1.84	0.207	1
Perfluorohexanesulfonic Acid (PFHxS)	2.24		ng/l	1.84	0.346	1
Perfluorooctanoic Acid (PFOA)	119		ng/l	1.84	0.217	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.84	0.632	1
Perfluorononanoic Acid (PFNA)	2.32		ng/l	1.84	0.287	1
Perfluorooctanesulfonic Acid (PFOS)	6.04		ng/l	1.84	0.463	1
Perfluorodecanoic Acid (PFDA)	1.13	J	ng/l	1.84	0.279	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.84	1.03	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.84	0.239	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.84	0.901	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.84	0.342	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.84	0.301	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.84	0.228	1
PFOA/PFOS, Total	125		ng/l	1.84	0.217	1

Project Name: SNH_WWTP SAMPLING
Project Number: Not Specified

Lab Number: L1918867
Report Date: 06/04/19

SAMPLE RESULTS

Lab ID: L1918867-11
Client ID: RF_WWTP(EFFL) #1,2
Sample Location: Not Specified

Date Collected: 03/13/19 00:00
Date Received: 05/07/19
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 122,537(M)
Analytical Date: 05/31/19 23:54
Analyst: AJ

Extraction Method: EPA 537
Extraction Date: 05/31/19 07:17

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	39.2		ng/l	1.83	0.374	1
Perfluoropentanoic Acid (PFPeA)	44.1		ng/l	1.83	0.363	1
Perfluorobutanesulfonic Acid (PFBS)	3.11		ng/l	1.83	0.218	1
Perfluorohexanoic Acid (PFHxA)	90.1		ng/l	1.83	0.300	1
Perfluoropentanesulfonic Acid (PFPeS)	0.330	J	ng/l	1.83	0.224	1
Perfluoroheptanoic Acid (PFHpA)	20.6		ng/l	1.83	0.206	1
Perfluorohexanesulfonic Acid (PFHxS)	2.48		ng/l	1.83	0.344	1
Perfluorooctanoic Acid (PFOA)	111		ng/l	1.83	0.216	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.83	0.630	1
Perfluorononanoic Acid (PFNA)	0.773	J	ng/l	1.83	0.286	1
Perfluorooctanesulfonic Acid (PFOS)	3.89		ng/l	1.83	0.462	1
Perfluorodecanoic Acid (PFDA)	0.652	J	ng/l	1.83	0.278	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.83	1.02	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.83	0.238	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.83	0.897	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.83	0.341	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.83	0.300	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.83	0.227	1
PFOA/PFOS, Total	115		ng/l	1.83	0.216	1

Project Name: SNH_WWTP SAMPLING
Project Number: Not Specified

Lab Number: L1918867
Report Date: 06/04/19

SAMPLE RESULTS

Lab ID: L1918867-12
Client ID: DO_WWTP(EFFL) #1,2
Sample Location: Not Specified

Date Collected: 03/13/19 00:00
Date Received: 05/07/19
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 122,537(M)
Analytical Date: 06/01/19 00:10
Analyst: AJ

Extraction Method: EPA 537
Extraction Date: 05/31/19 07:18

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	27.1		ng/l	1.84	0.376	1
Perfluoropentanoic Acid (PFPeA)	41.1		ng/l	1.84	0.365	1
Perfluorobutanesulfonic Acid (PFBS)	3.51		ng/l	1.84	0.220	1
Perfluorohexanoic Acid (PFHxA)	30.7		ng/l	1.84	0.302	1
Perfluoropentanesulfonic Acid (PFPeS)	0.520	J	ng/l	1.84	0.226	1
Perfluoroheptanoic Acid (PFHpA)	12.0		ng/l	1.84	0.208	1
Perfluorohexanesulfonic Acid (PFHxS)	2.59		ng/l	1.84	0.347	1
Perfluorooctanoic Acid (PFOA)	61.0		ng/l	1.84	0.218	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.84	0.635	1
Perfluorononanoic Acid (PFNA)	1.60	J	ng/l	1.84	0.288	1
Perfluorooctanesulfonic Acid (PFOS)	10.3		ng/l	1.84	0.465	1
Perfluorodecanoic Acid (PFDA)	0.694	J	ng/l	1.84	0.280	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.84	1.03	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.84	0.240	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.84	0.904	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.84	0.343	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.84	0.302	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.84	0.229	1
PFOA/PFOS, Total	71.3		ng/l	1.84	0.218	1

Table S15. Detected PFAS concentration in July.

LOCATION			DU, CHL #1,2	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-01	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.0106	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0306	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00471	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00186	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0664	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00186	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00549	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00259	
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0143	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00186	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00186	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.0389	
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00568	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00287	
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00186	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00186	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00186	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.000463	J
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00186	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00186	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00186	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00186	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00186	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00186	U
PFOA/PFOS, Total	null	ug/l	0.02	
PFAS, Total (5)	null	ug/l	0.067	

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LOCATION			RF, CHL #1,2	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-02	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00816	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0367	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00432	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00182	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0448	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00046	J
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00482	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00315	
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0124	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00182	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00182	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000898	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00594	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00096	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00182	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00182	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00182	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00182	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00182	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00182	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00182	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00182	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00182	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00182	U
PFOA/PFOS, Total	null	ug/l	0.0183	
PFAS, Total (5)	null	ug/l	0.0272	J

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LOCATION			EX, DCHL #1,2	
SAMPLING DATE			7/17/2019	
LAB SAMPLE ID			L1933265-03	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.0432	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0236	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00779	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00183	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0405	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00183	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00249	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.0017	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00885	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00183	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00183	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000993	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00401	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00157	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00183	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00183	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.000663	J
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00183	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00183	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00183	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00183	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00183	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00183	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00183	U
PFOA/PFOS, Total	null	ug/l	0.0129	
PFAS, Total (5)	null	ug/l	0.018	J

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LOCATION			NM, DCHL #1,2	
SAMPLING DATE			7/17/2019	
LAB SAMPLE ID			L1933265-04	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00632	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0205	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00372	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00181	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0212	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00181	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00177	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00137	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0079	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00181	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00181	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000866	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00378	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00175	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00181	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00181	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00105	J
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00181	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00181	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00181	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00181	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00181	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00181	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00181	U
PFOA/PFOS, Total	null	ug/l	0.0117	
PFAS, Total (5)	null	ug/l	0.0157	J

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LOCATION			DU, DCHL #1,2	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-05	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.0149	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0303	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00488	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00182	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0636	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00182	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00582	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00252	
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0164	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00182	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00182	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.0481	
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00794	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00351	
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00182	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00182	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00182	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.000451	J
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00182	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00182	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00182	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00182	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00182	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00182	U
PFOA/PFOS, Total	null	ug/l	0.0243	
PFAS, Total (5)	null	ug/l	0.0808	

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LOCATION			RF, DCHL #1,2	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-06	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00917	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0328	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00359	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00184	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0386	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00184	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00393	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00306	
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0113	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00184	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00184	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.00079	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00578	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.000904	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00184	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00184	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00184	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00184	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00184	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00184	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00184	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00184	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00184	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00184	U
PFOA/PFOS, Total	null	ug/l	0.0171	
PFAS, Total (5)	null	ug/l	0.0249	J

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LOCATION			EX, SIN #1,2	
SAMPLING DATE			7/17/2019	
LAB SAMPLE ID			L1933265-11	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00601	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.00342	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00383	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00186	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.00426	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00186	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00175	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00129	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0045	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00186	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00186	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000703	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00806	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.000431	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00186	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00186	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00186	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00186	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00184	J
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00186	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00186	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00186	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00186	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00186	U
PFOA/PFOS, Total	null	ug/l	0.0126	
PFAS, Total (5)	null	ug/l	0.0163	J

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LOCATION			NM, SIN #1,2	
SAMPLING DATE			7/17/2019	
LAB SAMPLE ID			L1933265-12	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00586	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.00478	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00214	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00181	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.00669	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00181	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.000924	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00112	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00313	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00181	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00181	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000395	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00518	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.000522	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00181	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00181	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00181	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00181	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00181	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00181	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00181	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00181	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00181	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00181	U
PFOA/PFOS, Total	null	ug/l	0.00831	
PFAS, Total (5)	null	ug/l	0.0107	J

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LOCATION			DU, SIN #1,2	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-13	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.0105	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0222	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00582	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00211	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0348	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00211	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.004	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00208	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0111	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00211	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00211	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.0264	
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.0103	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00209	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00211	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00211	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00211	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00126	J
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00132	J
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00211	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00211	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00211	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00211	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00211	U
PFOA/PFOS, Total	null	ug/l	0.0214	
PFAS, Total (5)	null	ug/l	0.0539	J

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LOCATION			RF, SIN #1,2	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-14	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00471	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.00566	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00192	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00185	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.00656	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00185	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00293	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00196	
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00485	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00631	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00185	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000311	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00636	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00185	U
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00185	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00185	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00185	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00185	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00185	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00185	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00185	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00185	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00185	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00185	U
PFOA/PFOS, Total	null	ug/l	0.0112	
PFAS, Total (5)	null	ug/l	0.0164	J

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LOCATION			EX, SOUT #1,2	
SAMPLING DATE			7/17/2019	
LAB SAMPLE ID			L1933265-15	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00591	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0234	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00741	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00234	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0402	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00234	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00233	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00136	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0087	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00234	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00234	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.00109	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00517	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00205	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00234	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00234	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00269	
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00234	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00234	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00234	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00246	
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00234	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00234	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.000528	J
PFOA/PFOS, Total	null	ug/l	0.0139	
PFAS, Total (5)	null	ug/l	0.0187	J

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LOCATION			NM, SOUT #1,2	
SAMPLING DATE			7/17/2019	
LAB SAMPLE ID			L1933265-16	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00347	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0192	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00349	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00246	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0199	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00246	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00132	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.000872	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00691	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00246	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00246	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000926	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.0037	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00167	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00246	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00246	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00104	J
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00246	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00246	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00246	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00106	J
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00246	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00246	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00246	U
PFOA/PFOS, Total	null	ug/l	0.0106	
PFAS, Total (5)	null	ug/l	0.0137	J

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LOCATION			DU, SOUT #1,2	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-17	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00733	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0307	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00485	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00212	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0467	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00212	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00551	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00128	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0136	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00212	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00212	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.0556	
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00665	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.0037	
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00212	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00212	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.000958	J
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00103	J
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00212	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00212	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00212	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00212	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00212	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00212	U
PFOA/PFOS, Total	null	ug/l	0.0203	
PFAS, Total (5)	null	ug/l	0.0826	J

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LOCATION			RF, SOUT #1,2	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-18	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00537	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0475	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00288	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00246	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0521	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00246	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00398	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.0035	
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0143	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00246	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00246	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.00101	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.0056	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00145	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00246	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00246	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00246	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00246	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00246	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00246	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00246	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00246	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00246	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00246	U
PFOA/PFOS, Total	null	ug/l	0.0199	
PFAS, Total (5)	null	ug/l	0.0284	J

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LOCATION			EX, CHL #1,2	
SAMPLING DATE			7/17/2019	
LAB SAMPLE ID			L1933265-19	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00186	U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0219	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00749	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00186	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0374	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00186	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00237	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00108	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00774	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00186	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00186	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000922	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00357	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00136	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00186	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00186	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00186	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00186	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00186	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00186	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00186	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00186	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00186	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00186	U
PFOA/PFOS, Total	null	ug/l	0.0113	
PFAS, Total (5)	null	ug/l	0.0157	J

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LOCATION			NM, CHL #1,2	
SAMPLING DATE			7/17/2019	
LAB SAMPLE ID			L1933265-20	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00504	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.018	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00396	
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00182	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0187	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00182	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00125	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00088	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00531	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00182	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00182	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000672	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00293	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00116	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00182	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00182	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00182	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00182	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00182	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00182	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00182	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00182	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00182	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00182	U
PFOA/PFOS, Total	null	ug/l	0.00824	
PFAS, Total (5)	null	ug/l	0.011	J

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LOCATION			SW, LT #1,2	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-21	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00087	J
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0012	J
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.000428	J
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00175	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.00147	J
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00175	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.000775	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.000333	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00148	J
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00175	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00175	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.00175	U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00142	J
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00175	U
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00175	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00175	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00175	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00175	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00175	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00175	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00175	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00175	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00175	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00175	U
PFOA/PFOS, Total	null	ug/l	0.0029	J
PFAS, Total (5)	null	ug/l	0.00401	J

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LOCATION			RF, FIELD BLANK	
SAMPLING DATE			7/16/2019	
LAB SAMPLE ID			L1933265-22	
SAMPLE TYPE			WATER	
SAMPLE DEPTH (ft.)				
	CasNum	Units	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution				
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00178	U
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.00178	U
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00178	U
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ug/l	0.00178	U
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.00178	U
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00178	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00178	U
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00178	U
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00178	U
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ug/l	0.00178	U
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00178	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.00178	U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00178	U
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00178	U
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ug/l	0.00178	U
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00178	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ug/l	0.00178	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00178	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00178	U
Perfluorooctanesulfonamide (FOSA)	754-91-6	ug/l	0.00178	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ug/l	0.00178	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00178	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00178	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00178	U
PFOA/PFOS, Total	null	ug/l	0.00178	U
PFAS, Total (5)	null	ug/l	0.00178	U

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Table S16. Detected PFAS concentration by TOP assay analysis in July.

LOCATION			DU, CHL #1,2		RF, CHL #1,2		EX, DCHL #1,2	
SAMPLING DATE			7/16/2019		7/16/2019		7/17/2019	
LAB SAMPLE ID			L1933265-01		L1933265-02		L1933265-03	
SAMPLE TYPE			WATER		WATER		WATER	
SAMPLE DEPTH (ft.)								
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)								
	CasNum	Units	Results	Qual	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00804		0.0109		0.0088	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.023		0.0431		0.0276	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00316		0.00608		0.0091	
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0351		0.0421		0.0406	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00182	U	0.00181	U	0.00179	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00312		0.00432		0.00251	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00102	J	0.00329		0.00167	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0106		0.0163		0.0131	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00182	U	0.00181	U	0.00179	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.03		0.000902	J	0.00102	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00346		0.00542		0.00343	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00132	J	0.00104	J	0.00115	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00182	U	0.00181	U	0.00179	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00182	U	0.00181	U	0.00179	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00182	U	0.00181	U	0.00179	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00182	U	0.00181	U	0.00179	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00182	U	0.00181	U	0.00179	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00182	U	0.00181	U	0.00179	U

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LOCATION			NM, DCHL #1,2		DU, DCHL #1,2	
SAMPLING DATE			7/17/2019		7/16/2019	
LAB SAMPLE ID			L1933265-04		L1933265-05	
SAMPLE TYPE			WATER		WATER	
SAMPLE DEPTH (ft.)						
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)						
	CasNum	Units	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00622		0.00747	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.013		0.0217	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00232		0.00313	
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0118		0.0336	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00185	U	0.00186	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.000981	J	0.00319	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.000711	J	0.000959	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00678		0.0112	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00185	U	0.00186	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000492	J	0.042	
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00208		0.00424	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.000648	J	0.00179	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00185	U	0.00186	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00185	U	0.000466	J
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00185	U	0.00186	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00185	U	0.00186	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00185	U	0.00186	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00185	U	0.00186	U

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LOCATION			RF, DCHL #1,2		EX, SIN #1,2		NM, SIN #1,2	
SAMPLING DATE			7/16/2019		7/17/2019		7/17/2019	
LAB SAMPLE ID			L1933265-06		L1933265-11		L1933265-12	
SAMPLE TYPE			WATER		WATER		WATER	
SAMPLE DEPTH (ft.)								
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)								
	CasNum	Units	Results	Qual	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00522		0.0464		0.0417	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0202		0.00412		0.00554	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.0023		0.00476		0.00277	
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0209		0.00434		0.0056	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00183	U	0.00184	U	0.00185	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00238		0.0019		0.000852	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00177	J	0.00184	U	0.00185	U
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00815		0.00997		0.00413	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00183	U	0.00184	U	0.00185	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000377	J	0.000893	J	0.000363	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00297		0.00535		0.00333	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00048	J	0.000373	J	0.000459	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-	ug/l	0.00183	U	0.00184	U	0.00185	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00183	U	0.00184	U	0.00185	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00183	U	0.00184	U	0.00185	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00183	U	0.00184	U	0.00185	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-	ug/l	0.00183	U	0.00184	U	0.00185	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00183	U	0.00184	U	0.00185	U

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LOCATION			DU, SIN #1,2		RF, SIN #1,2		EX, SOUT #1,2	
SAMPLING DATE			7/16/2019		7/16/2019		7/17/2019	
LAB SAMPLE ID			L1933265-13		L1933265-14		L1933265-15	
SAMPLE TYPE			WATER		WATER		WATER	
SAMPLE DEPTH (ft.)								
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)								
	CasNum	Units	Results	Qual	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.0524		0.00474		0.103	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0298		0.00377		0.0227	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00785		0.00127	J	0.0084	
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0446		0.00418		0.0443	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.0214		0.00254	U	0.0142	
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00407		0.00182	J	0.00128	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00229		0.00162	J	0.0144	
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0114		0.00382		0.00492	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00199	U	0.00254	U	0.00212	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.0566		0.00254	U	0.00212	U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00434		0.00289		0.0078	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00158	J	0.00254	U	0.00061	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-	ug/l	0.00199	U	0.00254	U	0.00212	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00524		0.00254	U	0.00212	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00199	U	0.00254	U	0.00212	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00199	U	0.00254	U	0.00212	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-	ug/l	0.00129	J	0.00254	U	0.00212	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00199	U	0.00254	U	0.00212	U

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LOCATION			NM, SOUT #1,2		DU, SOUT #1,2		RF, SOUT #1,2	
SAMPLING DATE			7/17/2019		7/16/2019		7/16/2019	
LAB SAMPLE ID			L1933265-16		L1933265-17		L1933265-18	
SAMPLE TYPE			WATER		WATER		WATER	
SAMPLE DEPTH (ft.)								
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)								
	CasNum	Units	Results	Qual	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.0263		0.0258		0.0242	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.0117		0.0178		0.0277	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00185	J	0.00248		0.00207	J
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0159		0.058		0.0316	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.06		0.0328		0.0117	
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.000918	J	0.00261		0.00177	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00484		0.00422		0.00299	
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00366		0.00496		0.00387	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00196	U	0.00189	U	0.00218	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000314	J	0.0272		0.00218	U
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00298		0.00422		0.00293	
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00178	J	0.00225		0.000603	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-	ug/l	0.00196	U	0.00189	U	0.00218	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00196	U	0.0063		0.00218	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00196	U	0.00216		0.00218	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.000447	J	0.000746	J	0.00218	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-	ug/l	0.00196	U	0.00212		0.00218	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00196	U	0.00189	U	0.00218	U

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LOCATION			EX, CHL #1,2		NM, CHL #1,2	
SAMPLING DATE			7/17/2019		7/17/2019	
LAB SAMPLE ID			L1933265-19		L1933265-20	
SAMPLE TYPE			WATER		WATER	
SAMPLE DEPTH (ft.)						
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)						
	CasNum	Units	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00745		0.00771	
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.015		0.0137	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00413		0.00171	J
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.0225		0.0121	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00187	U	0.00184	U
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.00158	J	0.00106	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.000772	J	0.000629	J
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.00819		0.00826	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00187	U	0.00184	U
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.000614	J	0.000353	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.00208		0.00135	J
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.000753	J	0.000614	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-	ug/l	0.00187	U	0.00184	U
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00187	U	0.00184	U
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00187	U	0.00184	U
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00187	U	0.00184	U
Perfluorotridecanoic Acid (PFTrDA)	72629-94-	ug/l	0.00187	U	0.00184	U
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00187	U	0.00184	U

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LOCATION			SW, LT #1,2		RF, FIELD BLANK	
SAMPLING DATE			7/16/2019		7/16/2019	
LAB SAMPLE ID			L1933265-21		L1933265-22	
SAMPLE TYPE			WATER		WATER	
SAMPLE DEPTH (ft.)						
Perfluorinated Alkyl Acids by Isotope Dilution (Post-Treatment)						
	CasNum	Units	Results	Qual	Results	Qual
Perfluorobutanoic Acid (PFBA)	375-22-4	ug/l	0.00088	J	-	-
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ug/l	0.00114	J	-	-
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ug/l	0.00182	U	-	-
Perfluorohexanoic Acid (PFHxA)	307-24-4	ug/l	0.00135	J	-	-
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ug/l	0.00182	U	-	-
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ug/l	0.000858	J	-	-
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ug/l	0.00182	U	-	-
Perfluorooctanoic Acid (PFOA)	335-67-1	ug/l	0.0125		-	-
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ug/l	0.00182	U	-	-
Perfluorononanoic Acid (PFNA)	375-95-1	ug/l	0.00182	U	-	-
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ug/l	0.000571	J	-	-
Perfluorodecanoic Acid (PFDA)	335-76-2	ug/l	0.00182	U	-	-
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ug/l	0.00182	U	-	-
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ug/l	0.00182	U	-	-
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ug/l	0.00182	U	-	-
Perfluorododecanoic Acid (PFDoA)	307-55-1	ug/l	0.00182	U	-	-
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ug/l	0.00182	U	-	-
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ug/l	0.00182	U	-	-

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Table S17. Detected PFAS concentration in Great Bay surface water.

	SAMPLE ID:			SW-GB #1, 2				SW-SP #1, 2	
	LAB ID:			L1935189-03				L1935189-04	
	COLLECTION DATE:			8/6/2019				8/6/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	Unit	ug/l							
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.00214		0.00179	0.000366	0.00277		0.00184	0.000376
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.00101	J	0.00179	0.000355	0.00186		0.00184	0.000365
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00179	0.000213	0.00127	J	0.00184	0.00022
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.00179	0.000405	ND		0.00184	0.000417
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.00127	J	0.00179	0.000294	0.00246		0.00184	0.000302
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00179	0.00022	ND		0.00184	0.000226
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000405	J	0.00179	0.000202	0.00101	J	0.00184	0.000208
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.000728	J	0.00179	0.000337	0.00101	J	0.00184	0.000347
Perfluorooctanoic Acid (PFOA)	335-67-1	0.00142	J	0.00179	0.000211	0.00212		0.00184	0.000218
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ND		0.00179	0.00119	ND		0.00184	0.00123
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00179	0.000616	ND		0.00184	0.000635
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.00179	0.00028	ND		0.00184	0.000288
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00363		0.00179	0.000452	0.00419		0.00184	0.000465
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.00179	0.000272	ND		0.00184	0.00028
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.00179	0.00109	ND		0.00184	0.00112
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00179	0.001	ND		0.00184	0.00103
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.00179	0.000581	ND		0.00184	0.000598
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00179	0.000233	ND		0.00184	0.00024
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00179	0.000878	ND		0.00184	0.000904
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.00179	0.00052	ND		0.00184	0.000535
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.00179	0.00072	ND		0.00184	0.000742
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00179	0.000333	ND		0.00184	0.000343
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00179	0.000293	ND		0.00184	0.000302
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00179	0.000222	ND		0.00184	0.000229
PFOA/PFOS, Total		0.00505	J	0.00179	0.000211	0.00631		0.00184	0.000218
PFAS, Total (5)		0.00618	J	0.00179	0.000202	0.00833	J	0.00184	0.000208

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	SAMPLE ID:			SW-MP #1, 2				SW-AP #1, 2	
	LAB ID:			L1935189-01				L1935189-02	
	COLLECTION DATE:			8/6/2019				8/6/2019	
	SAMPLE DEPTH:								
	SAMPLE MATRIX:			WATER				WATER	
	Unit	ug/l							
ANALYTE	CAS	Conc	Q	RL	MDL	Conc	Q	RL	MDL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION									
Perfluorobutanoic Acid (PFBA)	375-22-4	0.000466	J	0.0018	0.000368	0.00121	J	0.00182	0.000371
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.000646	J	0.0018	0.000357	0.000811	J	0.00182	0.00036
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.0018	0.000215	ND		0.00182	0.000216
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	NONE	ND		0.0018	0.000408	ND		0.00182	0.000411
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.000913	J	0.0018	0.000296	0.00108	J	0.00182	0.000298
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.0018	0.000221	ND		0.00182	0.000223
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.000444	J	0.0018	0.000203	0.000345	J	0.00182	0.000205
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.000686	J	0.0018	0.000339	0.000473	J	0.00182	0.000342
Perfluorooctanoic Acid (PFOA)	335-67-1	0.000606	J	0.0018	0.000213	0.000804	J	0.00182	0.000214
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ND		0.0018	0.0012	ND		0.00182	0.00121
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.0018	0.000621	ND		0.00182	0.000625
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.0018	0.000282	ND		0.00182	0.000284
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.00255		0.0018	0.000455	0.0014	J	0.00182	0.000458
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.0018	0.000274	ND		0.00182	0.000276
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ND		0.0018	0.00109	ND		0.00182	0.0011
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.0018	0.00101	ND		0.00182	0.00102
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ND		0.0018	0.000585	ND		0.00182	0.000589
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.0018	0.000235	ND		0.00182	0.000236
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.0018	0.000884	ND		0.00182	0.000891
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.0018	0.000523	ND		0.00182	0.000527
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ND		0.0018	0.000726	ND		0.00182	0.000731
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.0018	0.000336	ND		0.00182	0.000338
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.0018	0.000295	ND		0.00182	0.000297
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.0018	0.000224	ND		0.00182	0.000225
PFOA/PFOS, Total		0.00316	J	0.0018	0.000213	0.0022	J	0.00182	0.000214
PFAS, Total (5)		0.00429	J	0.0018	0.000203	0.00302	J	0.00182	0.000205

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	SAMPLE ID:			BLANK-MP	
	LAB ID:			L1935189-05	
	COLLECTION DATE:			8/6/2019	
	SAMPLE DEPTH:				
	SAMPLE MATRIX:			WATER	
	Unit	ug/l			
ANALYTE	CAS	Conc	Q	RL	MDL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION					
Perfluorobutanoic Acid (PFBA)	375-22-4	ND		0.00186	0.00038
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ND		0.00186	0.000369
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ND		0.00186	0.000222
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2	NONE	ND		0.00186	0.000422
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.000358	J	0.00186	0.000306
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	ND		0.00186	0.000229
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ND		0.00186	0.00021
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ND		0.00186	0.000351
Perfluorooctanoic Acid (PFOA)	335-67-1	ND		0.00186	0.00022
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2	27619-97-2	ND		0.00186	0.00124
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ND		0.00186	0.000642
Perfluorononanoic Acid (PFNA)	375-95-1	ND		0.00186	0.000291
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ND		0.00186	0.00047
Perfluorodecanoic Acid (PFDA)	335-76-2	ND		0.00186	0.000284
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2	39108-34-4	ND		0.00186	0.00113
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	ND		0.00186	0.00104
N-Methyl Perfluorooctanesulfonamidoacetic Aci	2355-31-9	ND		0.00186	0.000604
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ND		0.00186	0.000242
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ND		0.00186	0.000914
Perfluorooctanesulfonamide (FOSA)	754-91-6	ND		0.00186	0.000541
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	2991-50-6	ND		0.00186	0.00075
Perfluorododecanoic Acid (PFDoA)	307-55-1	ND		0.00186	0.000347
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ND		0.00186	0.000305
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ND		0.00186	0.000231
PFOA/PFOS, Total		ND		0.00186	0.00022
PFAS, Total (5)		ND		0.00186	0.00021

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Table S18. Detected PFAS concentration by TOP assay analysis in Great Bay surface water.

		SAMPLE ID:		SW-MP #1, 2					SW-AP #1, 2
		LAB ID:		L1935189-01					L1935189-02
		COLLECTION DATE:		8/6/2019					8/6/2019
		SAMPLE DEPTH:							
		SAMPLE MATRIX:		WATER					WATER
		NOCRIT							
ANALYTE	CAS	(ug/l)	Conc	Q	RL	MDL	Conc	Q	RL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION (POST-TREATMENT)									
Perfluorobutanoic Acid (PFBA)	375-22-4		0.00088	J	0.00182	0.000372	0.000882	J	0.00184
Perfluoropentanoic Acid (PFPeA)	2706-90-3		0.000912	J	0.00182	0.000361	0.00111	J	0.00184
Perfluorobutanesulfonic Acid (PFBS)	375-73-5		ND		0.00182	0.000217	ND		0.00184
Perfluorohexanoic Acid (PFHxA)	307-24-4		0.000949	J	0.00182	0.000299	0.0012	J	0.00184
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4		ND		0.00182	0.000224	ND		0.00184
Perfluoroheptanoic Acid (PFHpA)	375-85-9		0.000445	J	0.00182	0.000205	0.000605	J	0.00184
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4		ND		0.00182	0.000343	ND		0.00184
Perfluorooctanoic Acid (PFOA)	335-67-1		0.00262		0.00182	0.000215	0.0034		0.00184
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8		ND		0.00182	0.000628	ND		0.00184
Perfluorononanoic Acid (PFNA)	375-95-1		ND		0.00182	0.000285	ND		0.00184
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1		0.00189		0.00182	0.00046	0.0013	J	0.00184
Perfluorodecanoic Acid (PFDA)	335-76-2		ND		0.00182	0.000277	ND		0.00184
Perfluorononanesulfonic Acid (PFNS)	68259-12-1		ND		0.00182	0.00102	ND		0.00184
Perfluoroundecanoic Acid (PFUnA)	2058-94-8		ND		0.00182	0.000237	ND		0.00184
Perfluorodecanesulfonic Acid (PFDS)	335-77-3		ND		0.00182	0.000894	ND		0.00184
Perfluorododecanoic Acid (PFDoA)	307-55-1		ND		0.00182	0.000339	ND		0.00184
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8		ND		0.00182	0.000298	ND		0.00184
Perfluorotetradecanoic Acid (PFTA)	376-06-7		ND		0.00182	0.000226	ND		0.00184

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		SAMPLE ID:			SW-GB #1, 2			
		LAB ID:			L1935189-03			
		COLLECTION DATE:			8/6/2019			
		SAMPLE DEPTH:						
		SAMPLE MATRIX:			WATER			
		NOCRIT						
ANALYTE	CAS	(ug/l)	MDL	Conc	Q	RL	MDL	Conc	Q
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION (POST-TREATMENT)									
Perfluorobutanoic Acid (PFBA)	375-22-4		0.000376	0.00114	J	0.00182	0.000371	0.002	
Perfluoropentanoic Acid (PFPeA)	2706-90-3		0.000365	0.00142	J	0.00182	0.00036	0.00244	
Perfluorobutanesulfonic Acid (PFBS)	375-73-5		0.00022	ND		0.00182	0.000216	0.00147	J
Perfluorohexanoic Acid (PFHxA)	307-24-4		0.000302	0.00188		0.00182	0.000298	0.00263	
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4		0.000226	ND		0.00182	0.000223	ND	
Perfluoroheptanoic Acid (PFHpA)	375-85-9		0.000208	0.000778	J	0.00182	0.000205	0.00114	J
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4		0.000347	0.000465	J	0.00182	0.000342	0.000572	J
Perfluorooctanoic Acid (PFOA)	335-67-1		0.000218	0.00486		0.00182	0.000214	0.0055	
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8		0.000635	ND		0.00182	0.000625	ND	
Perfluorononanoic Acid (PFNA)	375-95-1		0.000288	ND		0.00182	0.000284	0.000697	J
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1		0.000465	0.00191		0.00182	0.000458	0.00518	
Perfluorodecanoic Acid (PFDA)	335-76-2		0.00028	ND		0.00182	0.000276	0.00048	J
Perfluorononanesulfonic Acid (PFNS)	68259-12-1		0.00103	ND		0.00182	0.00102	ND	
Perfluoroundecanoic Acid (PFUnA)	2058-94-8		0.00024	ND		0.00182	0.000236	ND	
Perfluorodecanesulfonic Acid (PFDS)	335-77-3		0.000904	ND		0.00182	0.000891	ND	
Perfluorododecanoic Acid (PFDoA)	307-55-1		0.000343	ND		0.00182	0.000338	ND	
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8		0.000302	ND		0.00182	0.000297	ND	
Perfluorotetradecanoic Acid (PFTA)	376-06-7		0.000229	ND		0.00182	0.000225	ND	

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		SAMPLE ID:	SW-SP #1, 2				BLANK-MP	
		LAB ID:	L1935189-04				L1935189-05	
		COLLECTION DATE:	8/6/2019				8/6/2019	
		SAMPLE DEPTH:						
		SAMPLE MATRIX:	WATER				WATER	
		NOCRIT						
ANALYTE	CAS	(ug/l)	RL	MDL	Conc	Q	RL	MDL
PERFLUORINATED ALKYL ACIDS BY ISOTOPE DILUTION (POST-TREATMENT)								
Perfluorobutanoic Acid (PFBA)	375-22-4		0.00184	0.000376	-	-	-	-
Perfluoropentanoic Acid (PFPeA)	2706-90-3		0.00184	0.000365	-	-	-	-
Perfluorobutanesulfonic Acid (PFBS)	375-73-5		0.00184	0.00022	-	-	-	-
Perfluorohexanoic Acid (PFHxA)	307-24-4		0.00184	0.000302	-	-	-	-
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4		0.00184	0.000226	-	-	-	-
Perfluoroheptanoic Acid (PFHpA)	375-85-9		0.00184	0.000208	-	-	-	-
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4		0.00184	0.000347	-	-	-	-
Perfluorooctanoic Acid (PFOA)	335-67-1		0.00184	0.000218	-	-	-	-
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8		0.00184	0.000635	-	-	-	-
Perfluorononanoic Acid (PFNA)	375-95-1		0.00184	0.000288	-	-	-	-
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1		0.00184	0.000465	-	-	-	-
Perfluorodecanoic Acid (PFDA)	335-76-2		0.00184	0.00028	-	-	-	-
Perfluorononanesulfonic Acid (PFNS)	68259-12-1		0.00184	0.00103	-	-	-	-
Perfluoroundecanoic Acid (PFUnA)	2058-94-8		0.00184	0.00024	-	-	-	-
Perfluorodecanesulfonic Acid (PFDS)	335-77-3		0.00184	0.000904	-	-	-	-
Perfluorododecanoic Acid (PFDoA)	307-55-1		0.00184	0.000343	-	-	-	-
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8		0.00184	0.000302	-	-	-	-
Perfluorotetradecanoic Acid (PFTA)	376-06-7		0.00184	0.000229	-	-	-	-

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Appendix B. List of Acronyms

AFFF ..... Aqueous Film Forming Foams

EPA ..... Environmental Protection Agency

4:2 FTS ..... 1H,1H,2H,2H-Perfluorohexanesulfonic Acid

6:2 FTS ..... 1H,1H,2H,2H-Perfluorooctanesulfonic Acid

8:2 FTS ..... 1H,1H,2H,2H-Perfluorodecanesulfonic Acid

NMeFOSAA ..... N-Methyl Perfluorooctanesulfonamidoacetic Acid

NEtFOSAA ..... N-Ethyl Perfluorooctanesulfonamidoacetic Acid

FOSA ..... Perfluorooctanesulfonamide

PFAA ..... Perfluoroalkyl Acids

PFAS ..... Per & Polyfluoroalkyl Substances

PFBA ..... Perfluorobutanoic acid

PFBS ..... Perfluorobutanesulfonic acid

PFCAs ..... Perflourinated Carboxylic Acid

PFSAs ..... Perflouroalkane Sulfonic Acid

PFDA ..... perfluorodecanoate

PFDoA ..... Perfluorododecanoic acid

PFHpA ..... Perfluoroheptanoic acid

PFHxA ..... Perfluorohexanoic acid

PFHxS ..... Perfluorohexanesulfonic Acid

PFNA ..... Perfluorononanoic acid

PFOA ..... Perfluorooctanic Acid

PFOS ..... Perfluorooctane sulfonate

PFPeA ..... Perfluoropentanoic acid

PFTA ..... Perfluorotetradecanoic Acid

PFTrDA ..... Perfluorotridecanoic Acid

PFUnA ..... Perfluoroundecanoic acid

PFPeS ..... Perfluoropentanesulfonic acid

PFHpS ..... Perfluoroheptanesulfonic acid

PFNS ..... Perfluorononanesulfonic acid

PFDS ..... Perfluorodecaneesulfonic acid