RTN 4-26179

Barnstable County Fire & Rescue Training Academy

Barnstable, MA

July 2021

IMMEDIATE RESPONSE ACTION STATUS & REMEDIAL MONITORING REPORT NO. 54

BETA

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Prepared by: BETA GROUP, INC.
Prepared for: –Barnstable County

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1.0 INTRODUCTION

BETA Group Inc. (BETA) has prepared this Immediate Response Action (IRA) Status and Remedial Monitoring Report (RMR) No. 54 that addresses a release of hazardous materials related to fire-fighting foams and attributed to the Barnstable County Fire and Rescue Training facility located at 155 South Flint Rock Road in Barnstable, Massachusetts (the FTA or facility). This document has been prepared and is being submitted to the Massachusetts Department of Environmental Protection (MassDEP) – Bureau of Waste Site Cleanup (BWSC) in response to the detection of elevated concentrations of per- and polyfluoroalkyl substances (PFAS), including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), in soil and groundwater at the facility and in adjacent areas, in particular to the east, southeast of the facility. This report provides monthly IRA status reporting on the groundwater pumping and treatment system at the Site for the month of May 2021. In addition, this status report describes the activities and results of the Site-wide groundwater monitoring in May 2021.

This (IRA) Status and Remedial Monitoring Report (RMR) No. 54 is being submitted to MassDEP as an attachment to the BWSC 105 Immediate Response Action (IRA) and BWSC 105A and 105B IRA Remedial Monitoring Report Transmittal Forms. Completed copies of these forms prior to electronic signature are included in Appendix A.

As current owners of the FTA, Barnstable County, as represented by the Barnstable County Commissioners, have been named as the Potentially Responsible Party (PRP) for this release. The contact person for the Disposal Site and release is:

Steve Tebo, Asset and Infrastructure Manager
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Telephone: 508-375-6643
Email: stebo@barnstablecounty.org

BETA is performing MCP Response Actions on behalf of the Barnstable County Commissioners. The Licensed Site Professional (LSP) overseeing Response Actions for this release is:

Roger Thibault, P.E., LSP No. 1443
BETA Group Inc.
701 George Washington Highway

Telephone: 401-333-2382
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2.0 GENERAL DISPOSAL SITE INFORMATION

2.1 PROPERTY AND SITE DESCRIPTION

The Barnstable County Fire and Rescue Training FTA (FTA or facility) is located on South Flint Rock Road in the Town of Barnstable. It appears on the United States Geological Survey (USGS) Topographic Quadrangle – Hyannis, Massachusetts -Figure 1 – Site Location map, prepared from a portion of the referenced USGS Topographic Quadrangle map. The Site is currently zoned for industrial use.

For the purposes of this and future MCP submittals, the property on which the Barnstable County Fire and Rescue Training FTA is located will be referred to as the FTA or facility. FTA or facility will also refer to the structures, land and functions of the FTA.

In accordance with the MCP definitions, where contamination attributable to the PFAS releases associated with firefighting foams and training on the FTA have come to be located will be referred to as the Disposal Site or Site.

The 6.2 acre FTA is improved by three primary buildings: an auxiliary fire station and training building (with two classrooms, administrative offices, and two apparatus bays), a classroom building, and a burn building (for live fire suppression training), along with several sheds and outbuildings used for fire and rescue training activities. Recently, a wood framed house-like structure formerly used for smoke training was demolished. Refer to Figure 2. The FTA is secured by chain link fencing and a locked gate. The FTA is listed on the Town of Barnstable Assessor's on-line records as Map 313, Lot 007. The current owner-of-record is the County of Barnstable, who acquired the facility from the Town of Barnstable in 1983 by deed recorded June 3, 1983, Barnstable Registry of Deeds, Book 3759, Page 39. Utilities servicing the FTA include municipal water, a private underground septic system, aboveground electricity and telecommunications.

The FTA was first constructed on land donated to the Town of Barnstable by the Cobb Trust in 1955. The FTA had been used for public safety training since the 1950's. The FTA had been used for public safety training by fire departments and fire districts from throughout Barnstable County, fire departments outside of Barnstable County, and other public and private institutions. Live fire training using firefighting foams, including aqueous film forming foams (AFFF), was conducted at the FTA for decades by fire districts and departments that used their own foam brought to the FTA in the apparatus of the organization participating in the training. Foam training exercises at the FTA ceased in 2009 according to FTA officials. Water training activities ceased in June 2019. Currently, the FTA periodically hosts classroom training sessions.

Land surrounding the FTA is primarily undeveloped, wooded land within a public water supply protection area. Flintrock Pond occupies approximately 6 acres directly to the west of the FTA. Several public water supply wells and their related facilities are located to the east, southeast, and west of the FTA.

At this time, the preliminary MCP Disposal Site (the Site) associated with RTN 4-26179 is considered to comprise approximately the majority of the FTA, the westerly adjacent Flintrock Pond, and a large woodland area to the southeast of the FTA, approaching Mary Dunn Pond.

The southeastern portion of the Site includes land owned by the Town of Barnstable, which is crossed by two electric power transmission lines running presumably within easements. Private industrial properties and related structures are located approximately 500 to 1,000 feet south of the Site. The Barnstable Municipal Airport is located to the west (runway 15 – 33) and south of the Site and the FTA.

The nearest residential properties are located approximately ¼ mile to the north of the Site. Based on 2010 U.S. Census data, the residential population located within a ½ mile radius of the Site is estimated to be less than 150 people. There are no known Institutions located within 500 feet of the Site. The FTA currently has approximately 2 to 5 workers who may be considered full-time. During training activities, which now is restricted to classroom training activities only, 20 to 30 fire fighters or rescue personnel and training personnel may temporarily use the facility. The municipal well pumping facilities are not staffed full-time.

2.2 LATITUDE AND LONGITUDE / UNIVERSAL TRANSVERSE MERCATOR'S

The coordinates for the Site are shown below. For simplicity, these coordinates are for the southerly end of the FTA.

Latitude/Longitude	Latitude:	41º 40' 41.53"
	Longitude:	70º 17' 7.82"
UTM Coordinates	Easting:	393,002
	Northing:	4,614,847

2.3 ENVIRONMENTAL SETTING AND SENSITIVE RECEPTORS

BETA's review of the Massachusetts GIS Priority Resources (21E) mapping (Figure 4) revealed that the Site is located within a Zone II Public Water Supply Protection Area and a Medium-Yield Sole Source Aquifer. The FTA is situated to the west and most likely upgradient of the Mary Dunn public water supply wells 1, 2, and 3 under pumping conditions. Mary Dunn Wells 1, 2, and 3 are located within the preliminary Disposal Site boundary at this time due to the detections of PFAS in the groundwater at those wells. There are no known private potable water wells located within 500 feet of the Site.

Mary Dunn Well 3 (MD-3), which is the nearest public water supply well to the facility, has been documented to pump at an average rate of 380 to 450 gallons per minute (gpm). Mary Dunn Wells 1 and 2 (MD-1 and MD-2) are located approximately 1600 feet and 1800 feet, respectively, southwest of the FTA. These wells have been reported to have been pumped at rates of 400 gpm, each. Airport Well 1, is also periodically used according to MassDEP Drinking Water Program; it is located further to the southeast of the Site, south of Mary Dunn Pond. Two other public water supply wells, identified as the Barnstable Fire District (BFD) wells BFD-2 and BFD-5, are located to the west and most likely upgradient of the Site. The BFD wells are not operated by or part of the Hyannis Water System (as are the Mary Dunn public water supply wells).

According to the USGS Topographic Quadrangle – Hyannis, Massachusetts, elevations at the Site are approximately 30 to 50 feet above mean sea level (MSL). Topography of the Site can be categorized as generally flat with slight to moderate slopes downward to the west and southeast, toward Flintrock Pond and Mary Dunn Pond, respectively.

The nearest surface water bodies to the Site are Flintrock Pond and an unnamed Pond; Flintrock Pond is located west adjacent to the FTA and the unnamed Pond is located northeast adjacent to the FTA (as depicted in Figures 2 and 3). A portion of Flintrock Pond is located within the preliminary MCP Disposal Site Boundary based on the detection of PFAS in sediment and surface water. There are no streams or wetlands located at the Site.

2.4 MASSDEP METHOD 1 CATEGORIES

2.4.1 GROUND WATER CATEGORY

As noted, the Site is located within a Zone II Public Water Supply Protection Area and a Medium-Yield Sole Source Aquifer.

Therefore, MCP Method 1 Ground Water Category 1 (GW-1) applies to the Site. Groundwater at the Site is also categorized as Method 1 GW-2 because groundwater has been measured at depths less than 15 feet below grade and an occupied building is located within the FTA facility.

All ground waters within the Commonwealth are considered a potential source of discharge to surface waters and shall be categorized, at a minimum, as Method 1 GW-3. Therefore, the applicable Method 1 Ground Water Categories for the Site are GW-1, GW-2 and GW-3.

2.4.2 SOIL CATEGORY

Soil categorization is based upon the type of human receptor and three potential exposure criteria: frequency of use, intensity of use, and accessibility of soil. The FTA portion of the Site is occupied by a fire and rescue training facility. Based on the nature of the facility, children are assumed to be "not present." Adults who work at the site as staff members are assumed to be present at "high frequency." Impacted soils have been identified beneath unpaved areas at depths ranging from approximately less than 3 to 15 feet below the ground surface. Therefore, impacted soils at the FTA are considered "potentially accessible."

Only groundwater impacts at significant depths below the ground surface have been identified at the remainder of the Site (outside of the FTA), which consists of undeveloped, industrially zoned land, a portion of a utility easement, and three unmanned public water supply well stations.

Intensity of use in regard to soil disturbance in the release area for adults at the Site is considered "high" because the area of impact at the FTA could potentially be disturbed during firefighting / rescue training activities; however, on-Site training activities involve a relatively short duration of high intensity use. Therefore, for current Site uses, soils at the Site are categorized as Soil Category S-2. The applicable Soil Categories for current Site uses have been identified as S-2/GW-1, S-2/GW-2 and S-2/GW-3.

The applicable Soil Categories for unrestricted future Site uses are S-1/GW-1, S-1/GW-2 and S-1/GW-3.

3.0 DISPOSAL SITE HISTORY AND OVERVIEW

The Site has historically been the subject of four MassDEP RTNs: 4-190, 4-11707, 4-20021, and 4-26179. This IRA Plan Modification is being submitted for RTN 4-26179 only. The original RTN, 4-190, is being managed separately; closure has been achieved for the remaining two RTNs.

3.1 RELEASE HISTORY AND DESCRIPTION - RTN 4-26179 (PFAS RELEASE)

In May 2012, USEPA issued their final rule "Revisions to the Unregulated Contaminant Monitoring Rule (UCMR3) for Public Water Systems," which was a national sampling mandate for "emerging contaminants" in public water supplies. The required sampling list included several PFAS compounds, including but not limited to PFOS and PFOA. In November 2013, samples were collected from Mary Dunn supply wells MD-1, MD-2 and MD-3 and analyzed for PFAS.

At the time of the testing, the US EPA Provisional Health Advisory (HA) was 0.20 micrograms per liter (µg/L) for PFOS. Analytical results revealed evidence of PFOS contamination in all three wells sampled. MD-1 and MD-2 were temporarily removed from service. MD-3 was apparently not in use at that time. A treatment system that utilizes granular activated carbon (GAC) was later implemented for MD-1 and MD-2 [July 2015] by the Hyannis Water Department. In 2016, GAC treatment was also implemented for MD-3. [See below].

In November 2013, Barnstable County personnel also collected soil and groundwater samples from the FTA property, located approximately 1,000 feet west of the Mary Dunn wells, and submitted them for laboratory analysis of PFAS. Groundwater analytical results revealed that FTA groundwater was impacted by PFOS and MassDEP was subsequently notified.

PFOS was also detected in soil at the FTA and in surface water and sediment within the adjacent Flintrock Pond. As summarized in the Notice of Responsibility (NOR) issued by MassDEP on August 4, 2016 (see below), based on the detected PFAS concentrations in soil and groundwater at the FTA and the inferred groundwater flow direction being to the southeast (toward the Mary Dunn wells), MassDEP determined that the releases of PFAS from the use of AFFF at the FTA is a source of PFAS detected in the Mary Dunn wells.

As a voluntary measure, Barnstable County refurbished the former perchlorate pump and treat system located at the FTA to help remediate and contain the PFOS apparently migrating from the facility. The groundwater pumping and treatment system (GWPTS) was re-started using GAC for treatment in July 2015. The system utilizes a groundwater recovery well, PRW-4, located approximately 800 feet southeast of the FTA. The groundwater treatment system (GWTS) itself is located in a structure on the FTA grounds.

In August 2015, Barnstable County funded a more detailed hydrogeological assessment, continued implementation of a groundwater pump and treat system to capture PFOS upgradient of the Mary Dunn wells, and additional assessment and immediate response actions. The Cape Cod Commission evaluated subsurface soil and groundwater conditions at the FTA facility as part of the IRA assessment activities. The soil results indicated a broad area of PFOS contamination throughout the subsurface. The highest PFOS concentrations were detected near the southwestern corner of the FTA, a location subsequently referred to as the hot spot.

Groundwater analytical results from the 2015 assessment revealed PFOS contamination ranging from less than 0.070 µg/L) (the current US EPA HA) to greater than 70 µg/L. The groundwater samples were collected from monitoring wells across the Site, located between the FTA and the Mary Dunn wells. Like the soil results, the highest PFOS concentrations were detected near the southwestern corner of the FTA.

In May 2016, US EPA revised/lowered its HA for PFAS from 0.20 µg/L of PFOS and PFOA to 0.070 µg/L for either compound or the total of the two.

EPA noted that the HA was for drinking water exposures only. In response to the lowered HA PFAS concentrations, on August 4, 2016, MassDEP issued a Notice of Responsibility (NOR) to Barnstable County and required submittal of an Immediate Response Action (IRA) Plan no later than September 15, 2016. MassDEP requested that the Site owner evaluate potential Imminent Hazards relative to downgradient public and private water supply wells.

MassDEP indicated that this evaluation should include identification of all nearby public and private water supply wells, review of any existing analytical data for those wells, and sampling and analysis of any nearby wells that have not been sampled for PFAS. MassDEP also stated that the IRA Plan should include measures to prevent, eliminate, and/or abate any hazards associated with the consumption of drinking water impacted by PFAS above the HA level of 0.070 ug/L.

MassDEP also required, as part of the IRA, activities to reduce the mass of PFAS at the FTA and the concentrations of PFAS in groundwater migrating from the FTA facility, such as excavating the soil hot spot and expanding the existing groundwater treatment system to decrease the mass of PFAS in groundwater.

On September 27, 2016, on behalf of Barnstable County, the Cape Cod Commission submitted an IRA Plan to MassDEP to address the PFOS/PFOA impacts. The IRA Plan included an evaluation of imminent hazards to downgradient public and private water supplies, specific plans for a Hot Spot removal action, and plans for an interim expansion of the existing groundwater pump and treatment system.

The IRA Plan also contained an evaluation of water supply alternatives. The proposed IRA to address the soil Hot Spot was to excavate up to 200 cubic yards from a 400 square foot area for off-Site disposal.

The Hot Spot soil was removed in January 2017, reducing the primary source of PFOS contamination leaching into groundwater. However, post-removal grading and settling of the backfill in the Hot Spot area left it prone to infiltration of runoff from the southern portion of the FTA.

Between December 2016 and February 2018, the Cape Cod Commission submitted 15 IRA Status and Remedial Monitoring Reports (RMRs) to MassDEP for the PFAS release. The RMRs addressed the FTA GWPTS, which is recovering and treating approximately 50,000 gallons per day (gpd) of groundwater from well PRW-4. The upgradient on-Site groundwater pump and treat system is also working to reduce PFAS concentrations in the aquifer before it reaches the Mary Dunn treatment system. Refer to Section 3.2 for further information regarding the on-Site GWPTS.

The GAC treatment of the Mary Dunn wells is actively preventing a potential Imminent Hazard to the Hyannis community by removing the PFAS compounds from the water supply. A Settlement Agreement is in place between the Town of Barnstable and Barnstable County that requires the County to fund a portion of the costs associated with operating the Mary Dunn wells treatment systems.

Timely exchange of pumping and performance data related to the treatment of the Mary Dunn well water supplies to verify effectiveness of the IRA is noted in the settlement agreement between the parties. On behalf of Barnstable County, BETA has submitted IRA Status reports and RMRs since March 2018. IRA Status and RMR reports have been submitted monthly since December 13, 2016.

As detailed in recent IRA Status and RMR reports, including this report, groundwater monitoring data for locations across the Disposal Site confirm that elevated PFAS concentrations are still present in Site groundwater. Analytical data from select monitoring wells indicate that PFAS concentrations in groundwater sampled in the former Hot Spot area have significantly decreased (following the Phase 1 stormwater improvements repair of the cap under the June 28, 2018 IRA Plan Modification); PFAS concentrations remain stable in groundwater sampled from wells east of the FTA; and PFAS concentrations remain elevated in groundwater sampled from within the area southeast of the FTA between the facility and the Mary Dunn wells. See Section 4.3 for the most recent (May 2021) groundwater monitoring data.

3.2 GROUNDWATER PUMP AND TREAT SYSTEMS

Response actions to address the early 1990s petroleum releases and the later detection of perchlorate included extensive subsurface assessment including installation of a significant network of monitoring wells.

In addition, to help remediate and control migration from the petroleum and perchlorate releases, in 1998 and 2007, respectively, response actions included the installation, upgrade, and/or renovation of a GWPTS at the Site. In July 2015 the decommissioned GWTS, formerly used to treat for perchlorate, was renovated and re-started to help remediate and contain the PFAS migration from the FTA; see below. The operational GWPTS was later noted in the NOR issued by MassDEP in August 2016 as part of the on-going IRAs. The NOR also requested that Barnstable County install additional recovery wells or increase the groundwater recovery rate to increase PFAS removal; see discussion of GWTS# 2 below. The approximate locations of key components of the GWPTS that are located on the FTA are shown on Figure 2 – Site Plan Detail. The location of the operating recovery well, PRW-4, and the approximate route of the force mains (two, 2-inch polyethylene pipes) are shown on Figure 3 – Site Plan.

GWTS # 1

In July 2015, the primary influent/recovery well pump installed in recovery well PRW-4 was repaired, a new variable frequency drive (VFD) unit pump was installed in the treatment system, and all accompanying electrical components were evaluated and repaired. The system was restarted in July 2015 upon the installation of 1500 pounds (lbs.) of aqueous phase GAC (Filtrasorb 400 virgin GAC) into each of the two, existing Siemens treatment vessels. The "capture zone" of PRW-4 was reportedly estimated to be 200 ft. at 40 gallons per minute (gpm). Groundwater is pumped from recovery well PRW-4, through an eight-hundred-foot force main to the treatment building on the FTA; see Figures 2 and 3.

The groundwater is discharged to an equalization tank, then filtered through a 5–10-micron size bag filter and pumped through the two (in series) GAC vessels and discharged to the several large recharge chambers located in the center of the FTA, upgradient of the recovery well and approximately cross-gradient of the highest levels of PFAS contamination detected at the FTA property. See Fig. 2B for the location of the recharge basins. As appropriate to prevent breakthrough of the PFAS6 compounds , the GAC is periodically changed out.

GWTS # 2

As noted, the NOR also requested that Barnstable County increase the groundwater recovery and treatment rate to increase PFAS removal from the aquifer. In November 2019, a second, supplemental treatment system was installed, designated as GWTS#2, to treat water from the existing recovery well and better use its extraction capacity. The second force main was re-piped and connected via hose and hard piping to GWTS#2. The system is contained in a mobile structure (former shipping container) and is designed to treat PFAS-impacted groundwater (via adsorption technology with liquid phase granular activated carbon) at a target flow rate of approximately 30 gpm.

Since the inception of treatment for PFAS in 2015, the spent GAC is collected by the supplier, Calgon Carbon Corp., during the changeout procedure and transported to their facility for standard thermal regeneration. As noted above, the FTA GWPTS uses virgin GAC supplied by Calgon.

Currently, Groundwater Treatment Technologies, LLC (GWTT) is contracted by Barnstable County to provide O&M of the GWTS, including but not limited to, bag filter checks and replacements, VFD pump monitoring, carbon vessel backwashing, and GAC replacement oversight.

Additionally, BETA collects monthly samples for PFAS from both systems to check their treatment performance (See section 4.1).

3.3 PHASE I INITIAL SITE INVESTIGATION AND TIER CLASSIFICATION

In May 2018, a Phase I Initial Site Investigation (ISI) Report and Tier Classification Submittal was submitted to MassDEP by BETA (formerly Nover-Armstrong Associates) on behalf of Barnstable County in response to the discovery of concentrations of PFAS compounds in soil and groundwater exceeding applicable USEPA Health Advisory (HA) levels. The Phase I ISI confirmed that the primary contaminant of concern is PFOS and, to a lesser extent, PFOA.

Based on the compiled Phase I Initial Site Investigation data, BETA opined in the Phase I report that continuation of the IRA activities and additional assessment and, potentially, additional remedial Response Actions are warranted at the Disposal Site.

A Phase II Comprehensive Site Assessment Conceptual Scope of Work (SOW) was submitted with the Phase I ISI outlining the scope, nature of investigation, and sample programs proposed to characterize the risk of harm posed to health, safety, public welfare, and the environment (for regulatory closure). The Phase II SOW proposed additional remedial and/or response actions such as continued monitoring of the Site groundwater conditions, potential soil removal or modifications to the existing groundwater treatment system to be implemented in the near future. At a later date, MassDEP indicated that a formal Phase II Comprehensive Site Assessment SOW was required in addition to the Conceptual SOW.

A Tier Classification was submitted to MassDEP concurrently with the Phase I Report. Based on the need to continue remedial actions as IRAs under the current IRA Plan, and on the continuing need to abate a potential Imminent Hazard condition related to impacts to public water supplies, the RTN 4-26179 release was classified as Tier I.

3.4 FLINTROCK POND ASSESSMENTS

Per the Order of Conditions: Special Conditions of Approval (SE3-5606), Item 17, the Town of Barnstable Conservation Commission required "new testing results for PFAS in Flintrock Pond." From November 2019 to October 2020, BETA has conducted surface water and sediment sampling at Flintrock Pond.

Elevated concentrations of the total summed of the five PFAs chemicals (PFOS, PFOA, PFNA, PFHxS, and PFHpA) were documented in the pond sediments and surface water; however, no MassDEP or US EPA regulatory standards or guidelines for sediment and surface water are available for comparison.

Concentrations of PFAS documented within Pond sediments are dominated by the PFOS and PFHxS compounds and increase with distance from the Pond's bank. Refer to the previously completed IRA Status Reports submitted to MassDEP for complete information on the assessment to date of Flintrock Pond.

Future Assessment

In response to Commission input and to meet MCP requirements, a comprehensive assessment program for the pond is under development to be implemented during the Phase II CSA. Barnstable County and BETA, in conjunction with Barnstable County dredging department, will develop/construct cable crossings of the pond with a means to move a small float or a boat to systematically cross the pond, while obtaining sediment samples from permanent/consistent locations throughout the Pond. The planned sediment sampling and the pond's ecological risk assessment per the requirements of 310 CMR 40.0830 and particularly at 40.0995. Additional sampling, especially spatially, will be conducted to complete the overall conceptual site model as part of Phase II Site assessment and to select and implement a remedial alternative for the Disposal Site. The proposed program is presented in the recently submitted Public Comment Draft Phase II Comprehensive Site Assessment SOW; see Section 3.7.

3.5 SAMPLING AND ANALYSIS FOR PFAS

Following the collection of aqueous and/or soil samples for the analysis of PFAS compounds, BETA submits all samples to Bureau Veritas Laboratories (BV Labs) (formerly Maxxam Analytical) for the analysis of PFAS via USEPA Method 537 modified.

BV Labs is an accredited laboratory located in Mississauga, Ontario that has performed the PFAS analyses for all samples collected from the Disposal Site since the assessment for PFAS impacts began.

BV Labs reports the concentrations of 23 PFAS compounds from aqueous and soil samples with laboratory detection limits as low as 2.0 ng/L (ppt).

However, for the purposes of achieving the low laboratory detection limits to compare against the MCP GW-1 Standard of 20 ppt for the monthly performance samples collected at the treatment systems, BV Labs is only able to report 21 PFAS compounds; two additional fluorotelomers are not reported.

Upon receipt of a laboratory report, BETA reviews the concentration data as well as the laboratory case narrative and quality assurance report to ensure no bias is present. BETA summarizes and tabulates the analytical results of six PFAS compounds (PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFDA) based on the MassDEP MCP PFAS risk standards (December 2019).

BETA presents the tabulated data and includes the laboratory analytical reports (or Certificates of Analysis) for that reporting period in the monthly IRA Status and RMR reports; the summary data tables, and laboratory analytical reports are included as attachments to these reports.

3.6 PUBLIC INVOLVEMENT

In January 2019, a petition from a group of residents of Barnstable and Hyannis, MA was received, requesting that the Site be designated a Public Involvement Plan (PIP) Site. In response to the request from the local petitioners, Barnstable County designated the Site as a PIP site and has begun PIP activities in accordance with 310 CMR 40.01404. Notification of the Site Designation and the initial public meeting was provided to all petitioners and the Town of Barnstable officials in writing in February 2019.

On May 2, 2019, a public meeting was held, and a Draft Public Involvement Plan (PIP) was prepared, presented, and distributed. Public comments (as they relate to the response actions implemented for the release of PFAS at the Site and are in accordance with 310 CMR 40.01404) have been incorporated into the final Plan, which was finalized on June 27, 2019.

3.7 PUBLIC COMMENT DRAFT PHASE II COMPREHENSIVE SITE ASSESSMENT SCOPE OF WORK

As noted in 3.3, MassDEP indicated that a formal Phase II Comprehensive Site Assessment (CSA) SOW was required for the RTN 4-26179 PFAS Release Site. On July 16, 2021, a Public Comment Draft Phase II Comprehensive Site Assessment (CSA) Scope of Work was submitted via eDEP and is available for public comment. This Draft Phase II CSA SOW document describes the robust assessment activities proposed to meet the objectives as stated in the MCP at 310 CMR 40.0833. Per Section 4.23 of the Final PIP, "Public Comment Periods," comments will be accepted on this Draft Phase II CSA SOW prior to finalization of the document. The public comment period will be open for 21 days, beginning on the date of distribution (July 20, 2021) to the PIP mailing list of the notice of availability of the Draft Phase II CSA SOW.

4.0 HISTORICALLY AND RECENTLY COMPLETED IRA ACTIVITIES

Since the submittal of the IRA Plan in September 2016 (as described in section 3.0), remedial response actions and assessment activities have continued to address the PFAS impacts at the Site. Most notably, the Barnstable County and the Cape Cod Commission implemented response actions to refurbish and re-start an existing, but not operating groundwater pump and treatment system in 2015 and oversaw the excavation of 200 cubic yards of PFAS impacted soils from the former "Hot Spot" area (a 400 square foot area) for off-Site disposal in January 2017.

From December 2018 through February 2019, Barnstable County implemented the regrading and temporary capping of the southwest corner of the FTA, including the former Hot Spot area, with related stormwater controls, termed the Phase I Stormwater Management Improvements/IRA Plan Modification. Additional details regarding the Phase I Stormwater Management Improvements are included in the February 2019 Reporting Period IRA Status No. 27 Report.

In November 2019, the County procured and started a second treatment system, GWTS #2, in an effort to increase the treatment capacity of groundwater from PRW-4. As a result groundwater conveyed from PRW-4 was split and re-piped and to both GWTS #1 and GWTS #2.

The following is a summary of the historic, continuing, and recent IRA response actions completed at the Site. Additional details regarding these IRA response actions can be found in previous IRA Status submittals.

4.1 CONTINUING OPERATION & MAINTENANCE OF GWTS

Cape Cod Commission oversaw and documented the GWPTS performance on behalf of Barnstable County from July 2015 through February 2018. The Cape Cod Commission also conducted groundwater monitoring and operation of the recovery well, PRW-4.

Monthly performance monitoring samples have been collected since GWTS #1 startup in July 2015, from the influent (PRW-4), midpoint, and effluent sample locations. Since November 2019, performance samples have been collected monthly from both GWTS # 1 and GWTS #2.

Periodic monitoring of the system is required to maintain operation of the VFD and recovery well pump including carbon exchanges, regular backwashing of the carbon vessels, force mains cleanouts, and replacement of the recovery well pumps. This work is currently performed by a wastewater treatment system operator, GWTT, under contract with the County. Since November 2019, GWTT maintains and operates both GWTS#1 and GWTS#2 systems.

IRA activities related to the operation and maintenance of the GWPTS conducted during earlier reporting periods have been described in detail in previously completed IRA Status Reports submitted to MassDEP. Refer to those submittals for complete information. The previously submitted documents are available in MassDEP Sites Database; refer to the follow link to access these reports.

https://eeaonline.eea.state.ma.us/portal#!/wastesite/4-0026179.

On behalf of Barnstable County, BETA submits the IRA monthly remedial monitoring reports and status reports summarizing pump and treat system operations for the respective reporting period. System sampling and IRA Status and RMR submittals continue monthly; these submittals always include the PFAS analytical summary data table from the monthly system samples and the respective laboratory analytical report. As noted previously, the laboratory reports for monthly GWTS performance monitoring provide the results for 21 PFAS compounds in order to allow for lower laboratory reporting limits.

Health Advisories and Regulatory Standards Used for Comparison

During the initial two years of the GWPTS operation (July 2016 through June 2018), the USEPA revised Health Advisory (HA) of 0.070 µg/L for two PFAS chemicals, Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS), was used for comparison to the analytical results of GWPTS performance samples. The HA (revised downward to 0.070 µg/L in July 2016) applied to each compound individually or for the total concentration of the two (PFOS and PFOA).

At that time, MassDEP adopted the USEPA HA. The USEPA considers its HA to still be in effect (as of March 2020). However, for MCP purposes it has been superseded by the promulgation (by MassDEP) of MCP risk standards for the PFAS6 compounds and Maximum Contaminant Levels for the PFAS6 under the Massachusetts Drinking Water regulations – see below.

On June 11, 2018, MassDEP's Office of Research and Standards (ORS) issued an updated ORS Guideline/HA that applied to the individual concentrations or the total summed of five PFAS chemicals: PFOS, PFOA, Perfluorononanoic Acid (PFNA), Perfluorohexanesulfonic Acid (PFHxS), and Perfluoroheptanoic Acid (PFHpA).

From June 11, 2018 until December 2019, individual concentrations of any of these five compounds or the total concentrations of all were compared to the MassDEP ORS HA of 0.070 µg/L.

On April 19, 2019, MassDEP released the Public Comment Draft of proposed revisions to the MCP, which included proposed Method 1 groundwater risk standards for the five PFAS compounds, plus an additional PFAS compound, Perfluorodecanoic Acid (PFDA). A Method 1 GW-1 risk standard of 0.020 µg/L was proposed for the individual concentrations of any of these six compounds or the total concentrations of all six. In December 2019, MassDEP published final MCP Method 1 risk standards for the PFAS6 compounds with an effective implementation date of December 27, 2019. From May 2019 through the current reporting period, tabulated treatment system analytical results have been compared to the six regulated PFAS compounds. The final MCP PFAS risk standards for groundwater include the 6 PFAS compounds of concern (PFAS6) listed above and the 0.020 µg/L[1] which is the GW-1 numerical risk standard for each compound or for the total of the PFAS6. These MCP risk standards are included in all relevant tables in the monthly and quarterly monitoring reports. Except where noted (due to older data), total PFAS concentrations reported and discussed in this report are the sum of concentrations of the PFAS6 compounds included in the final MCP risk standards of December 27, 2019.

4.2 CURRENT OPERATION & MAINTENANCE OF GWPT SYSTEMS

During the May 2021 reporting period, the primary treatment system (GWTS #1) and secondary system (GWTS #2) were in operation for all or portions of approximately 31 days.

On May 20, 2021, BETA collected performance samples from both GWTS #1 and GWTS #2 systems, which were both in operation at the time of sample collection.

4.2.1 REMEDIAL MONITORING REPORT – GWPTS #1

GWTS # 1 System Monitoring Results

As noted, system samples were collected on May 20, 2021 from the Influent (PRW-4), Midpoint and Effluent ports and were submitted to Bureau Veritas Laboratories (formerly Maxxam Analytics) of Mississauga, Ontario (Bureau Veritas) for the laboratory analysis of Total PFAS via USEPA Method 537 M.

Refer to the attached Table 1A, for a summary of the GWTS #1 PFAS analytical data. The complete laboratory report is attached in Appendix B.

[1] Concentrations of PFAS are presented in the data tables of this report in nanograms per liter (ng/L), also referred to as parts per trillion (ppt) and are reported by the laboratory in those units. However the published MCP Method GW-1 numerical risk standards for PFAS compounds (PFOS, PFOA, PFNA, PFHpA, PFHxS, and PFDA) are in presented in or micrograms per liter (µg/L), also referred to as parts per billion (ppb). In the relevant sections of this report, results are shown in both units.

Recovery well PRW-4 is the source of the Influent groundwater. The total sum of the six Massachusetts regulated PFAS (PFAS6) concentrations in the Influent (PRW-4) sample was 1,217 ng/L (1.217 µg/L), well above the GW-1 risk standards. However, the total PFAS6 concentrations in the Influent continued a downward trend observed since November 2020. Five of the six regulated PFAS compounds were detected at concentrations exceeding the MCP GW-1 risk standard (0.020 µg/l); PFDA was detected at concentrations below the MCP GW-1 standard. Based on the splitting of flow from PRW-4 to both groundwater treatment systems, the Influent analytical results apply to GWTS #2, as well as GWTS #1.

The PFAS6 (six MA regulated PFAS compounds) were detected above laboratory detection limits in the Midpoint Sample. four of the PFAS6 compounds (PFOS, PFNA, PFHxS, and PFHpA) were detected at concentrations above the applicable MCP GW-1 risk standard. For the purposes of achieving the lowest MDLs and RDLs [2] (for comparison to the MCP Method 1 Groundwater standards), Bureau Veritas reports the results for 21 PFAS compounds, including two (2) PFAS precursors; this allows the laboratory to achieve RDLs as low as 2.0 ng/L. The laboratory report provides details of MDLs and RDLs for each PFAS compound included in the analyte list. Following the review of the increasing PFAS6 concentrations in the Midpoint Sample, the changeout of the GAC was planned; the carbon changeout occurred on July 6, 2021.

Although four of the PFAS6 compounds were detected above risk standards in the Midpoint sample, PFAS6 concentrations were below the laboratory detection limits in the Effluent Sample and the detection and reporting limits were below the applicable MCP Method 1 GW-1 standards. Additionally, the remaining 15 reported PFAS compounds are reported below the laboratory RDLs and MDLs in the Effluent sample except for Perfluoropentanoic Acid (PFPeA) which was detected at 0.71 ng/L. Refer to the Table 1A and the complete laboratory report in Appendix B for laboratory RDLs and MDLs.

GWTS #1 Operational Details

The attached Table 2A presents the GWTS #1 performance data. For the May 2021 reporting period, the overall (average) system flow rate and gallons of groundwater treated are based on the effluent flow meter/totalizer readings reported for the system by the O&M contractor.

On this basis, approximately 0.31 million gallons of groundwater were treated during this May 2021 reporting period, at an average effluent flow rate of 7.0 gpm. Based on the approximate 0.31 million gallons treated and total influent concentration of 1.217 µg/L (May 2021 sample results), approximately 0.0015 kilograms of PFAS were estimated to have been removed from the plume area during this reporting period. As shown on Table 2A, average Effluent Flow Rates were low during the first half of the period, assumed to reflect the low influent rates to the system. During later weeks of the period, the effluent flow rates increased slightly; GWTT increased the flow rate at the VFD to help with back pressure build up at the bag filter.

The estimated, instantaneous combined influent flow rates (for both systems) ranged from approximately 43.8 gpm to 8.8 gpm (the approximate average instantaneous flow rate for both systems was 30.9 gpm). Due to the method used to estimate the instantaneous influent flow rate (timing of rise of groundwater in the GWTS #1 Equalization Tank with both force mains discharging to it), the estimated influent flow rates noted above apply to both systems, combined. Therefore, during the normal mode of operation, with the flow from each force main flowing to only one system, it is assumed that roughly 50% of the instantaneous influent rates stated above actually flows to GWTS #1 for treatment.

[2] Method Detection Limits and Reportable Detection Limits.

Both the estimated, instantaneous combined influent and individual system flow rates are tabulated in Table 2A. The average estimated instantaneous flow rate for GWTS #1, approximately 15.4 gpm, is calculated based on the assumption that 50% of the total flow goes to GWTS #1. During the May reporting period, the instantaneous influent flow rates (indicative of the output of PRW-4 and conveyance capacity of the influent force mains from the well to the treatment systems), started at low values (approximately 9 gpm), similar to the end of April 2021, and then increased by a factor of 4 and remained between approximately 32 to 42 gpm for the remainder of the period. The factors resulting in this increase in flow rate are not known. Precipitation reported for the month was abnormally low. Refer to the attached Table 2A for a summary of the GWTS #1 performance details.

As detailed in the IRA Status and RMR reports from the previous 2020 reporting periods and following the replacement of the submersible pump in PRW-4 in November 2020, iron-oxide sediment appears to be continuing to impact the system flow rates. In an effort to combat the iron-oxide sedimentation build-up and maintain the efficacy of groundwater treatment (PFAS removal) GWTT has continued to perform backwashes of the carbon vessels; the primary carbon vessel was backwashed on May 28, 2021. Additionally, GWTT reduced the effluent flow rate of the transfer pump in the first half of the reporting period in an effort to reduce the amount of iron oxide sediment/sludge being drawn from the EQ tank into the bag filters and GAC vessels Backwashing the GAC vessels has helped maintain the lifespan of the GAC, but GWTT continued to observe significant iron oxide sediment fouling within both systems during the reporting period. Iron sediment has been observed significantly accumulating in the EQ tank; it then fouls the bag filters and the GAC vessels when pumped through the system's treatment process. This affects the efficiency of the treatment; therefore, GWTT reduced the effluent flow rate (transfer pump flow rate) to reduce excess iron oxide carry over from the EQ tank. But, as reported in Table 2A, the flow rate of the transfer pump was increased for the second half of the reporting period.

4.2.2 REMEDIAL MONITORING REPORT – GWPTS #2

GWTS # 2 Monitoring Results

As previously mentioned, BETA collected performance samples from GWTS #2 system on May 20, 2021. Samples collected from the Influent (PRW-4), Midpoint, and Effluent ports were submitted to Bureau Veritas for the laboratory analysis of Total PFAS via USEPA Method 537 M. As noted above, recovery well PRW-4 is the source of the Influent groundwater to both groundwater treatment systems. Therefore, the Influent analytical results apply to GWTS #2, as well as GWTS #1.

The attached Table 1B, summarizes the GWTS #2 PFAS analytical data. The complete laboratory report is attached in Appendix B.

As previously mentioned, the tabulated treatment system analytical results from GWTS #2 are reported and compared to the PFAS6 compounds and their respective MCP Method 1 GW-1 Standards. The total sum of the six PFAS concentrations in the Influent sample was 1,217 ng/L (1.217 µg/L), well above the GW-1 risk standards. Five of the six regulated PFAS compounds were detected at concentrations exceeding the new MCP GW-1 risk standard (0.020 µg/l or 20 ng/L).

The PFAS6 compounds were not detected at concentrations above the laboratory reporting limits in this May 2021 Midpoint sample; however, five of the PFAS6 compounds were detected at concentrations above the laboratory reporting limits and the PFOS concentration and total sum of the PFAS6 concentrations detected in the Effluent sample were above the GW-1 risk standard. The results are summarized in Table 1B and a copy of the laboratory report is in Appendix B.

The laboratory report was received late on June 2, 2021 and BETA notified the County and its system operator GWTT of the breakthrough of PFAS6 at GWTS#2.

The system was shut down on June 3, 2021 until a carbon changeout could be schedule. The County and Calgon initiated the process of contracting for and scheduling a carbon changeout. Due to significant freight delays and scheduling delays, the carbon changeout was not conducted until July 6, 2021. Details regarding the changeout will be included in an IRA Status Report and RMR for the July 2021 reporting period.

GWTS #2 Operational Details

The attached Table 2B summarizes the GWPTS performance details.

As described in previous sections, during the normal mode of operation, with the flow from each force main flowing to only one system, it is assumed that roughly 50% of the instantaneous influent rates discussed above for GWTS #1 actually flows to GWTS #2 for treatment. Based on that assumption, for the May 2021 reporting period, the calculated average estimated instantaneous flow rate for GWTS #2 was approximately 15.4 gpm. As noted in the GWTS #1 performance review above, during the May reporting period, the instantaneous influent flow rates (total to both systems) started at low values, similar to the end of April 2021, and then increased by a factor of 4 and remained between approximately 32 to 42 gpm for the remainder of the period. The factors resulting in this increase in flow rate are not known.

The overall (average) system flow rate and gallons of groundwater treated were based on the Effluent flow rate/net totalizer readings reported for the system by the O&M contractor; approximately 0.41 million gallons of groundwater were estimated to be treated during this reporting period for May 2021, at an approximate average effluent flow rate of 9.1 gpm. On May 10, 2021, GWTT increased the effluent flow rate from the transfer pump in an effort to combat the iron sediment build up in the EQ tank that continued to foul the bag filters and GAC vessels. However, on May 25, 2021, the system was in a high-pressure alarm due to significant iron fouling of the bag filters and GAC vessels. GWTT conducted a backwash on the primary GAC vessel on May 28, 2021.

Based on 0.41 million gallons treated, approximately 0.002 kilograms of PFAS were estimated to have been removed from the plume area during this reporting period.

4.2.3 REMEDIAL MONITORING REPORT SUMMARY

During the May 2021 reporting period, the two treatment systems, GWTS #1 and GWTS #2, were in operation for all or portions of approximately 31 days. The overall (average) system flow rate and gallons of groundwater treated are based on the available Effluent flow totalizer readings reported for both systems by the O&M contractor. For the reporting period from May 1 to May 31, 2021 both systems treated an approximate combined 0.72 million gallons of groundwater from the (downgradient recovery well PRW-4) at an average, total (of the two systems) effluent flow rate of 16.2 gpm.

Based on the total 0.72 million gallons treated, approximately 0.003 kilograms of PFAS were estimated to have been removed from the plume area during this May 2021 reporting period.

Figure 5 depicts the concentration trends observed in groundwater at the extraction well PRW-4, as measured as the Influent to the groundwater treatment systems. In addition, the Midpoint concentrations for GWTS #1 are graphed. Due to the nature of the laboratory data reported since 2015, this graph depicts the total of the PFOS and PFOA compounds only. Following a spike in concentrations in mid-2019, PFOS and PFOA concentrations have generally decreased or remained relatively stable at PRW-4. The detected concentrations remain elevated relative to the GW-1 risk standards.

4.3 QUARTERLY GROUNDWATER MONITORING

Groundwater monitoring activities related to the documented PFAS Release on Site have been ongoing since November 2013. BETA, formerly Nover-Armstrong Associates, was contracted by Barnstable County to provide LSP and environmental services in April 2018 and has conducted groundwater monitoring activities since June 2018.

In November 2018, BETA proposed a long-term monitoring sampling plan for Site-wide groundwater monitoring on a quarterly and annual basis. Following discussion, MassDEP approved of the sampling plan that included sampling of twelve (12) wells during three quarterly sampling events and sampling an additional eight (8) wells (for a total of twenty (20) during the annual sampling round.

A copy of the plan can be found in previous IRA Status report submittals, including IRA Status Report and RMR No. 35 for the October 2019 reporting period. Additional monitoring points are added to either the quarterly or annual sampling round, as warranted to meet specific objectives or provide additional coverage.

BETA has conducted quarterly groundwater assessments since January 2019 under the approved program. The January 2019 event was selected as the original annual monitoring program for 2019 utilizing the selected 20 monitoring wells. In order to support the design of the proposed groundwater recovery expansion (an IRA Plan Modification), it was decided to move the annual monitoring round up to October 2019, and to add several wells to the sampling program. Subsequently, the annual groundwater monitoring program is held annually in October.

4.3.1 MAY 2021 SITE-WIDE QUARTERLY GROUNDWATER SAMPLING AND ANALYSIS

On May 19 and 20, 2021 BETA conducted a quarterly groundwater monitoring event based on the MassDEP approved sampling plan. A total of 15 monitoring wells were sampled for laboratory analysis of total PFAS by EPA Method 537 Modified. On those dates the following monitoring wells were sampled: HSW-6, PFW-1, PFW-5, OW-8A, PC-1, PC-6A, PC-11, PC-16d, PC-28, PC-30, PC-38, MW-12, MW-22, FS-1A, MW-201 and MW-215. The May 2021 program included additional monitoring wells MW-201 and MW-215 that were installed at the FTA in January 2021 during the pre-capping FTA soil assessment program (which was presented in the January 2021 reporting period status report. Additionally, monitoring well PC-38 was added to the standard quarterly sampling program. Figure 2 and Figure 3 depict sampling locations.

All sampled wells and all wells located within the immediate vicinity of the FTA property were gauged prior to sampling. Groundwater gauging data and groundwater elevation data are included in Table 3, appended.

Monitoring wells HSW-6, PFW-1, PFW-5, OW-8A, FS-1A, MW-201, and MW-215 are located on the FTA property; HSW-6 is located within the former Hot Spot remediation area and PFW-1 is located approximately 130 feet downgradient (of the former Hot Spot remediation area). PFW-5 and OW-8a are located cross-gradient of the Hot Spot area on the FTA property; MW-201 d abuts the fence line on the northern portion of the property and MW-215 is located within the inner track just north of GWTS#1.

Monitoring well PC-38 is located south (cross-gradient) of the FTA property.

The downgradient monitoring wells (MW-12, MW-22, PC-1, PC-11, , and PC-6A), between the FTA and the recovery well (PRW-4), were selected based on previous results to evaluate current conditions within the main PFAS plume.

Monitoring wells PC-9, PC-16d, PC-28, and PC-30 are located in the probable downgradient direction from recovery well PRW-4. Monitoring well PC-38 is located in the most southeastern downgradient location from the FTA.

A tabulated summary of the PFAS analytical data for the monitoring wells within the Disposal Site Boundary, including the results of the most recent May 2021 sampling round is included in Table 4 .

Copies of the laboratory reports/certificates of analysis are included in Appendix B.

As previously discussed, effective December 27, 2019, MCP groundwater risk standards for 6 PFAS compounds, (PFOS, PFOA, PFHpA, PFNA, PFHxS, and PFDA) apply to the Site with a GW-1 risk standard of 20 ng/l for the total and/or any single compound. These risk standards are included on Table 4.

Individual concentrations of one or more of the (regulated) PFAS6 compounds and Total Concentrations of the PFAS6 detected in the samples from all wells during the May 2021 sampling event were above the MCP GW-1 risk standards, except at PC-38.

In summary, PFAS concentrations detected in groundwater across the Disposal Site during the May 2021 round of groundwater assessment are similar to historic ranges, with exceptions discussed below. Although the total PFAS6 concentrations currently regulated by MassDEP documented in groundwater within the Disposal Site are significantly above the current applicable MCP Method 1 risk standards, concentrations have trended towards a significant, yet stable decrease, with exceptions discussed below, since PFAS assessment activities started at the Site in 2015, especially in the Hot Spot/ Phase 1 cap area.

BETA's review of the May 2021 groundwater data compared to historic sampling events indicates concentrations of PFAS documented in wells located on the FTA property and immediately east continue to appear to be falling or relatively stable. Figures 6 through 8, attached and discussed below, are graphical presentations of total (sum of) PFAS6 concentrations for selected monitoring wells in representative locations in this portion of the Disposal Site. It should be noted that the graphs depict discrete periodic sampling events at varying intervals from initial sampling in April 2015 and at quarterly intervals (typically) since January 2019. See Table 4 for sampling dates and PFAS6 concentrations detected for all sampling events. The laboratory reports in Appendix B include all PFAS analytical results, including laboratory detection and reporting limits, for the May 2021 sampling event.

Figure 6 depicts the concentration trends observed in groundwater at monitoring well PFW-1. Since the implementation of the Phase I stormwater improvements during the winter of 2018/2019, which included installing an impermeable cap over the former Hot Spot removal area and adjacent areas and diverting stormwater, PFAS concentrations have generally decreased significantly through mid-to late-2019 and have since remained relatively steady at elevated levels relative to the GW-1 risk standards.

Figure 7 depicts the significantly downward trend of PFAS6 concentrations observed in groundwater monitoring well OW-8A, which is located on the northeastern portion of the FTA, through the October 2020 quarterly sampling event. A noticeable increase in PFAS6 total concentrations from the October 2020 to the January 2021 sampling event is observed. Although the cause of this increase is not known, it is of BETA's opinion that increased precipitation may have influenced the concentration spike in the January 2021 sampling event; the detected concentrations observed from the May 2021 sampling event are approximately 700 ppt less than concentrations observed in January 2021.

Figure 8 depicts the continued stable trend in PFAS concentrations documented at monitoring wells MW-12 and MW-22 respectively. It would appear that the concentrations from MW-22 have increased significantly and that the concentrations from MW-12 have decreased.

However, based on the consistent concentration trend observed from these two wells since 2018, BETA opines that the samples were incorrectly labeled. It is not known at this time if concentration trends at MW-22 may be related to rates of withdrawal of water from the aquifer at Mary Dunn PWS #3 (MD-3)located approximately 535 feet east of MW-22.

PFAS concentrations documented in wells located farther southeast and downgradient of the FTA, specifically PC-6A, PC-11, PC-28, PC-16D, and PC-30, have variable trends. Figures 9A, 9B, 9C, and 9D depict PFAS concentration trends in PC-11, PC-6A, PC-28, and PC-30 respectively. Groundwater concentration trend at PC-28 appears to be decreasing since October 2020. PFAS6 concentrations at PC-11 (Fig. 9A) and PC-30 (Fig. 9D) show a marked increase in the spring and/or summer of 2019 followed by a significant decrease followed by continued stable concentrations. PC-6A (Fig. 9B) shows highly variable concentrations; however, concentrations observed since the Spring of 2019 have trended to decrease and remain stable.

Monitoring well PC-38, the furthest south-southeast (PC-38) location, sampled during this quarterly monitoring event, did not exhibit PFAS6 concentrations above the laboratory reporting limits.

See Table 4 and the laboratory report (Appendix B) for analytical details for the May 2021 sampling event.

The causes of the variable concentration trends observed at some wells (specifically PC-6A, PC-28, and PC-30) located further south and southeast of the FTA (towards Mary Dunn Pond) are not clear; however, based on the May 2021 data, the concentrations appear to be decreasing. The trends may be influenced by variable groundwater extraction by the current FTA pumping system, variable pumping rates of the three active Mary Dunn municipal wells and the Hyannis Airport supply well (located east-southeast of Mary Dunn Pond), and the timing and duration of operation of the Mary Dunn and Airport wells. The well pump at PRW-4 was underperforming from July 2020 to November 2020, when it failed requiring replacement of the well pump and piping. The well casing, pump, and riser piping were found to be severely fouled with iron oxide sediments. The failure of the well pump and downtime for replacement may be a contributory factor for the PFAS6 concentration increase observed at PC-28. Concentrations appear to be decreasing now which may be attributable to restoration of extraction rate and capture at PRW-4.

Utilizing the total sum of the six regulated PFAS compounds, concentration data were interpolated to depict an approximate concentration plume map based on the May 2021 monitoring results. Figure 10 depicts the concentration plume for the May 2021 monitoring results; the highest concentrations within the PFAS contaminant plume appear to be concentrated on the south end of the Site and in the vicinity of PRW-4. The lowest concentrations (below the Method 1 GW-1 standards) are on the outer northeastern and southeastern edges of the plume. It should be noted that the apparent increase in the PFAS6 concentrations at MW-22, discussed above, result in the appearance of higher concentrations (indicated by red shading) on Figure 10 west of Mary Dunn well #3. As noted above, there are indications that the May 2021 data for MW-22 actually apply to MW-12 and vice-versa.

4.3.2 SITE-WIDE GROUNDWATER GAUGING AND ELEVATION SURVEY

BETA gauged depth to groundwater in the monitoring wells located on and within 100 feet of the FTA and in selected monitoring wells east and southeast of the FTA on May 19, 2021. The Table 3 presents a tabulated summary of the seasonal groundwater elevation data (from 2018-2021) for selected monitoring points across the Disposal Site.

Groundwater flow is inferred to be to the south-southeasterly direction. Refer to Figure 11 for a depiction of the calculated groundwater flow from the May 2021 gauging event. The gauging results indicate moderate influence from the operating recovery well, PRW-4.

5.0 SITE WIDE CAPPING AND SELECT BUILDING DEMOLITION

In response to the Request for Expedited Immediate Response Action Plan Modification/Interim Deadline-Enforcement Document Number 6694, dated May 1, 2019 issued by the Massachusetts Department of Environmental Protection (MassDEP) and amended by email correspondence by the MassDEP, BETA (on behalf of the County) submitted a Draft IRA Plan Modification to DEP detailing preliminary plans for the expansion of the groundwater recovery and treatment system and capping measures to prevent infiltration of precipitation through the soils at the Site. Following the receipt of public comment, the IRA Plan Modification was finalized in December 2019 and design plans for Sitewide capping were submitted for approval to the Town of Barnstable via a Notice of Intent in February 2020. Final design approval and an Order of Conditions was obtained in November 2020 and January 2021 respectively.

The construction of the capping design will be funded via the Clean Water Trust State Revolving Fund (CWTSRF); the County received Bids for the project in April 2021. An IRA Plan Modification No. 3 was finalized and submitted electronically to DEP following the receipt of public comment on June 22, 2021. As the report stated, due to the nature of the project and its source of financing, it is not feasible to incorporate additional public comments into the final report. The capping project was awarded in July 2021. Construction is anticipated to begin in August 2021. Details of execution of the project will be included in future IRA Status reports.

6.0 IRA EVALUATION

In accordance with the MCP, this section presents evaluations of potential IRA conditions at the Site.

6.1 ASSESSMENT FOR SUBSTANTIAL RELEASE MIGRATION (SRM)

Due to the documentation that PFAS has most likely migrated more than 200 feet downgradient and has been detected in a public water supply well and surface water body, the Site meets the criteria for a Condition of Substantial Release Migration (SRM), as defined by 310 CMR 40.0006.

6.2 IDENTIFICATION OF CRITICAL EXPOSURE PATHWAYS (CEP)

No Critical Exposure Pathways, as defined by 310 CMR 40.0006, currently exist at the Disposal Site.

6.3 IMMINENT HAZARD (IH) EVALUATION

Based on the concentrations of PFOS exceeding the USEPA HA level in the Mary Dunn wells in 2013, the Cape Cod Commission identified the presence of an Imminent Hazard (IH) condition pursuant to 310 CMR 40.0321(2)(c).

The GAC treatment of the Mary Dunn Wells has been assumed to be actively preventing a potential Imminent Hazard to the Hyannis community by removing the PFAS compounds from the water supply.

The Mary Dunn wells are monitored on a regular basis by the Hyannis Water Department to ensure that exposure to humans is less than the USEPA HA, the MassDEP Drinking Water Standards effective on December 27, 2019 and the finalized MassDEP MCL (MMCL) standard.

MassDEP finalized the MMCLs for PFAS in January 2021; the final MCL for PFAS in drinking water is 20 ng/l and applies to the 6 regulated PFAS compounds.

6.4 ASSESSMENT OF NEED FOR IMMEDIATE RESPONSE ACTIONS (IRA)

The operation of the on-Site groundwater pumping and treatment system to reduce PFAS concentrations downgradient of the FTA will continue as an IRA. Continuation of assessment IRAs is warranted; specifically, periodic monitoring of groundwater at the Site and monitoring the PFAS treatment of the output of the Hyannis Water District/Town of Barnstable operated Mary Dunn Wells.

However, Site-wide assessment will also be proceeding under the Phase II Comprehensive Site Assessment (CSA) Scope of Work (SOW); the SOW has been submitted and the public comment period for the Public Comment Draft Phase II CSA SOW is under way at this time. Additional technologies to treat / remove PFAS from soil and groundwater at the FTA may be evaluated as part of the MCP Phase III evaluation of remedial alternatives.

In addition, planned expansion of groundwater extraction and treatment, as mandated by MassDEP, was described conceptually in the final December 2019 IRA Plan Modification. The final design and implementation of that component of the IRA Plan Modification is being re-evaluated in terms of feasibility of implementation as an IRA and potential overlap and duplication with MCP Phase III and Phase IV (remedy implementation) work to be conducted immediately following the completion of the Phase II CSA.

7.0 PUBLIC NOTIFICATIONS

Copies of public notification letters regarding the proposed IRA activities sent to officials of the Town of Barnstable in accordance with MCP 310 CMR 40.1403(3) (a) requirements are included as Appendix D. Per the Final PIP, email and written notifications regarding the submittal of this IRA Plan Modification to MassDEP and the availability of the Plan at the Site repository will be sent to those listed on the PIP Mailing List.

TABLES

Table 1A - Summary of Groundwater Pump and Treatment System Total PFAs Analytical Data - GWTS #1
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

SAMPLE ID	INFLUENT (PRW-4)						MIDPOINT						EFFLUENT					
USEPA Method 537.2	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)
MCP Method 1 GW-1 Standard [3]	20 ng/L						20 ng/L						20 ng/L					
SAMPLE DATE																		
4/1/2015	760	60	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
7/17/2015	5600	460	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
8/4/2015	5900	550	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
9/30/2015	17000	840	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
10/15/2015	9900	560	--[A]	--[A]	--[A]	--[A]	BRL (<9.4)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	9.4	BRL (<5.8)	--[A]	--[A]	--[A]	--[A]
11/12/2015	9000	BRL (<2000)	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)		--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
1/6/2016	7600	260	--[A]	--[A]	--[A]	--[A]	120	75	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
1/21/2016	5200	160	--[A]	--[A]	--[A]	--[A]	270	16	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
2/3/2016	3500	140	--[A]	--[A]	--[A]	--[A]	540	26	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
2/17/2016	4500	140	--[A]	--[A]	--[A]	--[A]	520	24	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
3/8/2016	3700	140	--[A]	--[A]	--[A]	--[A]	420	19	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
3/23/2016	5000	150	--[A]	--[A]	--[A]	--[A]	650	39	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
4/14/2016	4800	140	--[A]	--[A]	--[A]	--[A]	610	26	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
4/28/2016	6300	BRL (<200)	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<20)	BRL (<20)	--[A]	--[A]	--[A]	--[A]
5/12/2016	6800	BRL (<200)	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<20)	BRL (<20)	--[A]	--[A]	--[A]	--[A]
5/25/2016	6900	BRL (<210)	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
6/16/2016	7800	160	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
7/6/2016	7600	270	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	10	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
8/11/2016	13000	160	--[A]	--[A]	--[A]	--[A]	1600	54	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
Carbon change conducted after sample collection on 08/11/16.																		
8/18/2016	9500	210	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
9/8/2016	9500	190	--[A]	--[A]	--[A]	--[A]	8.5	5.3	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
9/8/2016	9500	190	--[A]	--[A]	--[A]	--[A]	8.5	5.3	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
10/6/2016	17000	250	--[A]	--[A]	--[A]	--[A]	110	8.3	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
10/20/2016	7200	130	--[A]	--[A]	--[A]	--[A]	1000	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
11/3/2016	7900	110	--[A]	--[A]	--[A]	--[A]	13.8	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
11/17/2016	5400	99	--[A]	--[A]	--[A]	--[A]	1200	NA	--[A]	--[A]	--[A]	--[A]	17	NA	--[A]	--[A]	--[A]	--[A]
12/1/2016	5300	100	--[A]	--[A]	--[A]	--[A]	400	14	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
12/14/2016	5700	95	--[A]	--[A]	--[A]	--[A]	82	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]	8.1	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
1/4/2017	4900	95	--[A]	--[A]	--[A]	--[A]	360	15	--[A]	--[A]	--[A]	--[A]	BRL (<3.3)	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
2/16/2017	2800	88	--[A]	--[A]	--[A]	--[A]	1000	39	--[A]	--[A]	--[A]	--[A]	25	BRL (<5.3)	--[A]	--[A]	--[A]	--[A]
3/1/2017	3700	120	--[A]	--[A]	--[A]	--[A]	1400	47	--[A]	--[A]	--[A]	--[A]	150	6.5	--[A]	--[A]	--[A]	--[A]
3/23/2017	3800	87	--[A]	--[A]	--[A]	--[A]	2000	71	--[A]	--[A]	--[A]	--[A]	160	9.5	--[A]	--[A]	--[A]	--[A]
5/3/2017	2400	86	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
Carbon change conducted on 04/13/17.																		
4/19/2017	3200	110	--[A]	--[A]	--[A]	--[A]	160	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
5/18/2017	3000	110	--[A]	--[A]	--[A]	--[A]	570	32	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
6/1/2017	3200	110	--[A]	--[A]	--[A]	--[A]	730	33	--[A]	--[A]	--[A]	--[A]	4.1	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
6/27/2017	2600	99	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	210	15	--[A]	--[A]	--[A]	--[A]
7/18/2017	3500	97	--[A]	--[A]	--[A]	--[A]	2300	72	--[A]	--[A]	--[A]	--[A]	49	25	--[A]	--[A]	--[A]	--[A]
Carbon change conducted on 8/09/17																		
8/16/2017	3000	110	--[A]	--[A]	--[A]	--[A]	BRL (<2.3)	BRL (<4.1)	--[A]	--[A]	--[A]	--[A]	BRL (<2.3)	BRL (<4.1)	--[A]	--[A]	--[A]	--[A]
8/28/2017	2900	100	--[A]	--[A]	--[A]	--[A]	27	BRL (<20)	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]
10/2/2017	3200	85	--[A]	--[A]	--[A]	--[A]	510	25	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
10/12/2017	4500	110	--[A]	--[A]	--[A]	--[A]	960	29	--[A]	--[A]	--[A]	--[A]	BRL (<2.6)	BRL (<4.6)	--[A]	--[A]	--[A]	--[A]
11/9/2017	2400	77	--[A]	--[A]	--[A]	--[A]	--	--	--[A]	--[A]	--[A]	--[A]	BRL (<6.0)	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
11/20/2017	2000	64	--[A]	--[A]	--[A]	--[A]	520	15	--[A]	--[A]	--[A]	--[A]	BRL (<6.0)	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
12/7/2017	1600	64	--[A]	--[A]	--[A]	--[A]	780	34	--[A]	--[A]	--[A]	--[A]	11	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
2/5/2018	2100	27	--[A]	--[A]	--[A]	--[A]	390	13	--[A]	--[A]	--[A]	--[A]	BRL (<6.0)	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
2/14/2018	2100	30	--[A]	--[A]	--[A]	--[A]	850	27	--[A]	--[A]	--[A]	--[A]	11	BRL (<3.3)	--[A]	--[A]	--[A]	--[A]
System shutdown on 2/14/18 due to transfer pump failure; system restart on 4/9/18.																		
4/9/2018	2,600	79	--[A]	--[A]	--[A]	--[A]	990	25	--[A]	--[A]	--[A]	--[A]	BRL (<20)	BRL (<20)	--[A]	--[A]	--[A]	--[A]
4/13/2018	3100	62	--[A]	--[A]	--[A]	--[A]	1500	35	--[A]	--[A]	--[A]	--[A]	30	BRL (<33)	--[A]	--[A]	--[A]	--[A]
5/9/2018	1800	73	--[A]	--[A]	--[A]	--[A]	490	26	--[A]	--[A]	--[A]	--[A]	BRL (<6.0)	BRL (<33)	--[A]	--[A]	--[A]	--[A]
System shutdown on 5/9/18 after sampling collection due to carbon breakthrough and influent pump alarm fail.																		
Carbon change conducted on 06/05/18; system restarted on 06/07/18.																		
6/14/2018	2800	120	79	540	110	--[A]	200	9.4	BRL (<8.7)	38	11	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
7/13/2018	2400	100	73	600	90	--[A]	1100	44	27	24	35	--[A]	BRL (<20)	BRL (<20)	BRL (<20)	BRL (<20)	BRL (<20)	--[A]
8/7/2018	2900	95	73	460	86	--[A]	630	31	22	130	34	--[A]	27	5.3	BRL (<8.7)	9.1	BRL (<7.4)	--[A]
9/27/2018	4300	69	50	360	190	--[A]	3600	69	49	330	65	--[A]	81	BRL (<3.3)	BRL (<8.7)	14	BRL (<7.4)	--[A]
Carbon change conducted on 09/28/18; system restarted on 10/01/18.																		
10/30/2018	2800	65	46	320	71	--[A]	100	6	8.7	16	78	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
11/16/2018	2900	62	50	290	77	--[A]	460	24	19	94	26	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
12/14/2018	1900	62	49	300	70	--[A]	1200	40	30	180	45	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
1/10/2019	2400	84	68	410	96	--[A]	2200	71	54	360	82	--[A]	21	BRL (<3.3)	BRL (<8.7)	BRL (<5.6)	BRL (<7.4)	--[A]
Carbon change conducted on 2/4/19; system restarted on 2/5/19.																		
2/15/2019	4600	130	120	550	110	--[A]	560	14	14	62	14	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<8.7)	BRL (<6.2)	BRL (<7.4)	--[A]
3/11/2019	5600	120	120	520	98	--[A]	63	BRL(<3.3)	BRL (<4.9)	BRL (<5.6)	BRL (<7.1)	--[A]	BRL (<6.0)	BRL (<3.3)	BRL (<4.9)	BRL (<5.6)	BRL (<7.1)	--[A]
Iron sediments pumped out of influent tank and transfer pump associated piping - 3/29/2019. Replaced VFD.																		
4/9/2019	6600	140	180	580	99	--[A]	400	7.4	9.9	31	BRL (<7.1)	--[A]	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	--[A]
5/21/2019	2500	83	59	290	100	8.6	3400	72	69	260	7.8	12	BRL (<12)	BRL (<7.4)	BRL(<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
Carbon change conducted on 06/13/19; system restarted on 06/14/19.																		
6/27/2019	8400	86	120	340	68	26	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
7/29/2019	9500	78	100	290	72	16	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
8/22/2019	8300	64	100	260	63	20	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
9/26/2019	4900	65	82	220	64	21	64	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
10/30/2019	3800	63	85	230	72	19	51	BRL (<7.4)	BRL (<4.9)	5.9	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
11/12/2019	4200	53	85	200	59	15	120	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
12/17/2019	1500	43	51	180	54	10	530	16	17	63	22	4.5	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
Carbon change conducted on 12/23/19; system restarted on 12/26/19.																		
1/17/2020	2200	57	60	220	69	13	11	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
2/13/2020	3100	74	66	310	92	17	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
3/3/2020	3300	72	64	300	81	14	7.4	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)	0.60	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)
4/28/2020	1900	52	42	210	56	42	86	2.7	2.2	10	3.4	0.51	BRL (<0.43)	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)
5/21/2020	1800	46	40	200	50	11	110	3.5	2.9	12	3.9	0.8	BRL (<0.43)	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)
6/24/2020	1400	41	41	160	49	19	64	3.3	2.7	15	5.4	1.4	3.30	0.94	0.84	0.83	1.2	BRL (<0.64)
7/28/2020	1700	44	43	200	52	12	130	3.4	3	13	3.9	0.96	BRL (<0.43)	BRL (<0.49)	BRL (<0.80	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)
Carbon change conducted on 08/12/2020; system restarted on 08/14/2020.																		
8/27/2020	1400	42	38	170	48	9	0.92	BRL (<0.49)	BRL (<0.8)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)	BRL (<0.43)	BRL (<0.49)	BRL (<0.80)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)
9/23/2020	2000	46	50	200	57	14	BRL (<0.43)	BRL (<0.49)	BRL (<0.80)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)	BRL (<0.43)	BRL (<0.49)	BRL (<0.80)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)
10/20/2020	2300	49	50	230	63	15	1.1	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	0.54	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
11/24/2020	2300	59	43	240	71	18	14	1	BRL (<2.0)	2.1	1.3	BRL (<2.0)	10	0.94	BRL (<2.0)	1.9	1.2	BRL (<2.0)
12/21/2020	1400	51	42	200	60	9	220	7.4	5.1	28	9.3	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
1/27/2021	1000	47	36	170	49	7.7	280	13	11	47	15	2.2	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
2/23/2021	2300	67	54	290	80	14	98	7.1	5.9	8.4	3.1	1.6	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
3/12/2021	1100	54	43	210	57	11	370	18	15	69	20	3.2	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
4/21/2021	690	28	25	100	32	7.6	290	14	13	54	17	3.7	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
5/20/2021	970	32	38	130	37	10	560	19	20	72	21	6.2	BRL (<0.43)	BRL (<0.49)	BRL (<0.80)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)

Notes:

1. Concentrations presented in ng/L - nanograms per Liter - parts per trillion
2. * - Prior to June 11, 2018, the USEPA established the EPA Health Advisory for two PFAS chemicals, PFOA and PFOS, which was 70 ng/L. Subsequently, MassDEP's Office of Research and Standards (ORS) expanded on this Health Advisory and created the ORS Guideline that applied to the total summed of five PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, and PFHpA, effective June 11, 2018.
3. On December 13, 2019, MassDEP published the newly established clean up standards for PFAS in soil and groundwater. These standards were effective as of December 27, 2019 and apply to the total sum of six PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFDA; the new standard is 20 ng/L or parts per trillion (ppt). Concentrations of the six PFAS compounds presented in the table were not compared to the new MassDEP standards until the January 2020 monthly system sample collection, which is after the effective date of December 27, 2019.
4. --[A]: Concentrations of the three additional PFAS chemicals, PFNA, PFHxS, and PFHpA were not presented prior to 06.11.18. The USEPA Health Advisory only applies to the PFOS and PFOA compounds. Concentrations of PFNA, PFHxS, and PFHpA were not presented/tabulated until after the MassDEP ORS Guideline was in effect on 06.11.18.
5. --[B] : Concentrations of the PFAS compound, PFDA, were not presented prior to the May 2019 sampling period. On April 19, 2019, MassDEP presented a draft of proposed risk standards for PFAS that included a sixth, PFAS compound, PFDA.
6. BRL - Below Laboratory Reporting Limits; reporting limit shown in parentheses.
7. Concentrations in bold exceed applicable MassDEP ORS Guideline and/or the MCP Method 1 GW-1 groundwater risk standard.
8. PFOS - Perfluorooctanesulfonic acid
9. PFOA - Perfluorooctanoic Acid
10. PFNA - Perfluorononanoic Acid
11. PFHxS - Perfluorohexanesulfonic Acid
12. PFHpA - Perfluoroheptanoic Acid
13. PFDA - Perfluorodecanoic Acid
14. NA - Concentration data not available

Table 1B - Summary of Groundwater Pump and Treatment System Total PFAs Analytical Data -GWTS #2
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

SAMPLE ID	INFLUENT (PRW-4)						MIDPOINT						EFFLUENT					
USEPA Method 537.2	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)	PFOS (ng/L)	PFOA (ng/L)	PFNA (ng/L)	PFHxS (ng/L)	PFHpA (ng/L)	PFDA (ng/L)
MassDEP ORS Guidline*	70 ng/L						70 ng/L						70 ng/L					
MCP Method 1 GW-1 Standard [15]	20 ng/L						20 ng/L						20 ng/L					
SAMPLE DATE																		
System Startup on 11/11/19.																		
11/12/2019	4200	53	85	200	59	15	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
11/15/2019	--	--	--	--	--	--	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
11/19/2019	--	--	--	--	--	--	BRL (<5.2)	44	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	42	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
12/17/2019 [16]	1500	43	51	180	54	10	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
1/17/2020	2200	57	60	220	69	13	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
2/13/2020	3100	74	66	310	92	17	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)	BRL (<5.2)	BRL (<7.4)	BRL (<4.9)	BRL (<5.2)	BRL (<7.1)	BRL (<4.1)
3/3/2020	3300	72	64	300	81	14	5.6	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)	BRL (<0.43)	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)
4/28/2020	1900	52	42	210	56	42	64	2.2	1.7	9.7	3.0	0.27	0.47	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)
5/21/2020	1800	46	40	200	50	11	76	2.8	2.0	10	3.6	0.52	BRL (<0.43)	BRL (<0.23)	BRL (<0.48)	BRL (<0.33)	BRL (<0.37)	BRL (<0.18)
6/24/2020	1400	41	41	160	49	19	39	2.9	2.3	12	4.3	1.1	0.84	BRL (<0.49)	BRL (<0.80)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)
7/28/2020	1700	44	43	200	52	12	84	3.8	3.3	17	5.7	0.76	BRL (<0.43)	BRL (<0.49)	BRL (<0.80)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)
8/27/2020	1400	42	38	170	48	9	6.1	BRL (<0.49)	BRL (<0.80)	1.2	0.61	BRL (<0.64)	BRL (<0.43)	BRL (<0.49)	BRL (<0.80)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)
9/23/2020	2000	46	50	200	57	14	18	0.79	0.86	2.4	1.3	BRL (<0.64)	BRL (<0.43)	BRL (<0.49)	BRL (<0.80)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)
10/20/2020	2300	49	50	230	63	15	7.5	0.64	BRL (<2.0)	1.4	1.0	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
11/24/2020	2300	59	43	240	71	18	120	3.2	2.4	17	5.0	0.92	1.5	0.52	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
12/21/2020	1400	51	42	200	60	9.0	190	7.5	5.2	23	9.3	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
1/27/2021	1000	47	36	170	49	7.7	190	11	7.3	37	13	1.5	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
2/23/2021	2300	67	54	290	80	14	52	3.5	2.4	12	4.7	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
3/12/2021	1100	54	43	210	57	11	370	18	15	70	22	3.3	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
4/21/2021	690	28	25	100	32	7.6	120	7	5.3	22	9.3	1.7	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
4/21/2021	690	28	25	100	32	7.6	120	7	5.3	22	9.3	1.7	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)	BRL (<2.0)
5/20/2021	970	32	38	130	37	10	BRL (<0.43)	BRL (<0.49)	BRL (<0.80)	BRL (<0.53)	BRL (<0.51)	BRL (<0.64)	42	3.1	2.4	9.1	4.9	BRL (<0.64)

Notes:

1. Concentrations presented in ng/L - nanograms per Liter - parts per trillion
2. MassDEP's Office of Research and Standards (ORS) expanded upon the USEPA's Health Advisory and created the ORS Guideline that applies to the total summed of five PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, and PFHpA, effective June 11, 2018.
3. Concentrations of the PFAS compound, PFDA, are presented based on the April 19, 2019, MassDEP draft of new/proposed groundwater standards for PFAS that includes a sixth, PFAS compound, PFDA. However the concentration of PFDA is not inclued in total PFAS removal calcuations.
5. BRL - Below Laboratory Reporting Limits; reporting limit shown in parentheses.
6. Concentrations in bold exceed applicable MassDEP ORS Guideline
7. PFOS - Perfluorooctanesulfonic acid
8. PFOA - Perfluorooctanoic Acid
9. PFNA - Perfluorononanoic Acid
10. PFHxS - Perfluorohexanesulfonic Acid
11. PFHpA - Perfluoroheptanoic Acid
12. PFDA - Perfluorodecanoic Acid
13. --: Concentration data not available and/or sample was not collected on that date.
14. Per MCP Regulations, the system was sampled one day, three days, and seven (7) days following the initial week of startup (11/11/19).
15. On December 13, 2019, MassDEP published the newly established clean up standards for PFAS in soil and groundwater. These standards were effective as of December 27, 2019 and apply to the total sum of six PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFDA. Concentrations of the six PFAS compounds presented in the table were not compared to the new MassDEP standards until the January 2020 monthly system sample collection.
16. The December monthly sample was collected from the system's effluent stream on 12/17/2019 following the receipt of the laboratory results from the 11/19/2019 sampling event on 12/16/2019. The effluent was resampled again to ensure significant breakthrough was not occurring from the secondary carbon vessel.

Table 2A - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 1 (GWTS #1)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[4]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT		Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[3]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]	Estimated Instantaneous Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[6]	Instantaneous Effluent Flow Rate (GPM)[2,3]	Totalizer (Gal)	Net Gallons Treated	Average Effluent Flow Rate (GPM)[6]				
4/9/2018	CE	No	75	NA	NA	NA	75	NA	NA	NA	NA	0	--	--	--	--	--		Yes	Yes	Conducted system pressure checks after restart.
4/10/2018	CE	Yes	94	74	NA	NA	77	74	2.07	59.3	NA	1	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/11/2018	CE	Yes	76	NA	NA	NA	76	NA	2.78	44.0	NA	2	--	--	--	--	--	0.001	Yes	No	vessels were backwashed individually from 1313 to 1427.
4/12/2018	CE	Yes	NA	NA	NA	NA	75	75	2.78	44.0	NA	3	--	--	--	--	--	0.002	Yes	No	Transfer pump is drawing down influent/holding tank faster than PRW-4 well is filling tank. No bag filter changes.
4/13/2018	CE	Yes	88	74	NA	NA	75	74	2.80	43.8	NA	4	--	--	--	--	--	0.003	Yes	Yes	Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/16/2018	CE	Yes	86	74	NA	NA	74	74	2.83	43.2	NA	7	--	--	--	--	--	0.005	Yes	No	pressure checks.
4/19/2018	CE	Yes	83		NA	NA	75		NA	NA	NA	10	--	--	--	--	--	NA	Yes	No	Transfer pump is maintaining drawdown and flow through system ahead of the PRW-4 well pump, no bag changes.
4/20/2018	CE	Yes	89	75	NA	NA	75	75	3.07	39.9	NA	11	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/23/2018	CE	Yes	92	76	NA	NA	77	76	3.18	38.5	NA	14	--	--	--	--	--	0.009	Yes	No	PRW-4 restarted at 14:55. Transfer pump maintaining flow ahead of PRW-4 well pump. Both carbon vessels backwashed. Changed 3 bag filters (5 um).
4/24/2018	CE	Yes	74	NA	NA	NA	76		3.18	38.5	NA	15	--	--	--	--	--	0.009	Yes	No	No bag change, conducted system pressure checks.
4/25/2018	CE	Yes	79	NA	NA	NA	75		3.30	37.1	NA	16	--	--	--	--	--	0.009	Yes	No	Pressure differential of 4 psi, no bag filter change, transfer pump is maintaining flow ahead of the PRW-4 well pump.
4/26/2018	CE	Yes	83	NA	NA	NA	76		3.37	36.4	NA	17	--	--	--	--	--	0.010	Yes	No	4 well pump are on and operating, treatment takes 28 seconds to drawn down 1 inch in influent tank (~17.5 gallons)
4/27/2018	CE	Yes	84	73	NA	NA	75	75	3.42	35.8	NA	18	--	--	--	--	--	0.010	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/30/2018	CE	Yes	87	73	NA	NA	75	75	3.53	34.7	NA	21.00	--	--	--	--	--	0.012	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks.
Totals - April 2018										41.3	NA	21.00						0.014			
5/1/2018	CS	Yes	83		NA	NA	75		3.83	32.0	NA	0.00	--	--	--	--	--	0.0000	Yes	No	Adjusted /increased VFD of transfer pump from 35 psi to 40 psi to maintain drawdown ahead of PRW-4 well pump . No bag change. 1" drawdown ~ 1:41 min
5/2/2018	CS	Yes	94	75	NA	NA	80	75	3.63	33.7	NA	1.00	--	--	--	--	--	0.0006	Yes	No	switch relay stuck in on position, PRW-4 shutoff at 0733 and restarted at 08:26 with float switch working properly. Adjusted transfer pump rate back to 35 psi.
5/4/2018	JES	Yes	110	73	NA	NA	73	75	3.65	33.6	NA	3.00	--	--	--	--	--	0.0017	Yes	No	Changed 3 bag filters (10 um) and conducted system pressure checks.
5/7/2018	JES	Yes	110	73	NA	NA	74	74	3.7	33.1	NA	6.00	--	--	--	--	--	0.0034	Yes	No	Changed 3 bag filters (5 um) and conducted system pressure checks.
Totals - May 2018										33.1	NA	8.00						0.004			
6/5/2018	CE/MM	No	--	--	NR	NR	NR	NR	--	--	NA	0	--	--	--	--	--	0	--	--	Carbon Change out- filled vessels with water and let to sit for ~24 hours, changed 3 bag filters (5 um)
6/6/2018	CE	Yes	--	--	NR	NR	NR	NR	3.45	35.5	NA	1	--	--	--	--	--	0.001	No	No	Pump floats not operating correctly, low float turns pump off and when low float is in water again, transfer pump starts. System remained off.
6/7/2018	CE	Yes	62	52	NR	NR	NR	NR	3.18	38.5	NA	2	--	--	--	--	--	0.001	Yes	No	Electrian on site in morning to correct float error; system operating normally.
6/11/2018	CE	Yes	56	61	NR	NR	NR	NR	3.63	33.7	NA	6	--	--	--	--	--	0.003	Yes	No	No bag change, conducted system pressure checks.
6/12/2018	CE	Yes	56	63	NR	NR	NR	NR	3.68	33.3	NA	7	--	--	--	--	--	0.004	Yes	No	No bag change, conducted system pressure checks.
6/12/2018	CE	Yes	56	63	NR	NR	NR	NR	3.68	33.3	NA	7	--	--	--	--	--				
6/13/2018	CE	Yes	58	54	NR	NR	NR	NR	3.46	35.4	NA	8	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters.
6/13/2018	MM	Yes	--	--	NR	NR	NR	NR	--	--	NA	8	--	--	--	--	--	--	--	Yes	Did not collect system data, only collected samples from Influent, Midpoint, and Effluent sample ports/locations.
6/16/2018	CE	Yes	77	60	NR	36.96804348	NR	NR	--	--	NA	11	--	--	--	--	--	--	--	No	Changed 3 bag filters.
6/19/2018	CE	Yes	92	65	NR	NR	NR	NR	--	--	NA	14	--	--	--	--	--	--	No	No	did not hear contact relay pull in. System remained off until electrical issue in recovery well is fixed. Fixed at 15:45
6/20/2018	CE	Yes	72	60	NR	NR	NR	NR	3.73	32.8	NA	15	--	--	--	--	--	0.008	Yes	No	No bag change, conducted system pressure checks.
6/21/2018	CE	Yes	79	60	NR	NR	NR	NR	--		NA	16	--	--	--	--	--				No bag change, conducted system pressure checks. Worked by phone with Bob Simmonds on Control panel for transfer pump, pump will not change speed.
6/22/2018	CE	Yes	87	67	NR	NR	NR	NR	3.72	32.9	NA	17	--	--	--	--	--	0.009	Yes	No	Changed 3 bag filters, conducted system pressure checks.
6/25/2018	CE	Yes	81	68	NR	NR	NR	NR	3.77	32.5	NA	20	--	--	--	--	--	0.011	Yes	No	Changed 3 bag filters, conducted system pressure checks.
6/27/2018	CE	Yes	79	68	NR	NR	NR	NR	3.73	32.8	NA	22	--	--	--	--	--	0.012	Yes	No	Changed 3 bag filters, conducted system pressure checks.
6/29/2018	CE	Yes	78	68	NR	NR	NR	NR	3.68	33.3	NA	24	--	--	--	--	--	0.014	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - June 2018										33.9	NA	24						0.013			
7/2/2018	CE	Yes	83	69	NR	NR	NR	NR	3.95	31.0	NA	2	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/5/2018	CE	No	--	--	NR	NR	NR	NR	--	--	NA	5	--	--	--	--	--	--	No	No	No power supplied to the recovery well.
7/6/2018	CE	Yes	86	69	NR	NR	NR	NR	3.87	31.7	NA	5	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/9/2018	CE	Yes	89	72	NR	NR	NR	NR	3.77	32.5	NA	8	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/11/2018	CE	Yes	88	72	NR	NR	NR	NR	3.85	31.8	NA	10	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/13/2018	CE	Yes	89	72	NR	NR	NR	NR	4.08	30.0	NA	12	--	--	--	--	--	0.006	Yes	Yes	Changed 3 bag filters, conducted system pressure checks.
7/16/2018	CE	Yes	98	70	NR	NR	NR	NR	3.97	30.9	NA	15	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/18/2018	CE	No	--	--	NR	NR	NR	NR	--	--	NA	--	--	--	--	--	--	--	No	No	No power supplied to the recovery well. Contact relay at recovery well pump out.
7/19/2018	CE	Yes	94	72	NR	NR	NR	NR	4.03	30.4	NA	17	--	--	--	--	--	0.008	Yes	No	Electrician replaced the contact relay; recovery well operating again. Changed 3 bag filters and collected system pressure checks.
7/20/2018	CE	Yes	81	72	NR	NR	NR	NR	--	--	NA	--	--	--	--	--	--	--	Yes	No	Changed 3 bag filters, conducted system pressure checks. Backwashed carbon vessels.
7/23/2018	CE	Yes	84	72	NR	NR	NR	NR	4.47	27.4	NA	21	--	--	--	--	--	0.009	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/25/2018	CE	Yes	84	72	NR	NR	NR	NR	--	--	NA	--	--	--	--	--	--	--	Yes	No	Collected system pressure checks.
7/26/2018	CE	Yes	80	72	NR	NR	NR	NR	--	--	NA	--	--	--	--	--	--	--	Yes	No	Collected system pressure checks.
7/27/2018	CE	Yes	88	72	NR	NR	NR	NR	4.8	25.5	NA	25	--	--	--	--	--	0.010	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/30/2018	CE	Yes	91	71	NR	NR	NR	NR	4.95	24.7	NA	28	--	--	--	--	--	0.011	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - July 2018										29.6	NA	28						0.015			
8/2/2018	CE	Yes	89	70					5.17	23.7		2						0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/6/2018	CE	Yes	94	72					5.22	23.5		6						0.002	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/10/2018	CE	Yes	98	72					4.32	28.4		6						0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/14/2018	CE	Yes	82	69					4.8	25.5		6						0.002	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/2/2018	CE	Yes	89	70	NR	NR	NR	NR	5.17	23.7	NA	2	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/6/2018	CE	Yes	94	72	NR	NR	NR	NR	5.22	23.5	NA	6	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/10/2018	CE	Yes	98	72	NR	NR	NR	NR	4.32	28.4	NA	10	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks. System was sampled on August 7, 2018.
8/14/2018	CE	Yes	82	69	NR	NR	NR	NR	4.8	25.5	NA	14	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/17/2018	CE	Yes	81	64	NR	NR	NR	NR	5.0	24.5	NA	17	--	--	--	--	--	0.008	Yes	No	Changed 3 bag filters, conducted system pressure checks. Backwashed carbon vessels.
8/21/2018	CE	No	78	68	NR	NR	NR	NR	5.2	23.6	NA	20	--	--	--	--	--	0.009	Yes	No	Recovery well down, due to contactor burnout/failure. System restarted at 14:45.
8/24/2018	CE	Yes	77	68	NR	NR	NR	NR	5.32	23.0	NA	23	--	--	--	--	--	0.010	Yes	No	Changed 3 bag filters, conducted system pressure checks.
8/28/2018	CE	Yes	89	69	NR	NR	NR	NR	6.03	20.3	NA	27	--	--	--	--	--	0.011	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - August 2018										24.1	NA	30						0.014			
9/4/2018	CE	Yes	89	67	NR	NR	NR	NR	5.87	20.9	NA	4	--	--	--	--	--	0.002	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/7/2018	CE	Yes	82	70	NR	NR	NR	NR	6.52	18.8	NA	7	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/11/2018	CE	Yes	88	70	NR	NR	NR	NR	7.03	17.4	NA	11	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/14/2018	CE	Yes	86	70	NR	NR	NR	NR	7.18	17.1	NA	14	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/18/2018	CE	Yes	91	74	NR	NR	NR	NR	8.02	15.3	NA	18	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/21/2018	CE	No	74	70	NR	NR	NR	NR	--	--	NA	--	--	--	--	--	--	--	No	No	Recovery well down.
9/24/2018	CE	Yes	94	70	NR	NR	NR	NR	8.03	15.3	NA	23	--	--	--	--	--	0.010	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/28/2018	CE	Yes	--	--	NR	NR	NR	NR	--	--	NA	--	--	--	--	--	--	--	--	--	Carbon Change out- filled vessels with water and let to sit for ~24 hours, changed 3 bag filters (5 um), system sampled on 09/27/18.
Totals - September 2018										17.4	NA	28						0.010			

Table 2A - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 1 (GWTS #1)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[4]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT		Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[3]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]	Estimated Instantaneous Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[5]	Instantaneous Effluent Flow Rate (GPM)[2,5]	Totalizer (Gal)	Net Gallons Treated	Average Effluent Flow Rate (GPM)[6]				
10/1/2018	CE	No	78	57	NR	NR	NR	NR	5.83	21.0	NA	1	--	--	--	--	--	0.000	Yes	No	System restarted after scheduled shutdown for carbon exchange. Changed 3 bag filters, conducted system pressure checks.
10/5/2018	CE	Yes	65	55	NR	NR	NR	NR	6.35	19.3	NA	5	--	--	--	--	--	0.002	Yes	No	Changed 3 bag filters, conducted system pressure checks.
10/10/2018	CE	Yes	56	57	NR	NR	NR	NR	6.95	17.6	NA	10	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
10/12/2018	CE	Yes	60	55	NR	NR	NR	NR	--	--	NA	12	--	--	--	--	--	--	Yes	No	No bag change necessary.
10/15/2018	CE	Yes	70	60	NR	NR	NR	NR	6.9	17.8	NA	15	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters, conducted system pressure checks. Repaired filter basket.
10/19/2018	CE	Yes	71	60	NR	NR	NR	NR	7.12	17.2	NA	19	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks.
10/23/2018	CE	Yes	76	63	NR	NR	NR	NR	7.73	15.8	NA	23	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks. Repaired holding basket in filter vessel.
10/26/2018	CE	Yes	72	64	NR	NR	NR	NR	8.83	13.9	NA	26	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
10/30/2018	CE	Yes	80	65	NR	NR	NR	NR	7.52	16.3	NA	30	--	--	--	--	--	0.009	Yes	Yes	Changed 3 bag filters, conducted system pressure checks. Repaired bag holder (basket) in filter vessel.
Totals - October 2018										17.4	NA	31						0.011			
11/2/2018	CE	Yes	71	62	NR	NR	NR	NR	7.86	15.6	NA	2	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
11/6/2018	CE	Yes	71	62	NR	NR	NR	NR	--	--	NA	6	--	--	--	--	--		No	No	Changed 3 bag filters, conducted system pressure checks. Backwashed both carbon vessels. System shutdown at 10:00 for force main descaling and flush.
11/8/2018	CE	Yes	65	45	NR	NR	NR	NR	5.25	23.3	NA	6	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks. System restarted at 12:40 following the completion of the force main descaling.
11/9/2018	CE	Yes	55	44	NR	NR	NR	NR	5.2	23.6	NA	7	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks.
11/12/2018	CE	Yes	51	47	NR	NR	NR	NR	5.03	24.4	NA	10	--	--	--	--	--	0.007	Yes	No	Conducted system pressure checks.
11/13/2018	CE	Yes	52	47	NR	NR	NR	NR	4.88	25.1	NA	11	--	--	--	--	--	0.007	Yes	No	Conducted system pressure checks.
11/14/2018	CE	Yes	54	47	NR	NR	NR	NR	4.92	24.9	NA	12	--	--	--	--	--	0.008	Yes	No	Conducted system pressure checks.
11/15/2018	CE	Yes	55	47	NR	NR	NR	NR	--	--	NA	13	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
11/16/2018	CE	Yes	54	50	NR	NR	NR	NR	4.63	26.5	NA	14	--	--	--	--	--	0.010	Yes	Yes	Changed 3 bag filters, conducted system pressure checks.
11/21/2018	CE	Yes	63	53	NR	NR	NR	NR	5.08	24.1	NA	19	--	--	--	--	--	0.012	Yes	No	Changed 3 bag filters, conducted system pressure checks.
11/27/2018	CE	Yes	69	55	NR	NR	NR	NR	5.75	21.3	NA	25	--	--	--	--	--	0.014	Yes	No	Changed 3 bag filters, conducted system pressure checks.
11/30/2018	CE	Yes	77	58	NR	NR	NR	NR	5.85	20.9	NA	28	--	--	--	--	--	0.016	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - November 2018										23.0	NA	28						0.012			
12/3/2018	CE	Yes	63	62	NR	NR	NR	NR	5.33	23.0	NA	3	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/7/2018	CE	Yes	83	67	NR	NR	NR	NR	5.58	22.0	NA	7	--	--	--	--	--	0.002	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/11/2018	CE	Yes	75	65	NR	NR	NR	NR	5.8	21.1	NA	11	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/14/2018	CE	Yes	70	63	NR	28.31311445	NR	NR	5.4	22.7	NA	14	--	--	--	--	--	0.004	Yes	Yes	Changed 3 bag filters, conducted system pressure checks.
12/18/2018	CE	Yes	70	65	NR	NR	NR	NR	6.72	18.2	NA	18	--	--	--	--	--	0.004	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/21/2018	CE	Yes	70	67	NR	NR	NR	NR	6.7	18.3	NA	21	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/26/2018	CE	Yes	78	71	NR	NR	NR	NR	7.38	16.6	NA	26	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/28/2018	CE	Yes	82	70	NR	NR	NR	NR	7.35	16.7	NA	28	--	--	--	--	--	0.006	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/31/2018	CE	Yes	82	71	NR	NR	NR	NR	7.38	16.6	NA	31	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - December 2018										19.5	NA	31						0.008			
1/4/2019	RPT	Yes	72	72	NR	NR	NR	NR	6.5	18.8	NA	4	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks, observed hole in pre-filter basket.
1/7/2019	PCB	Yes	80	71	NR	NR	NR	NR	6.2	19.8	NA	7	--	--	--	--	--	0.002	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/10/2018	RPT	Yes	75	70	NR	NR	NR	NR	7.03	17.4	NA	10	--	--	--	--	--	0.003	Yes	No	Conducted system pressure checks.
1/11/2018	MDM	Yes	79	71	NR	NR	NR	NR	7.62	16.1	NA	11	--	--	--	--	--	0.003	Yes	Yes	Change 3 bag filters, conducted system pressure checks.
1/14/2019	PCB	Yes	76	71	NR	NR	NR	NR	--	--	NA	14	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
1/15/2019	PCB	Yes	80	71	NR	NR	NR	NR	--	--	NA	15	--	--	--	--	--	--	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/18/2019	PCB	Yes	76	71	NR	NR	NR	NR	8.65	14.2	NA	18	--	--	--	--	--	0.004	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/21/2019	SCT	Yes	80	71	NR	NR	NR	NR	8.15	15.0	NA	21	--	--	--	--	--	0.005	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/24/2019	SCT	Yes	85	69	NR	NR	NR	NR	9.1	13.5	NA	24	--	--	--	--	--	0.005	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/27/2019	SCT	Yes	85	68	NR	NR	NR	NR	8.25	14.8	NA	27	--	--	--	--	--	0.007	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/30/2019	PCB	Yes	86	71	NR	NR	NR	NR	9	13.6	NA	30	--	--	--	--	--	0.007	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/31/2019	PCB	Yes	83	71	NR	NR	NR	NR	--	--	NA	31	--	--	--	--	--	--	Yes	No	Change 3 bag filters, conducted system pressure checks.
Totals - January 2019										14.5	NA	31						0.008			
2/4/2019	RPT	Yes	--	--	NR	NR	NR	NR	--	--	NA	--	--	--	--	--	--	--	--	No	Carbon Change out - filled vessels with water and let to sit for ~24 hours, changed 3 bag filters (5 um).
2/5/2019	RPT	No	52	35	NR	NR	NR	NR	7.33	16.7	NA	4	--	222.7	--	--	--	0.002	Yes	No	System restarted after scheduled shutdown for carbon exchange. Changed bag filters and conducted system pressure checks.
2/11/2019	PCB	Yes	83	45	NR	NR	NR	NR	11.58	10.6	NA	10	--	--	--	--	--	--	Yes	No	Changed 3 bag filters, conducted system pressure checks.
2/13/2019	ST	Yes	55	43	NR	NR	NR	NR	8.12	15.1	NA	12	--	--	--	--	--	--	Yes	No	Changed 3 bag filters, conducted system checks.
2/15/2019	MDM	Yes	--	--	NR	NR	NR	NR	7.5	16.3	NA	14	--	131.7	--	--	--	0.007	Yes	Yes	Sampled system and collected system pressure checks.
2/22/2019	ST	Yes	--	--	NR	NR	NR	NR	10.75	11.4	NA	21	--	43.75	--	--	--	0.007	Yes	No	Changed 3 bag filters, repaired filter basket, adjusted and lowered the speed drive on the transfer/discharge pump.
2/25/2019	MDM	Yes	25	15	NR	NR	NR	NR	7.5	16.3	NA	23	--	--	--	--	--	--	Yes	No	System shutdown at 09:33 for the replacement of the submersible pump at PRW-4 and restarted at 14.04.
Totals - February 2019										14.4	NA	26		132.7				0.011	Yes	No	
3/1/2019	ST	Yes	43	40	NR	NR	NR	NR	7.55	16.2	NA	1	--	76.6	--	--	--	0.001	Yes	No	Conducted system pressure checks.
3/3/2019	ST	Yes	45	40	NR	NR	NR	NR	--	--	NA	3	--	--	--	--	--	--	Yes	No	Conducted system pressure checks, changed bag filters, installed/replaced filters baskets with new stainless steel filter baskets.
3/5/2019	PCB	Yes	46	40	NR	NR	NR	NR	--	--	NA	5	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
3/7/2019	PCB/ST	Yes	50	40	NR	NR	NR	NR	8.16	15.0	NA	7	--	--	--	--	--	0.004	Yes	No	Conducted system pressure checks and changed bag filters.
3/9/2019	ST	Yes	44	41	NR	NR	NR	NR	7.75	15.8	NA	9	--	--	--	--	--	0.005	Yes	No	Changed bag filters.
3/11/2019	ST	Yes	58	50	NR	NR	NR	NR	7.92	15.5	NA	11	--	68.1	--	--	--	0.006	Yes	Yes	Changed bag filters
3/13/2019	ST	Yes	65	50	NR	NR	NR	NR	4.62	26.5	NA	13	--	--	--	--	--	--	Yes	No	Noticed low speed on transfer pump, adjusted VFD to increase pump speed to 55 Hz. Changed 3 bag filters twice.
3/14/2019	ST	Yes	75	50	NR	NR	NR	NR	5.16	23.7	NA	14	--	70.0	--	--	--	0.012	Yes	No	Conducted system pressure checks and collected samples from EQ tank for analysis at County lab for disposal criteria.
3/16/2019	PCB	No	62	60	NR	NR	NR	NR	--	--	NA	15	--	--	--	--	--	--	Yes	No	Pump at PRW-4 shut off upon arrival to system, contact relay failure, possibly due to power surge from thunderstorm. Restarted system after contact relay was replaced.
3/22/2019	ST	Yes	28	20	NR	NR	NR	NR	2.38	51.5	NA	21	--	51.5	--	--	--	0.038	Yes	No	Replaced VFD drive for effluent transfer pump inside system shed.
3/23/2019	ST	Yes	23	20	NR	NR	NR	NR	--	--	NA	22	--	--	--	--	--	--	No	No	Changed bag filters before system shutdown. System shutdown due to slow flow rate from transfer pump as a result of accumulating iron sediments in EQ tank from slow influent flow rate as a result of a the failing PRW-4 well pump.
3/29/2019	RPT/ST	No	--	--	NR	NR	NR	NR	--	--	NA	23	--	--	--	--	--	--	Yes	No	Removed/pumped out the contents of the influent equalization (EQ) tank, repaired the system's pump electrical components, adjusted VFD on transfer pump, installed unions on influent piping manifold, replaced bag filters at discharge into the EQ tank, and restarted the system at 1645.
Totals - March 2019										29.3	NA	25		63.2				0.022			

Table 2A - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 1 (GWTS #1)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[4]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT		Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[9]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]	Estimated Instantaneous Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[6]	Instantaneous Effluent Flow Rate (GPM)[7,8]	Totalizer (Gal)	Net Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
4/1/2019	ST	Yes	--	--	40	28	40	39	2.25	54.4	NA	1	--	--	--	--	--	0.002	Yes	No	Conducted system pressure checks and changed bag filters.
4/3/2019	ST	Yes	--	--	40	39	--	--	--	--	NA	3	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
4/6/2019	ST	Yes	--	--	50	41	50	50	2.23	54.9	NA	6	--	--	--	--	--	0.014	Yes	No	Conducted system pressure checks and changed bag filters.
4/9/2019	GWTT	Yes	--	--	40	50	--	--	1.6	76.6	NA	9	--	18.85	--	--	--	0.029	Yes	Yes	Conducted system pressure checks, backwashed the primary carbon vessel for ~30 minutes; inspected the transfer pump and removed excess iron oxide sedimentation from the inlet piping.
4/10/2019	ST	Yes	--	--	50	15	23	25	--	--	NA	10	--	--	--	--	--	--	Yes	No	Conducted system pressure checks and changed bag filters.
4/11/2019	ST	Yes	--	--	40	35	35	35	--	--	NA	11	--	--	--	--	--	--	Yes	No	Conducted system pressure checks and changed bag filters.
4/12/2019	GWTT	Yes	--	--	50	40	44	46	3	40.8	NA	12	--	--	--	--	--	0.020	Yes	No	Conducted system pressure checks and changed bag filters.
4/15/2019	GWTT	Yes	--	--	55	45	55	55	4.08	30.0	NA	15	--	--	--	--	--	0.019	Yes	No	Conducted system pressure checks and changed bag filters.
4/19/2019	GWTT	Yes	--	--	58	55	35	40	2.5	49.0	NA	19	--		--	--	--	0.039	Yes	No	Conducted system pressure checks and changed bag filters.
4/23/2019	GWTT	Yes	--	--	48	47	50	55	4.00	30.6	NA	23	--	33.4	--	--	--	0.029	Yes	No	Conducted system pressure checks and changed bag filters.
4/26/2019	GWTT	Yes	--	--	58	50	55	60	--	--	NA	26	--	20.3	--	--	--	--	Yes	No	Conducted system pressure checks and changed bag filters, conducted general housekeeping duties.
4/30/2019	GWTT	No	--	--	--	--	--	--	--	--	NA	29	--	--	--	--	--	--	--	Yes	System off on arrival due to contact relay failure for transfer pump operation; system restarted at 16:29 after contact relay was replaced.
Totals - April 2019										48.1	NA	29		24.2				0.058			
5/3/2019	GWTT	Yes	--	--	55	35	45	50	2.18	56.2	NA	3	--	32.93	--	--	--	0.003	Yes	No	Conducted system pressure checks and changed bag filters.
5/7/2019	GWTT	Yes	--	--	58	38	50	55	2.05	59.8	NA	7	--	31.57	--	--	--	0.007	Yes	No	Conducted system pressure checks and changed bag filters.
5/10/2019	GWTT	No	--	--	--	--	--	--	--	--	NA	--	--	--	--	--	--	--	--	--	System down as a result of failed VFD for transfer pump operation, changed bag filters.
5/17/2019	GWTT	No	--	--	55	38	--	--	--	--	NA	10	--	--	--	--	--	--	Yes	No	Installed new VFD drive, system shutdown due to power surge from thunderstorm. Electrician added 15 minute- electrical control delay at the control panel in the system shed; creating a 15 minute delay before the pump at PRW-4 powers on at the "high level" float switch.
5/21/2019	MDM	No	--	--	57	30	57	60	1.83	66.9	NA	14	--	33.38	--	--	--	0.016	Yes	Yes	Power surge from rogue ground voltage at electrical easement "fried" the electrical delay at control panel in system shed. Electrician bypassed delay to allow system restart at 11:15. Electrician will change coil at PRW-4 panel to lower voltage at later date. Conducted system pressure checks and changed bag filters.
5/24/2019	GWTT	Yes	--	--	58	35	58	60	2.083	58.8	NA	17	--	25.36	--	--	--	0.017	Yes	No	Conducted system pressure checks and changed bag filters. Bypass installed to allow 15 minute delay on PRW-4 submersible pump float switch.
5/28/2019	GWTT	Yes	--	--	56	46	55	60	2.65	46.2	NA	21	--	52.10	--	--	--	0.016	Yes	No	Conducted system pressure checks and changed bag filters twice. Backwashed both carbon vessels.
5/31/2019	GWTT	Yes	--	--	58	35	55	60	2.17	56.5	NA	24	--	36.90	--	--	--	0.022	Yes	No	Conducted system pressure checks and changed bag filters; 3" butterfly valve on INF of LGAC-1 #2 replaced. Installed a 3 inch flow totalizer and meter on effluent discharge piping.
Totals - May 2019										57.4	NA	24		35.4				0.023			
6/4/2019	GWTT	Yes	--	--	57	48	57	62	2.46	49.8	NA	4	--	20.2	--	--	--	0.010	Yes	No	Conducted system pressure checks and changed bag filter. Replaced in-kind flow meter previously installed on 5/31/19.
6/7/2019	GWTT	Yes	--	--	57	45	57	62	2.43	50.4	NA	7	--	16.2	--	--	--	0.017	Yes	No	Conducted system pressure checks and changed bag filters.
6/11/2019	GWTT	Yes	--	--	76	78	70	82	2.53	48.4	NA	11	--	17.3	--	--	--	0.026	Yes	No	Conducted system pressure checks and changed bag filters. System shutdown due to high pressure measurement on the LGAC vessels, (from iron fouling); carbon change to occur on 6/13/19.
6/13/2019	MDM	No	--	--	--	--	--	--	--	--	NA	11	--	--	--	--	--	--	No	No	System off for carbon change out.
6/14/2019	GWTT	No	--	--	--	--	25	28	2.3	53.3	NA	12	--	167.1	--	--	--	0.032	Yes	No	System restarted at 13:00; adjusted flow rate via VFD to 55 Hz. GWTT recorded Effluent flow rate from drop in site glass to be 44 seconds, immediately after adjusting the VFD.
6/18/2019	GWTT	Yes	--	--	25	10	11	15	2.23	54.9	NA	16	--	56.2	--	--	--	0.043	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 55 GPM.
6/21/2019	GWTT	Yes	--	--	17	15	17	20	2.12	57.8	NA	19	--	58.6	--	--	--	0.054	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 28 Hz.
6/25/2019	GWTT	Yes	--	--	20	18	20	25	2.3	53.3	NA	23	--	59.0	--	--	--	0.060	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 28 to 35 Hz.
6/27/2019	MDM	Yes	--	--	33	21	--	--	3.2	38.3	NA	25	--	17.5	--	--	--	0.047	Yes	Yes	Conducted system checks, system VFD at 35 Hz; pressure gauges at LGAC 2 are 0 psi.
6/28/2019	GWTT	Yes	--	--	33	22	30	35	2.4	51.0	NA	26	--	60.9	--	--	--	0.065	Yes	No	Conducted system checks, changed bag filters, VFD at 35 Hz. Effluent flow rate increased after bag filter changeout.
Totals - June 2019										50.8	NA	27		62.4		NR[11]		0.068			
7/2/2019	GWTT	Yes	--	--	32	20	30	32	2.52	48.6	NA	2	NR	52.6	20575	--	--	0.005	Yes	No	Conducted system checks, changed bag filters.
7/5/2019	GWTT	Yes	--	--	25	23	30	35	2.53	48.4	NA	5	NR	52.6	242970	222395	--	0.013	Yes	No	Conducted system checks, changed bag filters, VFD at 35 Hz. Effluent flow rate increased after bag filter changeout.
7/9/2019	GWTT	Yes	--	--	32	25	36	40	2.35	52.1	NA	9	NR	58.6	311680	68710	--	0.026	Yes	No	Conducted system checks, changed bag filters, VFD at 35 Hz. Effluent flow rate increased after bag filter changeout. Primary LGAC vessel requires a backwash.
7/12/2019	GWTT	Yes	--	--	39	35	39	43	2.42	50.6	NA	12	NR	55.7	407920	96240	--	0.033	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 42 Hz.
7/15/2019	GWTT	Yes	--	--	46	40	35	50	3.00	40.8	NA	15	NR	55.7	587740	179820	--	0.034	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 42 Hz to 40 Hz.
7/18/2019	GWTT	Yes	--	--	45	28	55	60	2.83	43.3	NA	18	NR	47.48	NR	NR	--	0.043	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 40 Hz to 45 Hz.
7/23/2019	GWTT	Yes	--	--	56	43	55	61	3.22	38.0	NA	23	NR	25.63	717580	129840	--	0.048	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 40 Hz to 45 Hz.
7/26/2019	GWTT	Yes	--	--	56	50	56	60	--	--	NA	26	NR	11.93	722700	5120	--	--	Yes	No	Conducted system checks, changed bag filters.
7/29/2019	GWTT	Yes	--	--	--	--	56	60	2.50	49.0	NA	29	NR	53.3	723360	660	--	0.078	Yes	Yes	Pumped out contents of exterior totes and conducted backwash of system (6,800 gallons removed by Global). Shutdown system for ~2 hours. VFD at 23 Hz on departure.
Totals - July 2019										46.9	NA	31		45.1		NR[11]		0.079			
8/2/2019	GWTT	Yes	--	--	15	5	18	9	2.68	50.6	NA	2	NR	19.68	723960	0	0.0	0.006	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 23 Hz to 28 Hz.
8/5/2019	GWTT	Yes	--	--	21	8	16	20	2.50	52.8	NA	5	NR	49.00	726280	2320	0.5	0.014	Yes	No	Conducted system checks, changed bag filters, VFD at 28 Hz.
8/8/2019	GWTT	Yes	--	--	20	19	22	27	2.23	54.9	NA	8	NR	53.50	729450	3170	0.7	0.024	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 32 Hz and 31 Hz. Visability of site glass impaired due to iron fouling, possible obstruction in site glass causing error in flow calculations.
8/13/2019	GWTT	Yes	--	--	27	23	28	30	2.17	56.5	NA	13	NR	56.45	738390	8940	1.2	0.040	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 23 Hz. Obstruction in site glass seems apparent, affecting flow rate calculations.
8/16/2019	GWTT	Yes	--	--	32	26	30	35	1.04	117.8	NA	16	NR	34.83	744020	5630	1.3	0.103			Conducted system checks, changed bag filters, adjusted VFD from 23 Hz to 28 Hz.
8/20/2019	GWTT	Yes	--	--	40	27	36	38	NR	NR	NA	20	NR	NR	757990	13970	2.4	--	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 38 Hz to 39 Hz. Could not calculate influent flow rate due to obstruction in site glass
8/23/2019	GWTT	Yes	--	--	41	29	38	44	--	--	NA	23	NR	50.00	790720	32730	7.6	0.063	Yes	Yes	Conducted system checks, changed bag filters, and adjusted VFD from 39 Hz to 40 Hz. Collected montly system samples on 8/22/19.
8/27/2019	GWTT	Yes	--	--	45	35	44	49	--	--	NA	27	NR	50.00	873750	83030	14.4	0.074	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 40 Hz to 42 Hz.
8/30/2019	GWTT	Yes	--	--	49	37	8	10	--	--	NA	30	NR	49.00	976540	102790	23.8	0.081	Yes	No	Conducted system checks, changed bag filters after backwash of primary vessel.
Totals - August 2019										66.5	NA	31		NR[11]		252580	6.5	0.113			
9/3/2019	GWTT	Yes	--	--	18	7	10	14	NA	NA	NA	3	--	NR	1044190	67650	15.7	0.001	Yes	No	Conducted system checks, changed bag filters, "High High Level" Alarm indicated, adjusted VFD, site glass plugged due to iron oxide sludge build up at bottom of EQ tank, could not collect influent flow rate.
9/6/2019	GWTT	Yes	--	--	27	14	22	25	NA	NA	NA	6	--	NR	NR	NR	NR	--	Yes	No	Conducted system checks, changed bag filters, "High High Level" Alarm indicated, adjusted VFD to 35 Hz from 31 Hz.
9/10/2019	GWTT	Yes	--	--	35	18	30	35	NA	NA	NA	10	--	NR	1203690	159500	27.7	0.008	Yes	No	
9/13/2019	GWTT	Yes	--	--	40	25	40	42	NA	NA	NA	13	--	NR	1311290	107600	24.9	0.009	Yes	No	Conducted system checks, changed bag filters, observed approximately 20 in. of sludge in EQ Tank, and adjusted VFD to 40 Hz from 38 Hz.
9/16/2019	GWTT	Yes	--	--	45	26	44	48	NA	NA	NA	16	--	NR	1413970	102680	23.8	0.011	Yes	No	Conducted system checks, changed bag filters, and adjusted VFD to 48 Hz.
9/20/2019	GWTT	Yes	--	--	68	35	12	14	NA	NA	NA	20	--	NR	1543040	129070	22.4	0.013	Yes	No	Conducted system checks, changed bag filters, backwashed primary GAC vessel, and adjusted VFD to 29 Hz.
9/23/2019	GWTT	Yes	--	--	24	8	23	27	NA	NA	NA	23	--	NR	1563850	20810	4.8	0.003	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 29 Hz to 34 Hz.
9/27/2019	GWTT	Yes	--	--	32	17	42	44	NA	NA	NA	27	--	NR	1577890	14040	2.4	0.002	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 34 Hz to 42 Hz, system samples collected on 9/26/19.
Totals - September 2019[12,13]										NA[1]	NA	30		NR[11]		601350	17.4	0.015			

Table 2A - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 1 (GWTS #1)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[4]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT		Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[9]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]	Estimated Instantaneous Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[6]	Instantaneous Effluent Flow Rate (GPM)[7,8]	Totalizer (Gal)	Net Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
10/1/2019	GWTT	Yes	--	--	50	28	18	19	NA	NA	NA	1	--	NR	1620400	--	--	--	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 42 Hz to 31 Hz. Operator noticed a loud sound on discharge pipes at LGAC #1 as well as a pressure drop across the entire system, system was instantly turned off and restarted after the VFD was adjusted. Operator assumed an obstruction (i.e. iron oxide precipitates) was in LGAC#1 restricting flow and loud sound was the obstruction being dislodged.
10/3/2019	GWTT	Yes	--	--	--	--	--	--	NA	NA	NA	3	--	NR	1639940	19540	6.8	0.0005	Yes	No	System was shut off at 8:00 during excavation of the effluent discharge piping. The discharge piping was repaired and the system was restarted at 16:00. The bag filters were changed.
10/7/2019	GWTT	Yes	--	--	27	14	22	20	NA	NA	NA	6	--	NR	1645550	5610	1.3	0.0002	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 31 Hz to 35 Hz.
10/11/2019	GWTT	Yes	--	--	32	30	19	20	NA	NA	NA	10	--	NR	1683870	38320	6.7	0.0015	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 35 Hz to 32 Hz.
10/15/2019	GWTT	Yes	--	--	29	20	27	30	NA	NA	NA	14	--	NR	1755270	71400	12.4	0.0040	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 32 Hz to 39 Hz.
10/18/2019	GWTT	Yes	--	--	38	22	30	35	NA	NA	NA	18	--	NR	1867270	112000	19.4	0.0082	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 39 Hz to 35 Hz.
10/22/2019	GWTT	Yes	--	--	34	13	31	35	NA	NA	NA	21	--	NR	1946590	79320	18.4	0.0090	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 35 Hz to 43 Hz.
10/25/2019	GWTT	Yes	--	--	44	34	35	42	NA	NA	NA	24	--	NR	2043780	97190	22.5	0.0126	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 43 Hz to 40 Hz.
10/28/2019	GWTT	Yes	--	--	44	34	35	42	5.38	22.8	NA	27	--	NR	2123880	80100	18.5	0.0117	Yes	No	Conducted system checks, changed bag filters, Global Cycle on site to vacuum pump out the contents from the EQ tank, bag filter unit, totes containing water from GAC vessel backwashes. The VFD was adjusted from 40 Hz to 24 Hz. Pressure gauge at P5 was replaced. System sampled on 10/30/19.
Totals - October 2019[12,13]										NA[7]	NA	30		NR[11]		503480	11.7	0.008			
11/1/2019	GWTT	Yes	--	--	15	2	19	19	5.00	24.5	NA	1	NR	53.26	2128040	4160	2.9	--	Yes	No	Conducted system checks, changed bag filters, and adjusted the VFD frequency.
11/4/2019	GWTT	Yes	--	--	26	8	21	17	4.28	28.60	NA	4	NR	45.37	2131870	3830	0.9	--	Yes	No	Conducted system checks, changed bag filters, and the VFD was adjusted from 30 Hz to 29 Hz.
11/7/2019	GWTT	Yes	--	--	25	10	30	27	3.70	33.1	16.6	7	NR	44.0	2042122	--	--	--	Yes	No	Conducted system checks, changed bag filters, exchanged 3" flow meter to 2" pulse turbine flow meter/totalizer. Adjusted the VFD from 29 Hz to 34 Hz on departure.
11/11/2019	GWTT	Yes	--	--	32	18	31	35	3.70	33.1	16.6	11	35	NR	2119390	77268	13.4	0.0037	Yes	Yes	Conducted system checks, changed bag filters, VFD left at 34 Hz. Force main Influent flow was split; temporary GWTPS expansion system started. System sampled on 11/12/19.
11/15/2019	GWTT	Yes	--	--	32	21	32	36	4.47	27.4	13.7	14	43	NR	2190828	71438	16.5	0.0058	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 34 Hz to 38 Hz on departure.
11/18/2019	GWTT	Yes	--	--	40	30	42	46	4.43	27.6	13.8	17	37	NR	2273202	82374	19.1	0.0081	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 38 Hz to 39 Hz upon departure.
11/22/2019	GWTT	Yes	--	--	42	27	41	45	3.50	35.0	17.5	21	33	NR	2391315	118113	20.5	0.0108	Yes	No	Conducted system checks, changed bag filters. VFD kept at 39 Hz. Cleared sludged out of bottom of sight glass on EQ tank.
11/25/2019	GWTT	Yes	--	--	43	32	43	46	3.90	31.4	15.7	24	42	NR	2486658	95343	22.1	0.0133	Yes	No	Conducted system checks, changed bag filters. VFD kept at 39 Hz.
11/29/2019	GWTT	Yes	--	--	45	32	44	48	4.10	29.9	14.9	28	39	NR	2601976	115318	20.0	0.0141	Yes	No	Conducted system checks, changed bag filters.
Totals - November 2019[12,13]										30.1	15.0	29		NR[11]		559854	21.6	0.016			
12/2/2019	BETA	Yes	--	--	--	--	--	--	--	--	--	2	--	--	2685088	83112	28.9	0.001	No	No	System shutdown at 10:00 for force main de-scale process.
12/4/2019	BETA	No	--	--	--	--	52	60	4.55	26.9	13.5	2	--	NR	2685088	0	0.0	0.000	Yes	No	Bag filters changed prior to system restart. System (PRW-4 and system) restarted at 12:12 following the force main de-scale and purging process. Collected post-bag filter checks after system restart.
12/6/2019	GWTT	Yes	--	--	55	25	52	58	2.17	62.0	31.0	4	50	NR	2735900	50812	17.6	0.001	Yes	No	Conducted system checks, flow into system #2 shutoff PRW-4 due to high level alarm. Changed the bag filters, and adjusted the VFD from 44 Hz to 46 Hz.
12/9/2019	GWTT	Yes	--	--	59	22	58	63	2.12	62.0	31.0	7	50	NR	2854135.0	118235	27.4	0.002	Yes	No	Conducted system checks, changed bag filters, adjusted VFD to 48 Hz to increase the discharge/effluent flow rate. GWTT communicated that carbon vessels should be backwashed since the differential pressure between P3 and P4 is 50 psi.
12/13/2019	GWTT	Yes	--	--	64	66	45	71	1.95	62.8	31.4	11	--	48.0	3002260.0	148125	25.7	0.003	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 48 Hz to 49 Hz (49 GPM) at departure. GWTT noted the pressure on the carbon vessels was approaching their maximum limit.
12/16/2019	GWTT	Yes	--	--	66	70	56	74	2.02	60.6	30.3	14	--	40.0	3122091.0	119831	27.7	0.004	Yes	Yes	Conducted system pressure checks, changed bag filters, adjusted the VFD from 49 Hz to 50 Hz (45 GPM). GWTT noted the pressure on the carbon vessels was approaching their maximum limit. System sampled on 12/17/19.
12/20/2019	GWTT	Yes	--	--	45	63	41	67	NR	NR	NR	18	--	16.00	3239075.0	116984	20.3	0.004	Yes	No	Conducted system pressure checks and changed bag filters and adjusted the VFD from 40 Hz to 47 Hz. Water waste from force main descale process removed from totes off-site by Global Cycle.
12/23/2019	GWTT	Yes	--	--	NR	NR	NR	NR	NR	NR	NR	21	--	NR	--	--	--	--	No	No	System shutdown for carbon changeout at 08:00. Spent carbon removed from both vessels and replaced with new virgin carbon.
12/26/2019	GWTT	No	--	--	NR	11	NR	14	2.25	54.4	27.2	22	--	NR	3317372.0	78297	54.4	0.012	Yes	No	System restarted and requilibrated at 08:00 following carbon changeout and carbon hydration. Conducted system pressure checks, changed bag filters, adjusted the VFD to 23 Hz upon departure.
12/30/2019	GWTT	Yes	--	--	19	11	6	13	2.42	50.6	25.3	26	--	52.00	3460145.0	142773	24.8	0.006	Yes	No	Conducted system checks and changed bag filters, VFD at 26 Hz.
Totals - December 2019[12,13]										54.2	27.1	27		39.0		858169	22.1	0.006			
1/3/2020	GWTT	Yes	--	--	18	8	14	15	2.37	51.8	25.9	3	--	49.00	3588009.0	127864	29.6	0.001	Yes	No	Conducted system checks and changed bag filters, and adjusted VFD.
1/6/2020	GWTT	Yes	--	--	18	11	14	15	2.92	42.0	21.0	6	--	45.00	3692480.0	104471	24.2	0.002	Yes	No	Conducted system checks and changed bag filters, and adjusted VFD.
1/10/2020	GWTT	Yes	--	--	21	12	17	20	3.00	40.8	20.4	10	--	46.00	3809788.0	117308	20.4	0.003	Yes	No	Conducted system checks and changed bag filters, VFD at 27 Hz.
1/13/2020	GWTT	Yes	--	--	21	16	18	21	3.35	36.6	18.3	13	--	39.00	3899180.0	89392	20.7	0.004	Yes	No	Conducted system checks and changed bag filters.
1/17/2020	GWTT	Yes	--	--	25	20	23	26	3.62	33.9	16.9	17	--	24.00	3992818.0	93638	16.3	0.004	Yes	Yes	Conducted system checks and changed bag filters. Adjusted VFD to 33 Hz. Flushed iron sludge/sediment out of bottom of sight glass on EQ holding tank.
1/20/2020	GWTT	Yes	--	--	28	21	26	29	3.97	30.9	15.4	20	--	37.00	4065780.0	72962	16.9	0.005	Yes	No	Conducted system checks and changed bag filters.
1/24/2020	GWTT	Yes	--	--	29	22	27	30	5.13	23.9	11.9	24	--	34.00	4150180.0	84400	14.7	0.005	Yes	No	Conducted system checks and changed bag filters.
1/26/2020	GWTT	Yes	--	--	26	24	25	28	5.75	21.3	10.7	27	--	39.00	4205753.0	55573	12.9	0.005	Yes	No	Conducted system checks and changed bag filters.
1/31/2020	GWTT	Yes	--	--	28	23	26	30	6.80	18.0	9.0	31	--	36.00	4272375.0	66622	11.6	0.005	Yes	No	Conducted system checks, changed bag filters, cleaned sight glass on EQ tank; about 4-5 inches of sludge accumulated at bottom.
Totals - January 2020[12,13]										33.2	16.6	30.9		38.8		812230	18.3	0.009			
2/4/2020	GWTT	Yes	--	--	28	22	26	30	8.00	15.3	7.7	4	--	36.00	4325997	120244	20.9	0.002	Yes	No	Conducted system checks and changed bag filters.
2/7/2020	GWTT	Yes	--	--	26	25	24	28	7.90	15.5	7.8	7	--	38.00	4360208	34211	7.9	0.001	Yes	No	Conducted system checks and changed bag filters.
2/11/2020	GWTT	Yes	--	--	26	25	26	30	11.07	11.1	5.5	11	--	43.00	4399300	39092	6.8	0.001	Yes	No	Conducted system checks and changed bag filters. Backwashed primary LGAC vessel, adjusted transfer pump from 33 Hz to 23 Hz after backwash.
2/13/2020	GWTT	Yes	--	--	9	8	7	9	12.33	9.9	5.0	13	--	42.00	4418200	18900	6.6	0.002	Yes	Yes	Conducted system checks and changed bag filters. Adjusted transfer pump from 33 Hz to 23 Hz, recycled backwash water into GWTS #2 for treatment.
2/18/2020	GWTT	Yes	--	--	12	6	8	9	16.63	7.4	3.7	18	--	42.00	4454815	36615	5.1	0.002	Yes	No	Conducted system checks and changed bag filters.
2/21/2020	GWTT	Yes	--	--	10	8	9	11	22.67	5.4	2.7	21	--	40.00	4471238	16423	3.8	0.002	Yes	No	Conducted system checks and changed bag filters.
2/24/2020	GWTT	Yes	--	--	15	5	13	15	2.65	46.2	23.1	24	--	44.00	4490425	19187	4.4	0.002	Yes	No	Conducted system checks and changed bag filters. Bag filters packed with significant iron-oixde sediments, influent flow rate into EQ tank significantly increased; slug of iron-oxide must have broke through from accumulation in the force main. Adjusted VFD from 23 Hz to 30 Hz.
2/26/2020	GWTT	Yes	--	--	25	10	20	24	2.60	47.1	23.6	26	--	37.00	4519500	29075	10.1	0.005	Yes	No	Conducted system checks and change bag filters. Increase discharge flow through VFD from 30 Hz to 35 Hz. Pressure readings at primary LGAC vessel indicating a need for a backwash.
2/28/2020	GWTT	Yes	--	--	29	10	13	15	2.55	48.0	24.0	28	--	52.00	4556491	36991	12.8	0.007	Yes	No	Conducted system checks and change bag filters. Conducted a backwash on primary LGAC vessel. Initial instantaneous Effluent flow rate was measured at 75 GPM after backwash. Adjusted VFD from 35 Hz to 26 Hz.
Totals - February 2020[12]										22.9	11.4	29		41.6		350738	8.4	0.004			
3/2/2020	GWTT	Yes	--	--	21	6	12	14	2.83	43.2	21.6	2	--	46.00	4645525	89034	20.6	0.001	Yes	Yes	Conducted system checks, changed bag filter, pumped water from large exterior tote through GWTS #2. System sampled on 3/3/2020
3/6/2020	GWTT	Yes	--	--	19	10	16	19	3.00	40.8	20.4	6	--	38.00	4723654	78129	13.6	0.002	Yes	No	Conducted system checks, changed bag filters, adjusted VFD from 26 Hz to 30 Hz.
3/9/2020	GWTT	Yes	--	--	25	18	11	15	3.00	40.8	20.4	9	--	51.00	4785425	61771	14.3	0.003	Yes	No	Conducted system checks, changed bag filters, at departure, instantaneous effluent flow rate at 51 gpm (30 Hz).
3/13/2020	GWTT	Yes	--	--	23	8	13	16	3.23	37.9	18.9	13	--	51.00	4898555	113130	19.6	0.005	Yes	No	Conducted system checks, changed bag filters.
3/16/2020	GWTT	Yes	--	--	23	9	14	17	3.75	32.7	16.3	16	--	50.00	4968818	70263	16.3	0.005	Yes	No	Conducted system checks, changed bag filters.
3/20/2020	GWTT	Yes	--	--	25	9	18	21	3.60	34.0	17.0	20	--	42.00	5052480	83662	14.5	0.006	Yes	No	Conducted system checks, changed bag filters, backwashed the primary LGAC vessel, adjusted the VFD from 30 Hz to 25 Hz: 42 GPM. Observed significant iron-oxide sedimentation accumulation in EQ tank.
3/23/2020	GWTT	Yes	--	--	17	9	15	17	3.00	40.8	20.4	23	--	48.00	5097785	45305	10.5	0.005	Yes	No	Conducted system checks; had to change the bag filters twice because the accumulated iron-oxide sediment in the EQ tank is getting pulled into the transfer pump affecting total gallons treated. Sight glass on EQ tank was flushed. Adjusted VFD from 25 Hz to 35 Hz.
3/26/2020	GWTT	Yes	--	--	34	17	27	29	3.00	40.8	20.4	26	--	48.00	5163530	65745	15.2	0.008	Yes	No	Conducted system checks, changed bag filters and increased the VFD from 35 Hz to 38 Hz.
3/30/2020	GWTT	Yes	--	--	38	14	34	38	3.27	37.5	18.8	30	--	42.00	5264195	100665	17.5	0.011	Yes	No	Conducted system checks, changed bag filters and increased the VFD from 38 Hz to 40 Hz.
Totals - March 2020[12,13]										38.7	19.4	31		46.2		707704	15.9	0.012			

Table 2A - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 1 (GWTS #1)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[4]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT		Days System Operating	EFFLUENT				Average Effluent Flow Rate (GPM)[9]	Estimated Total PFAs Removal (kg)[3]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]	Estimated Instantaneous Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Net Gallons Treated					
4/2/2020	GWTT	Yes	--	--	34	30	31	35	2.95	41.5	20.8	2	--	51.00	5304740	40545	14.1	0.000	Yes	No	Conducted system checks and changed bag filters.
4/6/2020	GWTT	Yes	--	--	33	33	31	35	3.12	39.3	19.7	6	--	50.00	5354280	49540	8.6	0.001	Yes	No	Conducted system checks and changed bag filters. Transfer pump VFD at 40 Hz.
4/9/2020	GWTT	Yes	--	--	--	--	15	18	3.47	35.3	17.7	8.5	--	49.00	5413745	59465	16.5	0.002	Yes	No	System shutdown for 2-4 hours at 7am for vac out of EQ tank and backwash of primary carbon vessel. Global removed 2,989 gallons of iron-oxide water mixture from EQ tank and exterior totes. Conducted system checks and changed bag filters. Adjusted VFD from 40 Hz (74 gpm) to 28 Hz (49 gpm).
4/13/2020	GWTT	Yes	--	--	16	10	11	15	3.92	31.3	15.6	12.5	--	44.00	5497360	83615	14.5	0.002	Yes	No	Conducted system checks and changed bag filters
4/16/2020	GWTT	Yes	--	--	18	15	15	19	4.32	28.4	14.2	15.5	--	35.00	5552940	55580	12.9	0.003	Yes	No	Conducted system checks and changed bag filters
4/20/2020	GWTT	Yes	--	--	19	14	19	23	5.00	24.5	12.3	19.5	--	30.00	5620048	67108	11.7	0.003	Yes	No	Conducted system checks and changed bag filters, adjusted VFD from 28 Hz to 32 Hz to allow higher pressure/flow through bag filters to help with iron-oxide sediment fouling.
4/24/2020	GWTT	Yes	--	--	26	21	26	30	5.25	23.3	11.7	23.5	--	30.00	5679610	59562	10.3	0.003	Yes	No	Conducted system checks and changed bag filters, adjusted the VFD from 32 Hz to 35 Hz.
4/27/2020	GWTT	Yes	--	--	30	28	30	34	6.37	19.2	9.6	26.5	--	28.00	5723132	43522	10.1	0.003	Yes	Yes	Conducted system checks and changed bag filters. System sampled on 4/28/2020.
Totals - April 2020[12,13]										30.4	15.2	29.5		39.6		458937	10.8	0.004			
5/1/2020	GWTT	Yes	--	--	31	26	31	35	3.75	32.7	16.3	1	--	26.00	5756710	33578	23.3	0.0003	Yes	No	Conducted system checks and changed bag filters.
5/5/2020	GWTT	Yes	--	--	31	20	30	35	3.40	36.0	18.0	5	--	26.00	5772378	15668	2.7	0.0002	Yes	No	Conducted system checks and changed bag filters.
5/8/2020	GWTT	Yes	--	--	33	24	14	15	3.38	36.2	18.1	8	--	48.00	5843400	71022	16.4	0.0015	Yes	No	Conducted system checks and changed bag filters. Backwashed primary LGAC vessel, adjusted transfer pump from 35 Hz to 30 Hz after backwash.
5/11/2020	GWTT	Yes	--	--	24	11	17	20	3.72	33.0	16.5	11	--	47.00	5922710	79310	18.4	0.0024	Yes	No	Conducted system checks and changed bag filters.
5/15/2020	GWTT	Yes	--	--	27	16	24	28	4.80	25.5	16.5	15	--	35.00	6012638	89928	15.6	0.0027	Yes	No	Conducted system checks and changed bag filters.
5/18/2020	GWTT	Yes	--	--	26	26	25	30	4.60	26.6	16.5	18	--	35.00	6075320	62682	14.5	0.0031	Yes	No	Conducted system checks and changed bag filters. System sampled on 5/21/2020.
5/22/2020	GWTT	Yes	--	--	30	27	34	40	5.10	24.0	16.5	22	--	32.00	6154187	78867	13.7	0.0035	Yes	Yes	Conducted system checks and changed bag filters. Adjusted VFD from 35 Hz to 38 Hz.
5/26/2020	GWTT	Yes	--	--	35	34	34	40	4.15	29.5	16.5	26	--	32.00	6196369	42182	7.3	0.0022	Yes	No	Conducted system checks and changed bag filters.
5/29/2020	GWTT	Yes	--	--	32	36	32	38	4.15	29.5	16.5	29	--	35.00	6221412	25043	5.8	0.0020	Yes	No	Conducted system checks and changed bag filters.
Totals - May 2020[12,13]										30.3	15.2	31		35.1		498280	11.2	0.0041			
6/2/2020	GWTT	Yes	--	--	34	35	14	17	4.27	28.7	14.4	2	--	46.00	6230577	9165	3.2	0.000	Yes	No	Conducted system checks and changed bag filters. Backwashed primary LGAC vessel; Transfer pump flow rate initially at 68 gpm after backwash. Adjusted VFD from 38 Hz to 30 Hz.
6/5/2020	GWTT	Yes	--	--	24	5	15	19	3.47	35.3	17.7	5	--	40.00	6273600	43023	10.0	0.000	Yes	No	Conducted system checks and changed bag filters.
6/9/2020	GWTT	Yes	--	--	24	10	19	24	3.85	31.8	15.9	9	--	40.00	6334345	60745	10.5	0.001	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD from 30 Hz to 35 Hz.
6/12/2020	GWTT	Yes	--	--	31	16	28	32	4.12	29.8	14.9	12	--	30.00	6404810	70465	16.3	0.002	Yes	No	Conducted system checks and changed bag filters..
6/16/2020	GWTT	Yes	--	--	32	24	30	35	4.67	26.3	13.1	16	--	47.00	6495449	90639	15.7	0.002	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD to 30 Hz and backwashed primary LGAC vessel.
6/19/2020	GWTT	Yes	--	--	22	8	14	18	5.00	24.5	12.3	19	--	43.00	6568815	73366	17.0	0.003	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD to 32 Hz.
6/22/2020	GWTT	Yes	--	--	24	14	19	24	5.72	21.4	10.7	22	--	36.00	6634380	65565	15.2	0.003	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD to 36 Hz.
6/25/2020	GWTT	Yes	--	--	24	19	22	25	5.63	21.7	10.9	25	--	40.00	6690810	56430	13.1	0.003	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD to 32 Hz. System samples collected on 6/24/2020.
6/29/2020	GWTT	Yes	--	--	27	18	13	15	5.15	23.8	11.9	29	--	43.00	6764833	74023	12.9	0.003	Yes	No	Conducted system checks and changed bag filters twice, backwashed primary LGAC vessel, and flushed iron oxide sediment from sight glass on EQ tank.
Totals - June 2020[12,13]										27.0	13.5	30		40.6		543421	12.6	0.0035			
7/2/2020	GWTT	Yes	--	--	25	13	20	25	4.60	26.6	13.3	2	--	39.00	6837610	72777	25.3	0.001	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD from 32 Hz to 34 Hz.
7/6/2020	GWTT	Yes	--	--	36	19	36	24	4.97	24.7	12.3	6	--	36.00	6913169	75559	13.1	0.001	Yes	No	Conducted system checks and changed bag filters, flushed out sight glass on the EQ tank. Adjusted VFD to 34 Hz.
7/10/2020	GWTT	Yes	--	--	24	24	22	28	4.97	24.7	12.3	10	--	39.00	6948605	35436	6.2	0.001	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD to 36Hz.
7/13/2020	GWTT	Yes	--	--	28	26	26	32	5.28	23.2	11.6	13	--	42.00	6996929	48324	11.2	0.002	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD to 38Hz.
7/16/2020	GWTT	Yes	--	--	32	33	11	15	6.03	20.3	10.2	16	--	44.00	7040815	43886	10.2	0.002	Yes	No	Conducted system checks and changed bag filters and adjusted VFD to 29 Hz. Conducted a backwash of primary LGAC vessel after initial readings. Reduced the transfer pump speed to reduce carry over of the iron-oxide sedimentation from the EQ tank into the bag filters and LGAC vessels.
7/20/2020	GWTT	Yes	--	--	13	11	9	13	6.57	18.7	9.3	20	--	41.00	7091010	50195	8.7	0.002	Yes	No	Conducted system checks and changed bag filters filters and LGAC vessels.
7/24/2020	GWTT	Yes	--	--	15	12	11	16	7.20	17.0	8.5	24	--	39.00	7129271	38261	6.6	0.002	Yes	No	Conducted system checks and changed bag filters, VFD at 29 Hz.
7/27/2020	GWTT	Yes	--	--	18	8	11	15	7.50	16.3	8.2	27	--	40.00	7140929	11658	2.7	0.001	Yes	Yes	Conducted system checks and changed bag filters. System sampled on 7/28/2020.
7/30/2020	GWTT	Yes	--	--	12	14	11	15	6.80	18.0	9.0	30	--	40.00	7161465	20536	4.8	0.002	Yes	No	Conducted system checks and changed bag filters.
Totals - July 2020[12,13]										21.1	10.5	31		40.0		396632	8.9	0.0031			
8/4/2020	GWTT	Yes	--	--	22	2	16	18	6.43	19.0	9.5	4	--	38.00	7187415	25950	4.5	0.000	Yes	No	Conducted system checks and changed bag filters twice due to excess iron-oxide precipitate carry over from accumulation in EQ tank. Adjusted VFD to 32Hz.
8/7/2020	GWTT	Yes	--	--	27	11	22	27	6.38	19.2	9.6	7	--	31.00	7228091	40676	9.4	0.001	Yes	No	Conducted system checks and changed bag filters, flushed out sight glass on the EQ tank.
8/10/2020	GWTT	Yes	--	--	27	13	24	29	6.52	18.8	9.4	10	--	25.00	7269613	41522	9.6	0.001	Yes	No	Conducted system checks and changed bag filters twice due to iron-oxide accumulation in the EQ tank; tank needs to be emptied. System shutdown on 8/12/2020 for carbon changeout.
System Shutdown for carbon changeout from 8/12/2020 to 8/14/2020																					
8/14/2020	GWTT	Yes	--	--	--	--	0	3	6.95	17.6	8.8	12	--	44.00	7307487	37874	13.2	0.001	Yes	No	Restarted system after carbon changeout. Conducted system checks and changed bag filters. Adjusted VFD to 26Hz.
8/17/2020	GWTT	Yes	--	--	18	5	5	9	7.00	17.5	8.8	15	--	38.00	7360064	52577	12.2	0.002	Yes	No	Conducted system checks and changed bag filters twice.
8/20/2020	GWTT	No	--	--	17	5	8	10	7.07	17.3	8.7	18	--	36.00	7405440	45376	10.5	0.002	Yes	No	Conducted system checks and changed bag filters twice. Transfer pump off on arrival due to high level alarm in EQ tank.
8/24/2020	GWTT	Yes	--	--	16	7	7	11	7.98	15.3	7.7	22	--	36.00	7469749	64309	11.2	0.002	Yes	No	Conducted system checks and changed bag filters.
8/28/2020	GWTT	Yes	--	--	16	7	10	11	7.42	16.5	8.3	26	--	30.00	7525700	55951	9.7	0.002	Yes	No	Conducted system checks and changed bag filters. System sampled on 8/27/2020. Iron sediment vacuumed pumped out from the EQ tank on 8/27/2020.
8/31/2020	GWTT	Yes	--	--	16	7	9	13	7.67	16.0	8.0	29	--	34.00	7575421	49721	11.5	0.003	Yes	No	Conducted system checks and changed bag filters.
Totals - August 2020[12,13]										17.5	8.7	29		34.7		413956	9.9	0.003			
9/4/2020	GWTT	Yes	--	--	16	7	9	13	9.75	12.6	6.3	4	--	32.00	7636205	60784	10.6	0.001	Yes	No	Conducted system checks and changed bag filters.
9/8/2020	GWTT	Yes	--	--	16	10	8	15	6.88	17.8	8.9	8	--	36.00	7684065	47860	8.3	0.001	Yes	No	Conducted system checks and changed bag filters. Increased VFD to 28 Hz.
9/11/2020	GWTT	Yes	--	--	10	10	5	10	8.60	14.2	8.9	11	--	36.00	7713895	29830	6.9	0.001	Yes	No	Conducted system checks and changed bag filters.
9/15/2020	GWTT	Yes	--	--	11	10	0	5	9.33	13.1	8.9	15	--	46.00	7751139	37244	6.5	0.001	Yes	No	Conducted system checks and changed bag filters. Backwashed primary carbon vessel.
9/18/2020	GWTT	Yes	--	--	7	5	2	6	11.05	11.1	8.9	18	--	45.00	7773921	22782	5.3	0.001	Yes	No	Conducted system checks and changed bag filters.
9/21/2020	GWTT	Yes	--	--	6	7	4	7	11.28	10.9	8.9	21	--	43.00	7794640	20719	4.8	0.001	Yes	No	Conducted system checks and changed bag filters.
9/25/2020	GWTT	Yes	--	--	2	5	2	5	12.53	9.8	8.9	25	--	43.00	7816800	22160	3.8	0.001	Yes	No	Conducted system checks and changed bag filters. System samples collected on September 23, 2020.
9/28/2020	GWTT	Yes	--	--	2	6	2	7	12.18	10.1	8.9	28	--	43.00	7827753	10953	2.5	0.001	Yes	No	Conducted system checks and changed bag filters.
Totals - September 2020[12,13]										12.4	6.2	30		40.5		252332	5.8	0.002			
10/2/2020	GWTT	Yes	--	--	2	5	0	5	13.63	9.0	4.5	2	--	43.00	7836549	8796	3.1	0.00009	Yes	No	Conducted system checks and changed bag filters.
10/5/2020	GWTT	Yes	--	--	16	7	5	10	12.77	9.6	4.8	5	--	40.00	7866820	30271	7.0	0.00045	Yes	No	Conducted system checks and changed bag filters.
10/13/2020	GWTT	Yes	--	--	22	8	13	16	12.90	9.5	4.7	13	--	31.00	7945077	78257	6.8	0.00114	Yes	No	Conducted system checks and changed bag filters.
10/16/2020	GWTT	Yes	--	--	15	10	10	15	14.52	8.4	4.2	16	--	42.00	7971820	26743	6.2	0.00128	Yes	No	Conducted system checks and changed bag filters.
10/19/2020	GWTT	Yes	--	--	19	10	12	15	16.32	7.5	3.8	19	--	33.00	7998570	26750	6.2	0.00152	Yes	Yes	Conducted system checks and changed bag filters. System sampled on 10/20/2020.
10/23/2020	GWTT	Yes	--	--	17	10	12	15	18.00	6.8	3.4	23	--	30.00	8035300	36730	6.4	0.00189	Yes	No	Conducted system checks and changed bag filters.
10/26/2020	GWTT	Yes	--	--	19	11	13	16	19.08	6.4	3.2	26	--	31.00	8060659	25359	5.9	0.00197	Yes	No	Conducted system checks and changed bag filters.
10/30/2020	GWTT	Yes	--	--	11	12	10	14	21.00	5.8	2.9	30	--	35.00	8081921	21262	3.7	0.00143	Yes	No	Conducted system checks and changed bag filters.
Totals - October 2020[12,13]										7.9	3.9	31		35.6		254168	5.7	0.002			

Table 2A - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 1 (GWTS #1)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[4]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT		Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[9]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]	Estimated Instantaneous Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[6]	Instantaneous Effluent Flow Rate (GPM)[7,8]	Totalizer (Gal)	Net Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
11/2/2020	GWTT	Yes	--	--	10	12	10	13	22.87	5.4	2.7	2	--	36.00	8093094	11173	2.6	0.00008	Yes	No	Conducted system checks and changed bag filters.
11/6/2020	GWTT	Yes	--	--	8	12	8	13	24.83	4.9	2.5	6	--	36.00	8101590	8496	1.5	0.00013	Yes	No	Conducted system checks and changed bag filters.
11/9/2020	GWTT	Yes	--	--	18	12	12	16	19.80	6.2	3.1	9	--	32.00	8121953	20363	4.7	0.00063	Yes	No	Conducted system checks and changed bag filters.
11/13/2020	GWTT	No	--	--	--	--	--	--	--	--	--	12	--	--	8130535	8582	1.5	--	No	No	GWTT observed no influent flow coming into the EQ tank. GWTT inspected the electrical components at PRW-4 and reset the power, after power reset, electrical current was at 77 A and power tripped and shut off. GWTT operator suggest the pump has locked up or the motor has failed. GWTT shut down both systems.
System Shutdown due to pump failure at recovery well PRW-4; pump replaced on 11/20/2020.																					
11/24/2020	GWTT	Yes	--	--	--	--	14	16	2.05	59.8	29.9	13	--	50.00	8133427	2892	2.0	0.00039	Yes	Yes	Following the replacement of the well pump at PRW-4 on 11/202/2020; GWTT restarted both systems, adjusted the transfer pump flow rate (38 Hz), changed the bag filters twice.
11/27/2020	GWTT	Yes	--	--	15	18	14	17	1.90	64.5	32.2	16	--	55.00	8146998	13571	3.1	0.00075	Yes	No	Following the replacement of the well pump at PRW-4 on 11/202/2020; GWTT restarted both systems, adjusted the transfer pump flow rate (38 Hz), changed the bag filters twice.
Totals - November 2020[12,13]										28.1	14.1	19		41.8		65077	2.4	0.001			
12/1/2020	GWTT	Yes	--	--	15	16	13	17	1.87	65.6	32.8	1	--	54.00	8173878	26880	4.7	0.00004	Yes	No	Conducted system checks and changed bag filters. Transfer pump off on arrival due to high level in EQ tank.
12/3/2020	GWTT	Yes	--	--	--	--	18	21	1.95	62.8	31.4	3	--	52.00	8254942	81064	28.1	0.00081	Yes	No	System shutdown briefly to vacuum out the exterior totes, both EQ tanks, bag filters, and drums. Conducted system checks and changed bag filters.
12/7/2020	GWTT	Yes	--	--	39	15	23	27	1.88	65.0	32.5	7	--	48.00	8370220	115278	20.0	0.00135	Yes	No	Conducted system checks and changed bag filters.
12/11/2020	GWTT	Yes	--	--	37	19	6	9	1.85	66.2	33.1	11	--	51.00	8478659	108439	18.8	0.00199	Yes	No	Conducted system checks and changed bag filters. Backwashed the primary carbon vessel. Adjusted VFD from 38 Hz to 32 Hz to maintain maximum contact time through carbon vessels.
12/15/2020	GWTT	Yes	--	--	15	9	8	10	1.95	62.8	31.4	15	--	48.00	8586900	108241	18.8	0.00271	Yes	No	Conducted system checks and changed bag filters.
12/18/2020	GWTT	Yes	--	--	20	15	15	18	1.87	65.6	32.8	18	--	48.00	8692013	105113	24.3	0.00421	Yes	No	Conducted system checks and changed bag filters; increased transfer pump speed from 32 Hz to 35 Hz.
12/21/2020	GWTT	Yes	--	--	--	--	--	--	--	--	--	21	--	---	8794684	102671	23.8	0.00480	Yes	Yes	Conducted system checks and changed bag filters; increased transfer pump speed from 32 Hz to 35 Hz.
12/24/2020	GWTT	Yes	--	--	34	12	14	17	2.13	57.4	28.7	24	--	54.00	8893410	98726	22.9	0.00527	Yes	No	Conducted system checks and changed bag filters; increased transfer pump speed from 35 Hz to 38 Hz.
12/28/2020	GWTT	Yes	--	--	35	24	3	8	2.33	52.5	26.3	28	--	52.00	9016828	123418	21.4	0.00577	Yes	No	Conducted system checks and changed bag filters, conducted backwash of the primary carbon vessel, and reduced the speed on the transfer pump from 38 Hz to 33 Hz.
Totals - December 2020[12,13]										62.3	31.1	31		50.9		869830	19.5	0.006			
1/1/2021	GWTT	Yes	--	--	25	10	15	20	2.58	47.4	23.7	1	--	48.00	9119170	102342	17.8	0.00013	Yes	No	Conducted system checks and changed bag filters,increased the speed on the transfer pump from 33 to 38 Hz.
1/4/2021	GWTT	Yes	--	--	30	20	22	27	2.73	44.8	22.4	4	--	48.00	9221193	102023	23.6	0.00068	Yes	No	Conducted system checks and changed bag filters,increased the speed on the transfer pump from 38 to 40 Hz.
1/8/2021	GWTT	Yes	--	--	40	28	32	38	2.83	43.2	21.6	8	--	35.00	9345620	124427	21.6	0.00124	Yes	No	Conducted system checks and changed bag filters
1/11/2021	GWTT	Yes	--	--	39	30	35	38	3.58	34.2	17.1	11	--	35.00	9432900	87280	20.2	0.00159	Yes	No	Conducted system checks and changed bag filters.
1/15/2021	GWTT	Yes	--	--	40	39	3	8	3.35	36.6	18.3	15	--	47.00	9529452	96552	16.8	0.00180	Yes	No	Conducted system checks and changed bag filters, conducted backwash of the primary carbon vessel, reduced discharge flow.
1/18/2021	GWTT	Yes	--	--	28	14	19	22	2.78	44.0	22.0	18	--	46.00	9607077	77625	18.0	0.00231	Yes	No	Conducted system checks, changed bag filters twice, and increased VFD on transfer pump from 40 Hz to 42 Hz.
1/22/2021	GWTT	Yes	--	--	43	28	12	15	3.28	37.3	18.7	22	--	55.00	9753680	146603	25.5	0.00400	Yes	No	Conducted system checks, changed bag filters, and reduced the VFD on the transfer pump from 42 Hz to 40 Hz.
1/25/2021	GWTT	Yes	--	--	31	19	21	25	3.92	31.3	15.6	25	--	49.00	9842918	89238	20.7	0.00369	Yes	No	Conducted system checks, changed bag filters.
1/29/2021	GWTT	Yes	--	--	32	22	25	29	3.85	31.8	15.9	29	--	45.00	9952387	109469	19.0	0.00394	Yes	Yes	Conducted system checks, changed bag filters. System sampled on 1/28/2021.
Totals - January 2021[12,13]										39.0	19.5	31		45.3		935559	21.0	0.005			
2/2/2021	GWTT	Yes	--	--	32	22	25	30	4.65	26.3	13.2	2	--	45.00	10055460	103073	17.9	0.00055	Yes	No	Conducted system checks and changed bag filters. Transfer pump VFD set to 40 Hz.
2/5/2021	GWTT	Yes	--	--	31	27	27	31	5.30	23.1	11.6	5	--	43.00	10122249	66789	15.5	0.00118	Yes	No	Conducted system checks and changed bag filters.
2/8/2021	GWTT	Yes	--	--	32	27	28	32	6.45	19.0	9.5	8	--	43.00	10186942	64693	15.0	0.00183	Yes	No	Conducted system checks and changed bag filters.
2/12/2021	GWTT	Yes	--	--	34	26	29	33	6.15	19.9	10.0	12	--	41.00	10261875	74933	13.0	0.00239	Yes	No	Conducted system checks and changed bag filters.
2/19/2021	GWTT	Yes	--	--	29	28	26	31	9.78	12.5	6.3	19	--	41.00	10368160	106285	10.5	0.00307	Yes	No	Conducted system checks and changed bag filters.
2/22/2021	GWTT	Yes	--	--	29	28	12	16	10.80	11.3	5.7	22	--	43.00	10404311	36151	8.4	0.00282	Yes	No	Conducted system checks and changed bag filters. Backwashed primary LGAC vessel; Adjusted VFD from 40 Hz to 32 Hz (56 gpm to 43 gpm). System sampled on 2/23/2021.
2/26/2021	GWTT	Yes	--	--	26	12	21	25	3.03	40.4	20.2	26	--	49.00	10468138	63827	11.1	0.00441	Yes	No	Conducted system checks and changed bag filters. Backwashed primary LGAC vessel; Adjusted VFD from 40 Hz to 32 Hz (56 gpm to 43 gpm). System sampled on 2/23/2021.
Totals - February 2021[12,13]										21.8	10.9	28		43.6		515751	12.8	0.0055			
3/1/2021	GWTT	Yes	--	--	49	25	36	42	3.08	39.7	19.9	1	--	37.00	10556720	88582	20.5	0.00017	Yes	No	Conducted system checks and changed bag filters. Transfer pump VFD set to 40 Hz.
3/5/2021	GWTT	Yes	--	--	52	13	24	29	4.55	26.9	13.5	5	--	47.00	10751555	194835	33.8	0.00136	Yes	No	Conducted system checks and changed bag filters. Pumped backwash water through system. Reduced transfer pump VFD from 47 Hz to 40 Hz.
3/8/2021	GWTT	Yes	--	--	34	20	24	29	4.53	27.0	13.5	8	--	37.00	10863588	112033	25.9	0.00167	Yes	No	Conducted system checks and changed bag filters.
3/12/2021	GWTT	Yes	--	--	12	15	11	15	2.53	48.4	24.2	12	--	47.00	11010830	147242	25.6	0.00247	Yes	No	Conducted system checks and changed bag filters. Global on site to vacuum out the contents of the exterior totes, EQ tank, and bag filter unit. Both carbon vessels backwashed. VFD was adjusted 37 Hz.
3/15/2021	GWTT	Yes	--	--	23	18	18	21	3.13	39.1	19.5	15	--	44.00	11072717	61887	14.3	0.00173	Yes	No	Conducted system checks and changed bag filters.
3/19/2021	GWTT	Yes	--	--	28	22	23	27	3.12	39.3	19.7	19	--	42.00	11148901	76184	13.2	0.00202	Yes	No	Conducted system checks and changed bag filters.
3/22/2021	GWTT	Yes	--	--	3+	23	22	22	3.40	36.0	18.0	22	--	45.00	11190701	41800	9.7	0.00171	Yes	No	Conducted system checks and changed bag filters.
3/26/2021	GWTT	Yes	--	--	32	26	25	30	3.62	33.9	16.9	26	--	40.00	11243388	52687	9.1	0.00191	Yes	No	Conducted system checks and changed bag filters.
3/30/2021	GWTT	Yes	--	--	33	24	26	31	3.93	31.1	15.6	30	--	40.00	11300605	57217	9.9	0.00240	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD 40 Hz.
Totals - March 2021[12,13]										35.7	17.9	31		42.1		832467	18.6	0.0047			
4/2/2021	GWTT	Yes	--	--	34	24	27	32	3.87	31.7	15.8	2	--	40.00	11337750	37145	8.6	0.00008	Yes	No	Conducted system checks and changed bag filters.
4/6/2021	GWTT	Yes	--	--	34	24	14	18	4.13	29.6	14.8	6	--	40.00	11366900	29150	5.1	0.00015	Yes	No	Conducted system checks and changed bag filters. Backwashed primary carbon vessel. Adjusted VFD on transfer pump.
4/9/2021	GWTT	Yes	--	--	21	9	10	14	4.23	28.9	14.5	9	--	40.00	11396283	29383	6.8	0.00029	Yes	No	Conducted system checks and changed bag filters.
4/13/2021	GWTT	Yes	--	--	27	10	18	23	4.85	25.3	12.6	13	--	35.00	11454318	58035	10.1	0.00063	Yes	No	Conducted system checks and changed bag filters. Adjusted to 36 Hz.
4/15/2021	GWTT	Yes	--	--	22	20	18	23	5.48	22.3	11.2	15	--	36.00	11483050	28732	10.0	0.00072	Yes	No	Conducted system checks and changed bag filters.
4/19/2021	GWTT	Yes	--	--	22	22	21	26	6.47	18.9	9.5	19	--	35.00	11527165	44115	7.7	0.00070	Yes	No	Conducted system checks and changed bag filters.
4/23/2021	GWTT	Yes	--	--	24	24	22	27	7.58	16.2	8.1	23	--	33.00	11564888	37723	6.5	0.00073	Yes	No	Conducted system checks and changed bag filters. System sampled on 4/21/2021.
4/27/2021	GWTT	Yes	--	--	22	22	20	25	8.85	13.8	6.9	27	--	35.00	11596382	31494	5.5	0.00071	Yes	No	Conducted system checks and changed bag filters.
4/30/2021	GWTT	Yes	--	--	23	23	20	25	10.02	12.2	6.1	30	--	34.00	11617474	21092	4.9	0.00071	Yes	No	Conducted system checks and changed bag filters.
Totals - April 2021[12]										22.1	11.1	30		36.4		316869	7.3	0.0011			

Table 2A - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 1 (GWTS #1)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Influent Bag Filter Differential Pressure (psi)[6]		Pre-Filter Changeout Differential Pressure (psi)		Post-Filter Changeout Differential Pressure (psi)		6" Influent Tank Fill Rate (min)	INFLUENT		Days System Operating	EFFLUENT					Estimated Total PFAs Removal (kg)[3]	System Operating on Departure	System Sampled	Comments
			Pre	Post	Gauge: P1	Gauge: P2	Gauge: P1	Gauge: P2		Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]	Estimated Instantaneous Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[7,9]	Totalizer (Gal)	Net Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
5/4/2021	GWTT	Yes	--	--	23	23	21	26	12.42	9.9	4.9	4	--	32.00	11640226	22752	4.0	0.00010	Yes	No	Conducted system checks and changed bag filters.
5/7/2021	GWTT	Yes	--	--	21	24	21	26	14.58	8.4	4.2	7	--	33.00	11655015	14789	3.4	0.00016	Yes	No	Conducted system checks and changed bag filters.
5/10/2021	GWTT	Yes	--	--	33	13	27	32	2.87	42.7	21.4	10	--	34.00	11679915	24900	5.8	0.00038	Yes	No	Conducted system checks and changed bag filters.
5/14/2021	GWTT	Yes	--	--	37	23	30	37	2.80	43.8	21.9	14	--	40.00	11715232	60217	6.0	0.00056	Yes	No	Conducted system checks and changed bag filters. Adjusted VFD on transfer pump from 36 Hz to 44Hz.
5/21/2021	GWTT	Yes	--	--	31	31	28	34	3.02	40.6	20.3	21	--	44.00	11788910	73678	7.3	0.00102	Yes	No	Conducted system checks and changed bag filters.
5/25/2021	GWTT	Yes	--	--	34	30	29	35	3.25	37.7	18.8	25	--	45.00	11851645	62735	10.9	0.00181	Yes	No	Conducted system checks and changed bag filters.
5/28/2021	GWTT	Yes	--	--	34	32	29	35	3.72	33.0	16.5	28	--	51.00	11907070	55425	12.8	0.00239	Yes	No	Conducted system checks and changed bag filters and backwashed primary carbon vessel.
Totals - May 2021[12]										30.9	15.4	31		39.9		314496	7.0	0.0015			

Notes:

1. CE - Coastal Engineering, GWTT - Groundwater Treatment Technologies
2. Prior to November 2019, the instantaneous Influent (INF) and effluent (EFF) flow rates are calculated based on the cross-sectional volume per vertical foot of the influent tank and the measured/timed filling (INF) rate or draining (EFF) of the tank. The diameter of the influent tank is approximately 78 inches. The cross-sectional volume of the tank is approximately 33.1 cubic feet per vertical linear foot. Therefore the flow rate calculation factor is approximately 122.5 gallons per 6 inches. Since 11/7/2019 (following the replacement of the effluent totalizer, ONLY INF flow rates (from PRW-4) are calculated based on an approximation. This Combined Instantaneous Influent flow rate represents the combined flow within both force main pipes from recovery well PRW-4 and since the startup of GWTS#2 on 11/11/2019, approximately 50% of the Combined Instantaneous Influent Flow Rate represents the Instantaneous Influent Flow Rate of GWTS#1.

3. Prior to November 2019 the total mass of PFAS removed is calculated based on the calcuated influent flow rate, the number of days the system has been operating, and the average total Infuent PFAs concentration for the month. Since November 2019, the total mass of PFAS removed is calculated based on the effluent flow rate.
4. NA or -- Not Applicable.
5. NR - Not Reported
6. As of April 1, 2019; the system's O&M data reporting was changed to include the differential pressure readings from the bag filter unit's pressure gauges before and after the bag filters are changed/replaced, if applicable.
7. Prior to November 2019, the average influent flow rate could not reliably be calculated/measured from September to (most of) October due to a blockage in the site glass on the EQ tank from accumulated iron-oxide precipitates in the bottom of the tank. The iron-oxide precipitates were removed from the EQ tank on Oct. 28, 2019.
8. Following the separation of the two force mains and the installation of GWTPS #2 on November 7, 2019, Instantaneous influent flow rates are estimated by approximating 50% of the Combined Instantaneou Influent flow rate values.
9. Instantaneous Effluent Flow Rate is recorded as the instantaneous flow rate as calculated or indicated from the totalizer flow meter on the system's effluent discharge piping - reading is collected after bag filter change and/or backwashing.
10. The Average effluent flow rate is calculated from the net gallons (Total Gallons Treated) obtained from the system's effluent totalizer flow meter and days that the system was in operation.
11. Prior to Nov. 7, 2019, calculated average effluent flow rates and the estimated PFAS removed total were calculated based on the reported totalizer readings. The totalizer flow meter readings on the effluent discharge piping were not reliable at flow rates less than 40 GPM.
Therefore the data are shaded to indicate that they are approximations only and for this reason the July through October data are also considered approximates.
12. As of September 2019, the "Totals" shown (from left to right) include the Average Instantaneous Influent Flow Rate, Total Days of System Operation, Average Instantaneous Effluent Flow Rate, Total Gallons Treated, Average Net Effluent Flow Rate, and Estimated PFAS Removed for the respective monthly reporting period.
Running average values shown for the effluent flow rate. Prior to November 7, 2019, totals shown (from left to right) included the Average Instantaneous Influent Flow Rate, Total Days of Operation, Average Instantaneous Effluent Flow Rate, and Estimated PFAS Removed for the respective monthly reporting period.
13. The calculated Net Gallons Treated and Average Effluent Flow Rates are based on totalizer readings from each monitoring date and the totals are representative of the monthly IRA reporting period. The average effluent flow rates calculated from the first monitoring date are based on measurements from the last monitoring date of the previous reporting period.

Table 2B - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 2 (GWTS #2)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Days System Operating	Transfer Pump Pres. (psi)	Pre-Filter Changeout Differential Pressure (psi)[2]		Post-Filter Changeout Differential Pressure (psi)		Carbon Vessels. Pre-change out (psi)		Carbon Vessels. Post-change out (psi)		Instantaneous Estimated INFLUENT[7]	EFFLUENT				Estimated Total PFAs Removal (kg)	System Operating on Departure	System Sampled	Comments
				Gauge: P1	Gauge: P2	Gauge: P3	Gauge: P2	Gauge: P3	Gauge: P4	Gauge: P5	Gauge: P4	Gauge: P5	Flow Rate (GPM)[3,4]	Totalizer (Gal)	Instant. Flow Rate (GPM)[3]	Net Gallons Treated [4]	Average Effluent Flow Rate (GPM)[5]				
11/11/2019	GWTT	Yes	1	38	0	0	0	0	<2	0	2	2	12.56	416900	32.00	0.0	--	0.00032	Yes	No	Influent flow stream from PRW-4 split and started system #2. Conducted system checks, changed bag filters after initial flush.
11/15/2019	GWTT	Yes	4	40	24	2	5	2	2	2	2	2	34.00	451645	34.00	34745.0	8.043	0.0008	Yes	Yes	Conducted system pressure checks and changed the bag filters. System shutdown temporarily to calculate influent flow rate at GWTPS #1. Collected system startup samples on 11/12/19 and 11/15/19.
11/18/2019	GWTT	Yes	7	--	32	2	6	6	2	2	4	4	44.00	491280	33.00	39635.0	9.175	0.0016	Yes	No	Conducted system pressure checks and changed the bag filters. System shutdown temporarily to calculate influent flow rate at GWTPS #1.
11/22/2019	GWTT	Yes	11	40	31	4	7	7	4	4	6	5	12.50	549022	34.00	57742.0	10.025	0.0028	Yes	No	Conducted system pressure checks and changed the bag filters. System shutdown temporarily to calculate influent flow rate at GWTPS #1.Collected system startup samples on 11/19/19.
11/25/2019	GWTT	Yes	14	40	15	6	7	7	4	5	5	6	12.50	594623	33.00	45601.0	10.556	0.0037	Yes	No	Conducted system pressure checks and changed the bag filters.
11/29/2019	GWTT	Yes	18	40	18	6	8	8	3	3	4	4	NR	649150	34.00	54527.0	9.466	0.0043	Yes	No	Conducted system pressure checks and changed the bag filters.
Totals - November 2019[6,10]			19										23.11		33	232250	8.49	0.0040			
12/2/2019	BETA	Yes	2		--	--	--	--	--	--	--	--	--	686500	--	37350.0	8.6	--	No	Yes	System shutdown at 10:00 for force main de-scale process; system locked out and tagged out.
12/4/2019	BETA	No	2	40	--	--	7	7	--	--	4	4	22.70	686700	30.00	200.0	0.07	0.00000	Yes	No	System restarted at 12:12 upon finishing the de-scale purging process and restarted PRW-4.
12/6/2019	GWTT	No	4	35	--	--	14	13	--	--	10	8	25.0	707866	47.00	21166.0	7.35	0.00029	Yes	No	System off upon arrival and bag filters were completed clogged with iron sediments. Bag filters had to be changed after 20 minutes of operation. GWTT observed a high amount of solids floating in the EQ tank and pumped down the EQ tank and observed significant iron sediment sludge on the bottom of the tank. GWTT notified BETA that they would raise the floats in EQ tank to help lessen the agitation of the sludge and carryover into the bag filters. System was on high level alarm and continued to shutoff of PRW-4, which shut off system #1 due to significant iron oxide sediment accumulation in EQ tank.
12/9/2019	GWTT	Yes	7	37	39	8	16	16	7	5	14	8	25.0	813065	46.00	105199.0	24.35	0.00171	Yes	No	Conducted system checks, changed bag filters. Raising floats in EQ tank has not affected the iron sediment at the bottom.
12/13/2019	GWTT	Yes	11	38	43	11	21	20	10	5	18	7	25.0	943807	42.00	130742.0	22.70	0.00250	Yes	No	Conducted system checks, changed bag filters.
12/16/2019	GWTT	Yes	14	45	43	13	23	22	10	3	21	5	25.0	1049390	41.00	105583.0	24.44	0.00343	Yes	No	Conducted system checks, changed bag filters, EQ tank "High Level" alarm triggered.
12/20/2019	GWTT	Yes	18	42	33	14	20	20	10	4	18	6.00	25.0	1148998	43.00	99608.0	17.29	0.00312	Yes	No	Conducted system checks and changed the bag filters. System shutdown temporarily for pump out of iron oxide sediment accumulation in EQ tank.
12/23/2019	GWTT	Yes	21	--	--	--	--	--	--	--	--	--	--	1209649	NR	60651.0	14.04	0.00296	Yes	No	System shutdown at 08:00 for carbon changeout conducted on System #1.
12/26/2019	GWTT	Yes	22	38	30	15	19	19	14	6	18	7	24.2	1209820	42.00	171.0	0.04	0.00001	Yes	No	System restarted at 09:30 AM following carbon changeout conducted on System #1. Conducted system checks and changed bag filters.
12/30/2019	GWTT	Yes	26	38	38	13	22	22	12	5	20	7	24.00	1320824	40.00	111004.0	19.27	0.00503	Yes	No	Conducted system pressure checks and changed the bag filters. Reset pump control floats in EQ tank back to original depths (following the removal of iron sediments at bottom of the tank).
Totals - December 2019[6,10]			27										24.49		41	671674	17.3	0.005			
1/3/2020	GWTT	Yes	3	43	35	13	20	20	10	4	18	6	--	1422315	42.00	101491.0	17.6	0.00076	Yes	No	Conducted system checks, changed bag filters.
1/6/2020	GWTT	Yes	6	40	27	15	19	19	11	5	16	8	20.98	1507290	43.00	84975.0	19.7	0.00169	Yes	No	Conducted system checks, changed bag filters.
1/10/2020	GWTT	Yes	10	38	29	15	19	19	13	5	17	6	20.42	1602935	43.00	95645.0	16.6	0.00237	Yes	No	Conducted system checks, changed bag filters.
1/13/2020	GWTT	Yes	13	38	26	16	19	19	18	6	6	8	18.28	1674840	41.00	71905.0	16.6	0.00309	Yes	No	Conducted system checks, changed bag filters.
1/17/2020	GWTT	Yes	17	--	28	16	20	20	15	6	18	7	16.94	1750933	41.00	76093.0	13.2	0.00321	Yes	No	Conducted system checks, changed bag filters.
1/20/2020	GWTT	Yes	20	38	25	16	11	11	15	6	18	7	15.44	1808630	48.00	57697.0	13.4	0.00382	Yes	No	Conducted system checks, changed bag filters. Backwashed primary LGAC vessel.
1/24/2020	GWTT	Yes	24	35	19	9	11.5	11.5	6	7	8	8	11.93	1872940	48.00	64310.0	11.2	0.00383	Yes	No	Conducted system checks, changed bag filters.
1/24/2020	GWTT	Yes	24	35	19	9	11.5	11.5	6	7	8	8	10.65	1872940	48.00	0.0	#DIV/0!				
1/27/2020	GWTT	Yes	27	35	16	10	12	11	7	7	9	8.00	10.65	1915785	46.00	42845.0	9.9	0.00383	Yes	No	Conducted system checks, changed bag filters, pumped backwash water through system's influent stream.
1/31/2020	GWTT	Yes	31	36	18	10	12	12	9	8	8	7	9.01	1962050	--	46265.0	8.0	0.00356	Yes	No	Conducted system checks, changed bag filters.
Totals - January 2020[6,10]			31			2/22/1900							14.92		44	641226	14.4	0.004			
2/4/2020	GWTT	Yes	4	2	18	10	12	12	9	8	8	7	7.66	2000333	46.00	38283	6.6	0.00053	Yes	No	Conducted system checks, changed bag filters.
2/7/2020	GWTT	Yes	7	36	14	11	12	11	8	7	8	6	7.75	2023878	46.00	23545	5.5	0.00076	Yes	No	Conducted system checks, changed bag filters.
2/11/2020	GWTT	Yes	11	35	14	12	13	13	9	8	10	8	5.53	2049888	47.00	26010	4.5	0.00099	Yes	No	Conducted system checks, changed bag filters.
2/13/2020	GWTT	Yes	13	36	13	12	14	13	10	8	10	8	4.97	2060169	46.00	10281	3.6	0.00093	Yes	Yes	Conducted system checks, changed bag filters. Pumped backwash water from GWTS #1 through system.
2/18/2020	GWTT	Yes	18	36	15	12	13	14	9	8	9	8	3.68	2081950	57.00	21781	3.0	0.00109	Yes	Yes	Conducted system checks, changed bag filters.
2/21/2020	GWTT	Yes	21	36	15	13	14	13	10	8	10	8	2.70	2094054	48.00	12104	2.8	0.00117	Yes	Yes	Conducted system checks, changed bag filters.
2/24/2020	GWTT	Yes	24	37	43	5	16	16	2	2	13	7	23.11	2108080	47.00	14026	3.2	0.00156	Yes	Yes	Conducted system checks, changed bag filters. Bag filters packed with significant iron-oixde sediments, influent flow rate into EQ tank significantly increased; slug of iron must have broke through. Had to change bag filters twice.
2/26/2020	GWTT	Yes	26	36	43	6	16	15	6	2	16	8	23.56	2134241	45.00	26161	9.1	0.00472	Yes	Yes	Conducted system checks and changed bag filters.
2/28/2020	GWTT	Yes	28	36	44	5	21	20	5	2	18	7	24.02	2168295	42.00	34054	11.8	0.00661	Yes	Yes	Conducted system checks, changed bag filters. Approximately 6 inch of iron-oxide sludge has accumulated on bottom of EQ tank; control float switches were raised to reduce disruption of settled sludge.
Totals - February 2020[6,10]			29										11.44		47	206245	4.9	0.003			
3/2/2020	GWTT	Yes	2	36	35	10	15	15	9	5	10	11	21.6	2249000	48.00	80705	18.7	0.00078	Yes	Yes	Conducted system checks, changed bag filters. Backwashed primary LGAC vessel, vaccumed the iron-oxide sludge out of the EQ tank, and into 55-gal drums on site; water from the drum can be decanted back through the system. System sampled on 3/3/2020.
3/6/2020	GWTT	Yes	6	37	25	10	16	15	8	8	12	10	20.4	2315739	47.00	66739	11.6	0.00145	Yes	No	Conducted system checks, changed bag filters. System shutdown temporarily to pump backwash water from exterior totes through system.
3/9/2020	GWTT	Yes	9	37	30	9	16	16	7	6.5	14	10	20.4	2366315	44.00	50576	11.7	0.00220	Yes	No	Conducted system checks, changed bag filters.
3/13/2020	GWTT	Yes	13	38	37	9	20	20	8	5	18	10	18.9	2476035	42.00	109720	19.0	0.00518	Yes	No	Conducted system checks, changed bag filters.
3/16/2020	GWTT	Yes	16	38	29	15	20	20	12	8	18	10	16.3	2544858	41.00	68823	15.9	0.00533	Yes	No	Conducted system checks, changed bag filters.
3/20/2020	GWTT	Yes	20	38	28	17	19	19	10	7	17	10	17.0	2615618	41.00	70760	12.3	0.00514	Yes	No	Conducted system checks, changed bag filters. Observed significant iron-oxide accumulation in EQ tank.
3/23/2020	GWTT	Yes	23	38	26	16	21	20	14	8.5	18	10	20.4	2636761	41.00	21143	4.9	0.00235	Yes	No	Conducted system checks, changed bag filters.
3/26/2020	GWTT	Yes	26	38	29	14	20	19	14	8.5	18	10	20.4	2663514	41.00	26753	6.2	0.00337	Yes	No	Conducted system checks, changed bag filters.
3/30/2020	GWTT	Yes	30	46	44	5	24	24	2	1	20	9	18.8	2721065	37.00	57551	10.0	0.00627	Yes	No	Conducted system checks, changed bag filters.
Totals - March 2020[6,10]			31										19.37		42	552770	12.4	0.00549			
4/2/2020	GWTT	Yes	2	42	42	13	24	23	10	3	21	5	20.8	2768543	27.00	47478	11.0	0.00028	Yes	No	Conducted system checks, changed bag filters, and slowed down the effluent discharge flow rate to reduce carry over of significant iron sludge into the bag filters.
4/6/2020	GWTT	Yes	6	42.5	42	12	27	27	10	3	25	6	19.7	2833368	25.00	64825	11.3	0.00085	Yes	No	Conducted system checks and changed bag filters.
4/9/2020	GWTT	Yes	8.5	39	--	--	9	8	7	6.5	7	6.5	17.7	2903750	39.00	70382	16.3	0.00174	Yes	No	System shutdown for 2-4 hours at 7am for vac out of EQ holding tank and backwash of primary carbon vessel. Conducted system checks and changed bag filters.
4/13/2020	GWTT	Yes	12.5	39	24.5	7	10	9	4	5	8	6.0	15.6	3004475	38.00	100725	17.5	0.00275	Yes	No	Conducted system checks and changed bag filters. Lowered transfer pump "off control" float in EQ holding tank to allow longer run time and less cycling.
4/16/2020	GWTT	Yes	15.5	40	20.8	8	11	10	7	6	8	6.0	14.2	3074510	36.00	70035	16.2	0.00316	Yes	No	Conducted system checks and changed bag filters, pumped backwash water from exterior totes into (system #2) holding tank.
4/20/2020	GWTT	Yes	19.5	40	25	8	11	10	6	5	9	6.0	12.3	3156813	37.00	82303	14.3	0.00350	Yes	No	Conducted system checks and changed bag filters. Lowered transfer pump "off control" float in EQ holding tank to allow longer run time and less cycling.
4/24/2020	GWTT	Yes	23.5	42	26	10	15	14	7	5	10	6.0	11.7	3225480	33.00	68667	11.9	0.00352	Yes	No	Conducted system checks and changed bag filters.
4/27/2020	GWTT	Yes	26.5	40	21	12	15	14	10	6	12	6.0	9.6	3271810	33.00	46330	10.7	0.00357	Yes	Yes	Conducted system checks and changed bag filters. Collected system samples on 4/28/2020.
Totals - April 2020[6,10]			29.5										15.2		34	550745	13.0	0.00481			

Table 2B - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 2 (GWTS #2)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Days System Operating	Transfer Pump Pres. (psi)	Pre-Filter Changeout Differential Pressure (psi)[2]		Post-Filter Changeout Differential Pressure (psi)		Carbon Vessels. Pre-change out (psi)		Carbon Vessels. Post-change out (psi)		Instantaneous Estimated INFLUENT[7]	EFFLUENT				Estimated Total PFAs Removal (kg)	System Operating on Departure	System Sampled	Comments
				Gauge: P1	Gauge: P2	Gauge: P3	Gauge: P2	Gauge: P3	Gauge: P4	Gauge: P5	Gauge: P4	Gauge: P5	Flow Rate (GPM)[3,4]	Totalizer (Gal)	Instant. Flow Rate (GPM)[3]	Net Gallons Treated[4]	Average Effluent Flow Rate (GPM)[5]				
5/1/2020	GWTT	Yes	1	47	43	9	22	22	8	3	20	5.0	16.3	3320924	32.00	49114	8.5	0.00310	Yes	No	Conducted system checks and changed bag filters twice during visit, system on idle upon arrival due to high level.
5/5/2020	GWTT	Yes	5	42	42	12	26	26	10	3	23	5.0	18.0	3359082	25.00	38158	6.6	0.00241	Yes	No	Conducted system checks and changed bag filters twice; influent flow rate has spiked but has caused a large influx of iron sediments.
5/8/2020	GWTT	Yes	8	42	35	13	22	22	10	4	20	6.0	18.1	3426824	34.00	67742	15.7	0.00570	Yes	No	Conducted system checks and changed bag filters.
5/11/2020	GWTT	Yes	11	42	25	16	22	22	14	5	20	6.0	16.5	3485100	32.00	58276	13.5	0.00490	Yes	No	Conducted system checks and changed bag filters. Pumped down green exterior tote holding backwash water from system #1.
5/15/2020	GWTT	Yes	15	39	35	17	8.5	8	16	4	7	6.0	12.8	3562051	38.00	76951	13.4	0.00485	Yes	No	Conducted system checks and changed bag filters. Backwashed primary LGAC vessel.
5/18/2020	GWTT	Yes	18	39	16	8	9	9	6	6	7	6.0	13.3	3614934	39.00	52883	12.2	0.00445	Yes	Yes	Conducted system checks and changed bag filters. Pumped down green exterior tote holding backwash water from 5.15.20 through System #2. System sampled on 5/21/2020.
5/22/2020	GWTT	Yes	22	42	24	7	10	10	4	4	7	6.0	12.0	3682536	36.00	67602	11.7	0.00426	Yes	No	Conducted system checks and changed bag filters.
5/26/2020	GWTT	Yes	26	41	44	4	17	16	0	0	14	5.0	14.8	3735642	34.00	53106	9.2	0.00335	Yes	No	Conducted system checks and changed bag filters twice.
5/29/2020	GWTT	Yes	29	40	44	4	21	19	4	1	15	4.0	14.8	3785810	34.00	50168	11.6	0.00422	Yes	No	Conducted system checks and changed bag filters twice.
Totals - May 2020[6,10]			31										15.2		33.8	514000	11.5	0.00418			
6/2/2020	GWTT	Yes	2	43	42	8	23	23	8	3	21	5.0	14.4	3832928	32.00	47118	8.2	0.00235	Yes	No	Conducted system checks and changed bag filters, primary carbon vessel needs to be backwashed.
6/5/2020	GWTT	Yes	5	40	35	9	13	13	2	2	10	5.0	17.7	3887828	35.00	54900	12.7	0.00366	Yes	No	Conducted system checks and changed bag filters.
6/9/2020	GWTT	Yes	9	40	21	10	7.5	7	8	5	6	5.0	15.9	3922210	35.00	34382	6.0	0.00172	Yes	No	Conducted system checks and changed bag filters. Bakcwashed primary LGAC vessel, pumped down outside holding tank through system before backwashing carbon vessel.
6/12/2020	GWTT	Yes	12	40	21	10	7.5	7	8	5	6	5.0	14.9	3970210	35.00	48000	11.1	0.00320	Yes	No	Conducted system checks and changed bag filters.
6/16/2020	GWTT	Yes	16	41	23	8	10	10	6	5	8	6.0	13.1	4029179	36.00	58969	10.2	0.00295	Yes	No	Conducted system checks and changed bag filters. Pumped backwash water from exterior holding totes through system.
6/19/2020	GWTT	Yes	19	40	21	10	7.5	7	8	5	6	5.0	12.3	4069514	38.00	40335	9.3	0.00269	Yes	No	Conducted system checks and changed bag filters.
6/22/2020	GWTT	Yes	22	41	14	10	11	11	9	5	9	5.0	10.7	4102439	37.00	32925	7.6	0.00219	Yes	No	Conducted system checks and changed bag filters.
6/25/2020	GWTT	Yes	25	42	16	12	10	10	8	4	5	5.0	10.9	4128010	35.00	25571	5.9	0.00170	Yes	No	Conducted system checks and changed bag filters.
6/29/2020	GWTT	Yes	29	41	16	9	10	10	8	5	9	5.0	11.9	4154842	35.00	26832	4.7	0.00134	Yes	No	Conducted system checks and changed bag filters.
Totals - June 2020[6]			30										13.5		35.3	369032	8.5	0.00238			
7/2/2020	GWTT	Yes	2	42	43	4	12	11	0	0	10	5.0	13.3	4173048	34.00	18206	4.2	0.00146	Yes	No	Conducted system checks and changed bag filters.
7/6/2020	GWTT	Yes	6	42	37	8	16.5	16	7	3	14	5.0	12.3	4243300	34.00	70252	12.2	0.00423	Yes	No	Conducted system checks and changed bag filters.
7/9/2020	GWTT	Yes	9	43	42	8	23	23	8	3	21	5.0	12.3	4279505	31.00	36205	8.4	0.00291	Yes	No	Conducted system checks and changed bag filters.
7/12/2020	GWTT	Yes	12	47	47	18	18	18	7	3	16	5.0	11.6	4329440	32.00	49935	11.6	0.00401	Yes	No	Conducted system checks and changed bag filters.
7/16/2020	GWTT	Yes	16	42	25	13	16.5	16	12	5	14	7.0	10.2	4374349	33.00	44909	7.8	0.00271	Yes	No	Conducted system checks and changed bag filters.
7/20/2020	GWTT	Yes	20	40	34	12	7.5	7	10	3	6	5.0	9.3	4435010	40.00	60661	10.5	0.00365	Yes	No	Conducted system checks and changed bag filters. Pumped backwash water from System #1 through system and then backwashed primary LGAC vessel.
7/24/2020	GWTT	Yes	24	40	37	4	9.5	9	2	2	8	6.0	8.5	4493135	40.00	58125	10.1	0.00350	Yes	No	Changed bag filters and pumped excess backwash water through system.
7/27/2020	GWTT	Yes	27	41	43	6	13	12	2	0	10	5.0	8.2	4521639	38.00	28504	6.6	0.00229	Yes	No	Conducted system checks and changed bag filters twice due to iron-oixde accumulation in the EQ tank.
7/30/2020	GWTT	Yes	30	41	32	7	14	13	6	3	10	5.0	9.0	4585515	37.00	63876	14.8	0.00513	Yes	No	Conducted system checks; the system is receiving more water (influent) that GWTS#1, operator assumes it's related to the build up of iron in the force main piping.
Totals - July 2020[6,10]			31										10.5		35.4	430673	9.6	0.00335			
8/4/2020	GWTT	No	4	41	41	7	17	16	5	3	14	5.5	9.5	4669181	38.00	83666	11.6	0.00336	Yes	No	System down on arrival due to split/rupture of 2 inch hard hose connecting the transfer pump to the bag filters. Hose was replaced and system restarted on 8/4/2020. Conducted system checks and changed bag filters.
8/7/2020	GWTT	Yes	7	41	18	14	16	15	12	6	12	6.0	9.6	4686019	34.00	16838	3.9	0.00113	Yes	No	Conducted system checks and changed bag filters.
8/10/2020	GWTT	Yes	10	40.5	16.5	14	15	14	11	5	12	6.0	9.4	4701138	31.00	15119	3.5	0.00101	Yes	No	Conducted system checks and changed bag filters. System shutdown on 8/12/2020 for carbon changeout.
8/14/2020	GWTT	Yes	12	40	--	--	15	14	--	--	10.5	6.0	8.8	4714722	41.00	13584	2.4	0.00068	Yes	No	Restarted system after carbon changeout. Conducted system checks and changed bag filters.
8/17/2020	GWTT	Yes	15	40	16.5	13.5	15	14	10	6	12	6.0	8.8	4732036	41.00	17314	4.0	0.00116	Yes	No	Conducted system checks and changed bag filters.
8/20/2020	GWTT	Yes	18	44	22	12	15	14	10	5	12	6.0	8.7	4744901	40.00	12865	3.0	0.00086	Yes	No	Conducted system checks and changed bag filters.
8/24/2020	GWTT	Yes	22	41	19	13	15	14	10	5	12	6.0	7.7	4774135	40.00	29234	5.1	0.00147	Yes	No	Conducted system checks and changed bag filters.
8/28/2020	GWTT	Yes	26	30	18	14	25	23	10	5	20	12.0	8.3	4793800	40.00	19665	3.4	0.00099	Yes	No	Conducted system checks and changed bag filters. System sampled on 8/27/2020 and iron sediment vacuum removed from EQ tank on 8/27/2020.
8/31/2020	GWTT	Yes	29	40	20	12	14	12	8	6	10	7.0	8.0	4807524	42.00	13724	3.2	0.00092	Yes	No	Conducted system checks and changed bag filters.
Totals - August 2020[6,10]			29										8.7		38.6	222009	5.3	0.00144			
9/4/2020	GWTT	Yes	4	40	15	12	13	13	8	6	10	6.0	6.3	4821810	42.00	14286	2.5	0.00099	Yes	No	Conducted system checks and changed bag filters.
9/8/2020	GWTT	Yes	8	40	45	4	9	8	0	0	6	6.0	8.9	4834498	38.00	12688	2.2	0.00088	Yes	No	Conducted system checks and changed bag filters.
9/11/2020	GWTT	Yes	11	44	16	6	9	7	5	5	6	5.0	7.1	4866725	38.00	32227	7.5	0.00299	Yes	No	Conducted system checks and changed bag filters.
9/15/2020	GWTT	Yes	15	42	19	7	8	7	6	5	6	8.0	6.6	4907555	38.00	40830	7.1	0.00284	Yes	No	Conducted system checks and changed bag filters.
9/18/2020	GWTT	Yes	18	42	9.5	27	8	7	6	5	6	5.0	5.5	4937021	37.00	29466	6.8	0.00273	Yes	No	Conducted system checks and changed bag filters.
9/21/2020	GWTT	Yes	21	35	14	8	9	9	6	5	6	5.0	5.4	4963941	37.00	26920	6.2	0.00250	Yes	No	Conducted system checks and changed bag filters.
9/25/2020	GWTT	Yes	25	45	21	7	8	7	4	4	4	5.0	4.9	4999400	35.00	35459	6.2	0.00247	Yes	No	Conducted system checks and changed bag filters.
9/28/2020	GWTT	Yes	28	43	43	3	10	10	8	5	8	5.0	5.0	5032229	35.00	32829	7.6	0.00304	Yes	No	Conducted system checks and changed bag filters.
Totals - September 2020[6,10]			30										6.2		37.5	224705	5.2	0.00202			

Table 2B - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 2 (GWTS #2)
Barnstable County Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Date	Operator[1]	System Operating on Arrival	Days System Operating	Transfer Pump Pres. (psi)	Pre-Filter Changeout Differential Pressure (psi)[2]		Post-Filter Changeout Differential Pressure (psi)		Carbon Vessels. Pre-change out (psi)		Carbon Vessels. Post-change out (psi)		Instantaneous Estimated INFLUENT[7]	EFFLUENT				Estimated Total PFAs Removal (kg)	System Operating on Departure	System Sampled	Comments
				Gauge: P1	Gauge: P2	Gauge: P3	Gauge: P2	Gauge: P3	Gauge: P4	Gauge: P5	Gauge: P4	Gauge: P5	Flow Rate (GPM)[3,4]	Totalizer (Gal)	Instant. Flow Rate (GPM)[8]	Net Gallons Treated[4]	Average Effluent Flow Rate (GPM)[5]				
10/2/2020	GWTT	Yes	2	43	28	6	9	8	5	4	7	5.0	4.5	5076447	34.00	44218	7.7	0.00352	Yes	No	Conducted system checks and changed bag filters.
10/5/2020	GWTT	Yes	5	40	15	12	13	13	8	6	10	6.0	4.8	5088882	35.00	12435	2.9	0.00132	Yes	No	Conducted system checks and changed bag filters.
10/8/2020	GWTT	Yes	8	42	10	9	9	9	6	5	6	5.0	4.8	5097900	35.00	9018	2.1	0.00096	Yes	No	Conducted system checks and changed bag filters.
10/13/2020	GWTT	Yes	13	42	11	9	10	9	7	5	7	5.0	4.7	5107054	35.00	9154	1.3	0.00058	Yes	No	Conducted system checks and changed bag filters.
10/16/2020	GWTT	Yes	16	42	10	8	8	8	4	6	4	4.0	4.2	5117300	35.00	10246	2.4	0.00109	Yes	No	Conducted system checks and changed bag filters.
10/19/2020	GWTT	Yes	19	42	10	9	10	9	7	6	7	6.0	3.8	5124608	35.00	7308	1.7	0.00077	Yes	No	Conducted system checks and changed bag filters.
10/23/2020	GWTT	Yes	23	42	10	9	9	9	7	6	4	6.0	3.4	5127608	35.00	3000	0.5	0.00024	Yes	No	Conducted system checks and changed bag filters.
10/26/2020	GWTT	Yes	26	42	10.5	9	10	9.5	7	6	8	6.0	3.2	5129753	34.00	2145	0.5	0.00023	Yes	No	Conducted system checks and changed bag filters.
10/30/2020	GWTT	Yes	30	42	14	10	10	9	7	6	8	6.0	2.9	5142555	34.00	12802	2.2	0.00102	Yes	No	Conducted system checks and changed bag filters.
Totals - October 2020[6,10]			31										4.0		34.7	110326	2.5	0.00113			
11/2/2020	GWTT	Yes	2	42	19	8	10	10	6	5	8	6.0	2.7	5155575	34.00	13020	3.0	0.00139	Yes	No	Conducted system checks and changed bag filters.
11/6/2020	GWTT	Yes	6	43	22	8	10	10	6	5	8	6.0	2.5	5175583	34.00	20008	3.5	0.00160	Yes	No	Conducted system checks and changed bag filters.
11/9/2020	GWTT	Yes	9	43	28	6	9	8	5	4	7	5.0	3.1	5181542	34.00	5959	1.4	0.00064	Yes	No	Conducted system checks and changed bag filters.
11/13/2020	GWTT	No	12	--	--	--	--	--	--	--	--	--	--	5182921	--	1379	0.2	0.00011	No	No	GWTT observed no influent flow coming into the EQ tank. GWTT inspected the electrical components at PRW-4 and reset the power, after power reset, electrical current was at 77 A and power tripped and shut off. GWTT operator suggest the pump has locked up or the motor has failed. GWTT shut down both systems.
11/24/2020	GWTT	No	13	43	--	--	11	11	--	--	9	6.0	29.9	5184025	34.00	1104	0.1	0.00003	No	Yes	GWTT restarted system following the replacement of the pump at PRW-4 on 11/20/2020. Well was surged and cleaned, changed out bag filters multiple times and conducted system checks.
11/27/2020	GWTT	Yes	16	44	45	4	11	11	0	0	9.5	6.0	32.2	5195180	32.00	11155	2.6	0.00119	Yes	No	Conducted system checks and changed bag filters twice.
Totals - November 2020[6,10]			19										14.1		33.6	52625	1.9	0.00054			
12/1/2020	GWTT	Yes	1	44	44	4	13.5	13	2	3	10	5.5	32.8	5219532	32.00	24352	4.2	0.00126	Yes	No	Conducted system checks and changed bag filters twice.
12/3/2020	GWTT	Yes	3	43	--	--	8	7.5	--	--	6	6.0	31.4	5286833	36.00	67301	23.4	0.00697	Yes	No	Conducted system checks, Global on site to vacuum out the EQ tank, backwash primary GAC vessel.
12/7/2020	GWTT	Yes	7	43	41	5	10	10	2	2	8	6.0	32.5	5390190	33.00	103357	17.9	0.00535	Yes	No	Conducted system checks and changed bag filters twice. Pumped backwash water through system.
12/11/2020	GWTT	Yes	11	44	42	8	14	14	6	3	10	6.0	33.1	5483045	33.00	92855	16.1	0.00481	Yes	No	Conducted system checks and changed bag filters.
12/15/2020	GWTT	Yes	15	45	45	10	18	18	9	5	15	5.0	31.4	5578819	34.00	95774	16.6	0.00496	Yes	No	Conducted system checks and changed bag filters. High level alarm in INF tank was active on arrival. Bag filters were impacted with iron.
12/18/2020	GWTT	Yes	18	45	39	18	25	25	16	4	18	7.0	32.8	5670557	28.00	91738	21.2	0.00633	Yes	No	Conducted system checks and changed bag filters. Increased flow rate through system.
12/21/2020	GWTT	Yes	21	41	38	8	20	20	6	4	16	8.0	--	5765668	41.00	95111	22.0	0.00656	Yes	Yes	Conducted system checks and changed bag filters.
12/24/2020	GWTT	Yes	24	48	41	16	26	26	14	3	22	7.0	28.7	5859505	38.00	93837	21.7	0.00648	Yes	No	Conducted system checks and changed bag filters. High level alarm in INF tank was active on arrival. Bag filters were impacted with iron.
12/28/2020	GWTT	Yes	28	45	41	23	31	31	20	4	25	6.0	26.3	5975018	38.00	115513	20.1	0.00598	Yes	No	Conducted system checks and changed bag filters.
Totals - December 2020[6,10]			31										31.1		34.8	779838	17.5	0.005			
1/1/2021	GWTT	Yes	1	48	42	22	33	33	20	3	30	5.0	23.7	6069850	26.00	94832	16.5	0.00365	Yes	No	Conducted system checks and changed bag filters.
1/4/2021	GWTT	Yes	4	46	37	28	27	27	16	5	24	6.0	22.4	6159356	33.00	89506	20.7	0.00459	Yes	No	Conducted system checks and changed bag filters.
1/8/2021	GWTT	Yes	8	48	40	18	30	30	18	2	24	5.0	21.6	6265900	30.00	106544	18.5	0.00410	Yes	No	Conducted system checks and changed bag filters.
1/11/2021	GWTT	Yes	11	42	26	26	25	24	22	6	22	7.0	17.1	6343500	30.00	77600	18.0	0.00398	Yes	No	Conducted system checks and changed bag filters. Took bag filter unit #3330 offline.
1/15/2021	GWTT	Yes	15	45	43	28	33	33	16	3	30	5.0	18.3	6425570	38.00	82070	14.2	0.00316	Yes	No	Conducted system checks and changed bag filters. Bag filter housing from unit #3330 was replaced.
1/18/2021	GWTT	Yes	18	44	42	16	8	8	13	3	9	9.0	22.0	6480181	32.00	54611	12.6	0.00280	Yes	No	Conducted system checks and changed bag filters. Pumped backwash water from GWTS #1 through system, then backwashed the primary carbon vessel. Bag filter housing from unit #3330 was replaced.
1/22/2021	GWTT	Yes	22	43	28	10	11	11	7	5	8	6.0	18.7	6561860	32.00	81679	14.2	0.00314	Yes	No	Conducted system checks and changed bag filters. Pumped contents of backwash from GWTS#1 through system.
1/25/2021	GWTT	Yes	25	43	26	12	16	16	9	5	12	6.0	15.6	6619040	29.00	57180	13.2	0.00293	Yes	No	Conducted system checks and changed bag filters.
1/29/2021	GWTT	Yes	29	44	28	14	19	19	10	5	16	6.0	15.9	6683438	27.00	64398	11.2	0.00248	Yes	No	Conducted system checks and changed bag filters.
Totals - January 2021[6,10]			31										19.5		30.8	708420	15.9	0.004			
2/2/2021	GWTT	Yes	2	44	26	16	14	14	15	6	10	5.0	13.2	6736550	30.00	53112	9.2	0.00438	Yes	No	Conducted system checks and changed bag filters.
2/5/2021	GWTT	Yes	5	44	24	16	19	19	13	5	16	6.0	11.6	6770434	30.00	33884	7.8	0.00372	Yes	No	Conducted system checks and changed bag filters.
2/8/2021	GWTT	Yes	8	44	25	18	21	21	16	6	18	6.0	9.5	6800133	27.00	29699	6.9	0.00326	Yes	No	Conducted system checks and changed bag filters.
2/12/2021	GWTT	Yes	12	44	28	17	21	21	14	5	18	6.0	10.0	6834311	26.00	34178	5.9	0.00282	Yes	No	Conducted system checks and changed bag filters.
2/19/2021	GWTT	Yes	19	44	23	20	21	21	17	6	18	6.0	6.3	6876800	26.00	42489	4.2	0.00200	Yes	No	Conducted system checks and changed bag filters.
2/22/2021	GWTT	Yes	22	--	30	12	--	--	7	4	--	--	5.7	6889638	11.00	12838	3.0	0.00141	No	Yes	Conducted system checks and changed bag filters. System shutdown on departure due to significant iron fouling in the EQ tank and in primary carbon vessel. GWTT and BETA decided to shut down GWTS #2 until a pump out of the tanks can be completed to reduce additional iron sedimentation in the carbon vessels. System was sampled on 2/23/2021.
Totals - February 2021[6,10]			22										10.9		25.0	206200	6.5	0.002			
3/1/2021	GWTT	No	--	--	--	--	--	--	--	--	--	--	--	6889715	--	--	--	--	--	--'	System off.
3/5/2021	GWTT	No	--	--	--	--	--	--	--	--	--	--	--	6889715	--	--	--	--	--	--'	Settled water from EQ tank pumped into System #1. Blue lay flat hose was replaced with hard hose at influent manifold.
3/8/2021	GWTT	No	--	--	--	--	--	--	--	--	--	--	--	6889715	--	--	--	--	--	--'	Flushed influent line into System #1.
3/12/2021	GWTT	No	1	42	8	7	6	6	4	3	4	3.0	24.2	6892375	36.00	2660	0.5	0.00012	Yes	Yes	Global Cycle on site to vacuum iron oxide sediments from the EQ tank, bag filter housings, and exterior totes. Both carbon vessels backwashed. Restarted system, conducted system checks, changed bag filters twice.
3/15/2021	GWTT	Yes	3	43	42	8	12	12	6	3	12	4.0	19.5	6978828	30.00	86453	20.0	0.00499	Yes	No	Conducted system checks and changed bag filters.
3/19/2021	GWTT	Yes	7	44	42	28	27	27	16	4	23	4.0	19.7	7074315	30.00	95487	16.6	0.00414	Yes	No	Conducted system checks and changed bag filters.
3/22/2021	GWTT	Yes	10	44	42	18	28	28	16	3	28	4.0	18.0	7129300	30.00	54985	12.7	0.00318	Yes	No	Conducted system checks and changed bag filters.
3/26/2021	GWTT	Yes	14	43	42	18	8	8	16	2	5	5.0	16.9	7197740	31.00	68440	11.9	0.00297	Yes	No	Conducted system checks and changed bag filters twice. Backwashed primary LGAC vessel. Reduced discharge to 30 GPM to reduce the amount of iron sludge carry over into LGAC vessels.
3/30/2021	GWTT	Yes	18	44	42	14	13	13	5	3	10	5.0	15.6	7286339	28.00	88599	15.4	0.00384	Yes	No	Conducted system checks and changed bag filters.
Totals - March 2021[6,10]			19										17.9		30.8	396624	14.5	0.002			
4/2/2021	GWTT	Yes	2	44	41	13	21	21	10	3	18	5.0	15.8	7350578	25.00	64239	14.9	0.00222	Yes	No	Conducted system checks and changed bag filters.
4/6/2021	GWTT	Yes	6	45	43	12	25	25	10	2	22	4.0	14.8	7400768	22.00	50190	8.7	0.00130	Yes	No	Conducted system checks and changed bag filters.
4/9/2021	GWTT	Yes	9	46	42	15	9	9	12	3	6	6.5	14.5	7451550	23.00	50782	11.8	0.00176	Yes	No	Conducted system checks, changed bag filters, and backwashed primary carbon vessel.
4/13/2021	GWTT	Yes	13	46	34	9	12	12	7	4	10	6.0	12.6	7536033	21.00	84483	14.7	0.00219	Yes	Yes	Conducted system checks and changed bag filters.
4/15/2021	GWTT	Yes	15	45	20	10	14	14	8	5	12	8.0	11.2	7576369	24.00	40336	14.0	0.00209	Yes	No	Conducted system checks and changed bag filters.
4/19/2021	GWTT	Yes	19	46	30	10	16	16	8	4	14	6.0	9.5	7645588	20.00	69219	12.0	0.00179	Yes	No	Conducted system checks and changed bag filters.
4/23/2021	GWTT	Yes	23	46	31	10	16	16	8	4	13	6.0	8.1	7706867	19.00	61279	10.6	0.00159	Yes	No	Conducted system checks and changed bag filters.
4/27/2021	GWTT	Yes	27	47	28	23	18	18	10	5	17	6.0	6.9	7759389	18.00	52522	9.1	0.00136	Yes	No	Conducted system checks and changed bag filters.
4/30/2021	GWTT	Yes	30	46	23	15	17	17	12	5	14	6.0	6.1	7793537	19.00	34148	7.9	0.00118	Yes	No	Conducted system checks and changed bag filters.
Totals - April 2021[6,10]			30										11.1		21.2	507198	11.7	0.002			
5/4/2021	GWTT	Yes	4	46	25	15	8	8	12	5	7	6.0	4.9	7831797	21.00	38260	6.6	0.00137	Yes	No	Conducted system checks and changed bag filters. Backwashed primary LGAC vessel.
5/7/2021	GWTT	Yes	7	46	25	15	9	9	8	8	7	7.0	4.2	7855288	23.00	23491	5.4	0.00112	Yes	No	Conducted system checks and changed bag filters.
5/10/2021	GWTT	Yes	10	44	36	4	13	13	2	2	10	9.0	21.4	7874795	29.00	19507	4.5	0.00093	Yes	No	Conducted system checks, changed bag filters, increased discharge/effluent flow rate.
5/14/2021	GWTT	Yes	14	46	43	6	40	7	4	3	12	8.0	21.9	7923831	26.00	49036	8.5	0.00175	Yes	Yes	Conducted system checks and changed bag filters twice
5/17/2021	GWTT	Yes	17	46	41	9	18	17	7	4	14	6.0	--	7968545	25.00	44714	10.4	0.00213	Yes	Yes	Conducted system checks and changed bag filters twice
5/21/2021	GWTT	Yes	21	50	43	10	20	19	8	2	18	7.0	20.3	8017370	24.00	93539	16.2	0.00334	Yes	No	Conducted system checks and changed bag filters.
5/25/2021	GWTT	No	25	50	41	15	22	22	12	3	20	6.0	18.8	8094614	20.00	77244	13.4	0.00276	Yes	No	Conducted system checks and changed bag filters. System in high pressure alarm on arrival due to iron fouling of bag filters.
5/28/2021	GWTT	Yes	28	50	41	15	24	24	13	3	21	6.0	16.5	8156940	25.00	62326	14.4	0.00297	Yes	No	Conducted system checks and changed bag filters. Backwashed primary LGAC vessel.
Totals - May 2021[6,10]			31										15.4		24.1	408117	9.1	0.002			

Notes:
1. GWTT - Groundwater Treatment Technologies
2. Pressure readings before filter bag changeout or if no changeout was done.
3. Influent flow is an instantaneous estimate of the flow rate from the submersible Well Pump at PRW-4.
4. During monthly reporting periods the net gallons are calculated from previous effluent totalizer readings. (Difference between the current totalizer reading - the last dated totalizer reading).
5. The Average effluent flow rate is calculated from the net gallons obtained from the system's effluent totalizer flow meter and days that the system was in operation.
6. The "Totals" shown (from left to right) include the, Total Days of System Operation, Average Instantaneous Influent Flow Rate, Average Instantaneous Effluent Flow Rate, Total Gallons Treated, Average Net Effluent Flow Rate, and Estimated PFAS Removed for the respective monthly reporting period.
7. Instantaneous influent flow rates are estimated by approximating 50% of the influent flow rate values calculated from GWPTS #1 (See Table 2A).
8. Instantaneous effluent flow rate estimated by stopwatch at totalizer meter.
9. Flow calculated based on gallons marking on EQ tank. Estimated flow rate = 25 GPM (i.e. flow is calculated based on an in-situ observation of flow into the EQ tank, and 100 gallons of groundwater flows into the EQ tank for a 4 minute duration.
10. The monthly totals represent the monthly IRA reporting period and the average effluent flow rates calculated from the first monitoring date are based on measurements from the last monitoring date of the previous reporting period.

Table 3 - Groundwater Elevation and Gauging Data 2018-2020
Barnstable Country Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Well ID	Location (From Academy)	Elev. (TOC) (Feet)	Groundwater Level from TOC (Feet) Date											Groundwater Elevation (Feet) Date										
			6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18-19/2020	5/11/2020	7/27/2020	10/20/2020	1/28/2021	5/19/2021	6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18-19/2020	5/11/2020	7/27/2020	10/20/2020	1/28/2021	5/19/2021
FS-1sa2	Academy	41.839	--	12.45	10.96	11.78	--	11.56	10.82	13.47	15.16	15.54	15.15	--	29.389	30.879	30.059	--	30.279	31.019	28.369	26.679	26.299	26.689
FS-1sA	Academy	41.769	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FS-1sC	Academy	41.915	--	--	--	--	--	--	--	--	--	15.43	--	--	--	--	--	--	--	--	--	--	--	--	--
HSW-1/HS-1(a)	Academy	40.012	--	9.62	8.78	8.02	11.67	9.45	7.9	12.33	14.37	13.31	13.04	--	30.392	31.232	31.992	28.342	30.562	32.112	27.682	25.642	26.702	26.972
HSW-6/HS-2(a)	Academy	39.305	9.37	10.39	8.02	8.02	10.76	8.74	8.63	10.67	13.36	12.61	12.35	29.935	28.915	31.285	31.285	28.545	30.565	30.675	28.635	25.945	26.695	26.955
OW-2D	Academy	37.36	--	7.91	6.39	6.39	8.76	7.00	6.20	6.94	11.75	10.78	10.60	--	29.45	30.97	30.97	28.6	30.36	31.16	30.42	25.61	26.58	26.76
OW-2S	Academy	37.532	--	8.33	6.22	7.93	9.59	7.65	6.98	9.54	12.52	11.49	11.3	--	29.202	31.312	29.602	27.942	29.882	30.552	27.992	25.012	26.042	26.232
OW-4	Not Located	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW-8A	Academy	42.471	12.33	12.21	11.75	12.59	14.37	12.4	11.57	14.26	16.91	16.19	15.94	30.141	30.261	30.721	29.881	28.101	30.071	30.901	28.211	25.561	26.281	26.531
OW-8i	Academy	42.579	--	--	--	--	--	--	--	--	17.01	16.15	--	--	--	--	--	--	--	--	--	25.569	26.429	--
PFW-1	Academy	41.83	11.67	12.53	11.02	11.83	13.78	11.65	10.84	13.54	16.25	15.54	15.19	30.16	29.3	30.81	30	28.05	30.18	30.99	28.29	25.58	26.29	26.64
PFW-2	Academy	40.019	--	10.44	8.95	9.72	11.53	9.6	8.77	11.48	15.21	13.48	13.05	--	29.579	31.069	30.299	28.489	30.419	31.249	28.539	24.809	26.539	26.969
PFW-3	Academy	37.832	--	8.2	6.67	7.5	9.29	7.32	6.5	9.25	12.00	11.14	10.92	--	29.632	31.162	30.332	28.542	30.512	31.332	28.582	25.832	26.692	26.912
PFW-4	Academy	39.344	--	9.78	8.21	9.07	10.98	8.84	8.03	10.81	14.5	12.69	12.45	--	29.564	31.134	30.274	28.364	30.504	31.314	28.534	24.844	26.654	26.894
PFW-5	Academy	42.017	--	12.38	11.29	11.79	13.56	11.55	10.77	13.48	16.15	15.38	15.11	--	29.637	30.727	30.227	28.457	30.467	31.247	28.537	25.867	26.637	26.907
PFW-6	Academy	40.577	--	11.23	9.75	10.59	--	10.4	9.59	12.28	14.94	14.26	13.98	--	29.347	30.827	29.987	--	30.177	30.987	28.297	25.637	26.317	26.597
MW-1	Adjacent Academy	42.584	--	--	12.06	12.54	14.46	12.35	11.54	14.19	16.92	16.22	15.9	--	--	20.79	30.044	28.124	30.234	31.044	28.394	25.664	26.364	26.684
MW-2	Adjacent Academy	42.72	--	--	--	--	14.79	12.7	11.82	14.56	17.24	16.56	16.25	--	--	--	--	27.93	30.02	30.9	28.16	25.48	26.16	26.47
MW-3D	Adjacent Academy	43.654	--	--	--	--	--	--	--	--	17.61	16.91	16.55	--	--	--	--	--	--	--	--	26.044	26.744	27.104
MW-3i	Adjacent Academy	43.823	--	13.8	12.31	13.14	15.04	--	--	--	17.49	16.84	--	--	29.24	30.73	29.9	28.783	--	--	--	26.333	26.983	--
MW-3S	Adjacent Academy -SE	43.535	--	13.64	12.17	12.99	14.89	12.8	11.99	14.69	17.39	16.65	16.35	--	29.22	30.75	29.93	28.645	30.735	31.545	28.845	26.145	26.885	27.185
MW-6	Adjacent Academy -SE	41.432	--	--	--	--	13.58	11.4	10.61	13.24	--	15.3	15.0	--	--	--	--	27.852	30.032	30.822	28.192	--	--	--
MW-7	Adjacent Academy -SE	43.126	--	--	12.8	13.6	15.59	13.42	12.63	15.24	dry	17.33	17.0	--	--	30.326	27.536	27.536	29.706	30.496	27.886	dry	25.796	26.126
MW-8	Adjacent Academy -SE	48.721	--	--	13.46	14.28	16.22	--	13.29	--	dry	dry	--	--	--	35.261	34.441	32.501	--	--	--	--	dry	dry
MW-8C	Adjacent Academy -SE	43.992	--	--	--	--	--	14.1	--	--	dry	17.96	17.6	--	--	--	--	--	--	--	--	--	26.032	26.392
MW-9D (not viable)	Adjacent Academy -SE	45.079	--	--	14.21	--	17.08	14.9	--	--	19.44	--	--	--	--	30.869	--	27.999	30.179	--	--	--	--	--
MW-9S	Adjacent Academy -SE	44.629	--	--	--	--	--	--	--	--	--	18.84	--	--	--	--	--	--	--	--	--	--	25.789	--
MW-10	Adjacent Academy	44.212	--	14.85	13.43	14.26	16.23	14.06	13.26	15.92	dry	dry	17.53	--	29.362	30.782	29.952	27.982	30.152	30.952	28.292	--	dry	26.682
MW-10D	Adjacent Academy/Des	NS	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-10S	Adjacent Academy/Des	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-11	Adjacent Academy/Des	NS	--	--	--	--	15.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-12s	DG -E	43.421	14.62	14.76	13.3	14.29	16.1	13.94	13.2	15.8	18.32	17.94	17.6	28.801	28.661	30.121	29.131	27.321	29.481	30.221	27.621	25.101	25.481	25.821
MW-12i	DG -E	43.448	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-13	DG -E	43.404	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-15D	DG -E	43.591	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-15S	DG -E	43.458	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-17	DG -E	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-19A	DG- NE	44.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-19B	DG- NE	44.146	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-21	DG-NE	41.23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-22	DG-NE	43.46	14.3	15.06	13.5	14.4	16.35	14.13	13.32	15.9	18.46	18.23	17.22	29.16	28.4	29.96	29.06	27.11	29.33	30.14	27.56	25.00	25.23	26.24
MW-23	DG-NE	49.491	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-27	DG-NE	41.909	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-28S	DG- NE	41.413	--	--	--	--	12.95	10.9	10.1	12.77	15.41	14.75	14.6	--	--	--	--	28.463	30.513	31.313	28.643	26.003	26.663	26.813
MW-28D (abandoned	DG- NE	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-32	DG- NE	41.984	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-33	DG- NE	52.612	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-35I	DG- NE	52.265	--	27.32	--	--	29.08	--	--	--	28.39	--	--	--	24.945	--	--	23.185	--	--	--	23.875	--	--
MW-35s	DG- NE	52.557	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-35D	DG- NE	52.481	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-36A	DG- NE	58.548	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-36B	DG- NE	58.498	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-36D	DG- NE	58.43	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-37D	DG-E	46.862	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-37I	DG-E	46.875	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-37s	DG-E	47.046	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-99I	DG-E - North of PRW-4	49.98	--	--	--	--	22.94	--	--	--	--	--	--	--	--	--	--	27.04	--	--	--	--	--	--
PC-0	DG-SE	58.276	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-1	DG-SE	54.57	26.14	26.81	25.36	26.22	28.34	26	25.24	27.88	30.41	--	29.45	28.43	27.76	29.21	28.35	26.23	28.57	29.33	26.69	24.16	--	--
PC-2	DG-SE	51.776	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-3	DG-SE	52.047	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-4	DG-SE	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-5	DG-SE	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-6A	DG- Far east	59.322	31.05	31.52	30.13	31	33.2	30.89	30.2	32.9	35.21	35.13	34.21	28.272	27.802	29.192	28.322	26.122	28.432	29.122	26.422	24.112	24.192	25.112
PC-7	DG- Far east	57.612	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-8	DG- Far east	56.881	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-9	DG- Far east /fair condi	43.278	--	17.3	--	--	19.1	--	--	--	21.14	--	--	--	25.978	--	--	24.178	--	--	--	22.138	--	--
PC-10	DG- Far east	51.099	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-11	DG- Far east	55.515	27.25	27.7	26.35	27.18	29.35	27	26.3	28.78	31.17	31.17	30.3	28.265	27.815	29.165	26.165	27.25	27.7	26.35	29.35	28.265	27.815	29.165
PC-12	DG- Far east	54.676	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-13	DG- Far east	49.386	--	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--	--
PC-14	DG- Far east	48.022	--	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--	--
PC-15 (not viable)	DG- Far east	53.467	--	--	--	--	29.22	--	--	--	--	--		--	--	--	--	24.247	--	--	--	--	--	--
PC -16D	DG- Far east	56.276	29.53	29.75	28.4	29.35	31.4	29.15	28.4	30.68	32.85	33.46	32.39	26.746	26.526	27.876	26.926	24.876	27.126	27.876	25.596	23.426	22.816	23.886
PC -16S	DG- Far east	56.073	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-17	DG- Far east	55.616	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-18	DG- Far east	55.342	--	28.67	--	--	30.4	--	--	--	32.1	--	--	--	26.672	--	--	24.942	--	--	--	23.242	--	--
PC-19	DG- Far east	55.484	--	--	--	--	29.1	--	--	--	--	--	--	--	--	--	--	26.384	--	--	--	--	--	--
PC-20	DG- Far east	57.126	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-21	DG- Far east	54.807	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-22	DG- Far east	44.482	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-23D	DG- Far east	42.433	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-23s	DG- Far east	41.275	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-24	DG- Far east	50.022	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-25	DG- Far east	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-26	DG- Far east	58.338	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-28	DG- Far east	40.895	--	15.85	13.59	13.53	16.7	14.65	13.79	16.88	18.77	18.98	17.99	--	25.045	27.305	27.365	24.195	26.245	27.105	24.015	22.125	21.915	22.905
PC-29	DG- Far east	42.169	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-30	DG- Far east	57.484	30	30.33	29.95	29.95	32.11	29.85	29.08	29.74	33.85	34.14	32.12	27.484	27.154	27.534	27.534	25.374	27.634	28.404	27.744	23.634	23.344	25.364
PC-31	DG- Far east	59.337	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-32	DG- Far east	56.901	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-33	DG- Far east	55.463	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 3 - Groundwater Elevation and Gauging Data 2018-2020
Barnstable Country Fire and Rescue Training Academy
155 Flint Rock Road, Barnstable, MA
RTN 4-26179

Well ID	Location (From Academy)	Elev. (TOC) (Feet)	Groundwater Level from TOC (Feet) Date											Groundwater Elevation (Feet) Date										
			6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18-19/2020	5/11/2020	7/27/2020	10/20/2020	1/28/2021	5/19/2021	6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18-19/2020	5/11/2020	7/27/2020	10/20/2020	1/28/2021	5/19/2021
PC-34S	Adjacent to Academy-S	37.544	--	--	6.42	7.26	9.26	7.2	6.35	9.08	12.12	11.07	10.8	--	--	31.124	30.284	28.284	30.344	31.194	28.464	25.424	26.474	26.744
PC-34D	Adjacent to Academy-S	38.278	--	--	--	--	9.84	7.79	6.21	8.89	12.35	11.64	11.32	--	--	--	--	28.438	30.488	32.068	29.388	25.928	26.638	26.958
PC-35S	Adjacent to Academy-S	37.544	--	--	6.42	7.26	9.26	7.2	6.35	9.08	12.12	11.07	10.8	--	--	31.124	30.284	28.284	30.344	31.194	28.464	25.424	26.474	26.744
PC-35D	Adjacent to Academy-S	38.201	--	--	--	--	9.62	7.55	6.73	9.41	12.35	11.43	11.11	--	--	--	--	28.581	30.651	31.471	28.791	25.851	26.771	27.091
PC-36S	Adjacent to Academy-S	46.163	--	16.7	--	--	18.15	--	--	--	20.45	--	--	--	29.463	--	--	28.013	--	--	--	25.713	--	--
PC-36D	Adjacent to Academy-S	46.008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PC-37	Adjacent to Academy-S	33.732	--	4.0	2.48	3.33	4.94	3.05	2.24	5.03	7.72	6.95	6.69	--	29.7	31.3	30.4	28.792	30.682	31.492	28.702	26.012	26.782	27.042
PC-38	Adjacent to Academy-S	58.266	--	--	--	--	32.28	--	29.28	32.07	34.5	34.15	--	--	--	--	--	25.986	--	28.986	26.196	23.766	24.116	--
PC-39	Adjacent to Academy-S	55.511	--	--	--	--	--	25.89	--	--	--	--	--	--	--	--	--	--	29.621	--	--	--	--	--
HW-1D	Mary Dunn Pond (DG)	30.685	--	4.22	--	--	6.07	--	--	--	8.2	--	--	--	26.5	--	--	24.62	--	--	--	22.49	--	--
HW-1S	Mary Dunn Pond (DG)	30.095	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
W-9	Not Located	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRW-1	Recovery Well -OFF	57.488	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRW-2	Recovery Well -OFF	39.782	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRW-3	Recovery Well -OFF	42.769	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRW-4	Recovery Well -ON	57.639	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RW-1	Recovery Well	44.815	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TW80-9	Pezometer- West of FP	36.594	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WH-2D	Mary Dunn Pond (DG)	33.263	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WH-2S	Mary Dunn Pond (DG)	33.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WS-101	Mary Dunn Pond (DG)	36.529	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pond	Pond Edge[9]	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	29.23	26.142	--	--
Pond Gauge [5]	Flintrock Pond	30.97	--	--	4.5	3.8	--	4.35	--	--	--	--	--	--	--	35.47	34.77	--	35.32	--	--	--	--	--

Notes:
1. '-- : Indicates monitoring well has not been surveyed and/or is not gauged regularly.
2. DG: Downgradient
3. All monitoring wells located on the Academy property were surveyed in 2018.
4. Monitoring wells located off Academy property were surveyed in 2007 by Cape Cod Commission.
5. Pond Gauge was installed in April 2019.
6. NS- Not Surveyed; unable to locate, not deemed a viable well.
7. NA- Not Available; survey data is unavailable as it's being re-evaluated.
8. Well IDs and Location displayed in gray indicate the well has been abandoned or destroyed.
9. The Pond Edge elevation was collected during a simple survey on 7/27/2020 of Flintrock Pond water's edge. Monitoring well PFW-4 was utilized as a benchmark.

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	HSW-6/HS-2(a)														HSW-1/HS-1(a)											
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	1/21/2016	3/30/2016	8/11/2016	4/10/2017	7/27/2017	11/17/2017	2/9/2018	6/26/2018	1/9/2019	10/28/2019	7/28/2020	10/20/2020	1/26/2021	5/20/2021	1/21/2016	8/11/2016	4/10/2017	7/27/2017	11/17/2017	2/9/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18/2020	5/11/2020
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																												
PFOS	70	20	77,000	320,000	41,000	28,000	21,000	45,000	25,000	950	1,300	3,600	2,300	5,700	2,800	2,700	110,000	56,000	38,000	24,000	25,000	13,000	1,800	2,000	1,100	1,800	740	1,300
PFOA	70	20	--	--	--	660	--	320	160	15	94	79	80	48	320	180	--	--	1,000	350	1,300	320	840	100	64	46	36	100
PFNA	NE	20	--	--	--	--	--	--	--	BRL (<87)	26	46	40	52	35	47	--	--	--	--	--	--	43	65	43	33	22	57
PFHxS	NE	20	--	--	--	--	--	--	--	26	140	310	350	71	1,400	440	--	--	--	--	--	--	1,700	300	170	150	66	300
PFHpA	NE	20	--	--	--	--	--	--	--	15	66	100	69	56	640	150	--	--	--	--	--	--	510	67	52	43	32	63
PFDA	NE	20	--	--	--	--	--	--	--	--	--	30	18	23	21	19	--	--	--	--	--	--	--	55	19	13	9.1	37
TOTAL 2s PFAS	70	20	77,000	320,000	41,000	28,660	21,000	45,320	25,160	1,006	1,626	1,626	2,857	5,950	5,216	3,536	110,000	56,000	39,000	24,350	26,300	13,320	4,893	2,587	1,448	2,085	905	1,857

Notes:

1. Prior to June 11, 2018, the USEPA established the EPA Health Advisory for two PFAS chemicals, PFOA and PFOS, which was 70 ng/L. Subsequently, MassDEP's Office of Research and Standards (ORS) expanded on this Health Advisory and created the ORS Guideline that applies to the total summed of five PFAS chemicals, PFOS, PFOA, PFNA, PFHxS, and PFHpA, effective June 11, 2018.

2. The USEPA and MassDEP ORS Guideline applies to five PFAS chemicals of concern (PFOS, PFOA, PFNA, PFHpA, and PFHxS) individually as well as the sum of the five PFAS of concern.

3. The complete PFAS concentration data set collected from PRW-4 is detailed in the data table titled "Summary of Groundwater Pump and Treatment System PFOS/PFOA Analytical Data. Data presented herein is summarized and data was selected based on quarterly sampling events.

4. (--) Concentrations of the three additional PFAS chemicals, PFNA, PFHxS, and PFHpA were not presented until after the MassDEP ORS Guideline was in effect on 06.11.18. PFAS concentrations were regulated by the USEPA Health Advisory prior to 6.11.18. Concentrations of PFDA were not presented prior to April 19, 2019. MassDEP released drafted Method 1 groundwater risk standards for PFAS on April 19, 2019 that applies to the total sum and individual concentrations of six PFAS compounds (PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFDA) , which is 20 ng/L. These drafted groundwater standards were finalized and became effective on December 27, 2019.

5. BRL - Below Laboratory Detection Limits

6. Concentrations presented in ng/L - nanograms per Liter - parts per trillion

7. Concentrations in bold exceed applicable Health Advisory Limit or Method 1 GW-1 Standard

8. PFOS - Perfluorooctanesulfonate

9. PFOA - Perfluorooctanoic Acid

10. PFNA - Perfluorononanoic Acid

11. PFHxS - Perfluorohexanesulfonic Acid

12. PFHpA - Perfluoroheptanoic Acid

13. PFDA - Perfluorodecanoic Acid

14. NA - Concentration data not available

15. Monitoring well HS-1, HS-2, HS-2S, and HS-6 were destroyed or removed during soil removal activities in January 2017 as part of an Immediate Response Action Plan. The well was replaced with HSW-1/HS-1a as post-excavation activities.

16. Monitoring well HW-1D is a downgradient well located on the north side of Mary Dunn Pond.

17. NE- Not Established

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	HS-1 [15]		HS-6 [15]	HS-2 [15]	HS-2S [15]		PFW-1																	
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	8/11/2016	12/8/2016	8/11/2016	7/27/2017	8/18/2016	5/3/2017	4/1/2015	10/7/2015	3/8/2016	3/30/2016	8/11/2016	4/10/2017	2/9/2018	6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18/2020	5/11/2020	7/28/2020	10/20/2020	1/26/2021	5/20/2021
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																										
PFOS	70	20	56,000	36,000	41,000	21,000	300	150	8,400	60,000	7,000	56,000	3,500	4,100	8,100	76,000	38,000	20,000	24,000	16,000	22,000	6,000	5,200	4,000	3,400	3,100
PFOA	70	20	460	1,800	450	370	BRL (<5.3)	8.2	360	800	--	--	--	--	470	1,500	160	300	560	130	220	250	210	110	150	160
PFNA	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	--	3,900	330	360	210	570	230	94	110	80	94	66
PFHxS	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	--	7,400	960	1,500	4,800	910	1,000	890	820	450	750	750
PFHpA	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	--	610	140	290	500	150	200	220	160	82	200	250
PFDA	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	110	160	120	200	81	89	37	69	45
TOTAL 2s PFAS	70	20	56,460	37,800	41,450	21,370	300	158	8,760	60,800	7,000	56000	3500	4,100	8,570	89,410	39,590	22,560	30,230	17,880	23,850	7,535	6,589	4,759	4,663	4,371

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PFW-2															PFW-3		
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	4/1/2015	6/18/2015	10/27/2015	1/21/2016	3/30/2016	8/11/2016	12/8/2016	4/10/2017	7/27/2017	11/17/2017	2/9/2018	1/9/2019	10/28/2019	5/11/2020	10/20/2020	4/1/2015	10/15/2015	4/18/2017
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																				
PFOS	70	20	220,000	200,000	32,000	39,000	120,000	65,000	13,000	17,000	73,000	25,000	32,000	5,200	2,100	690	1,700	2,700	3,800	3,400
PFOA	70	20	5200	BRL(<800)	--	1,100	2,100	--	--	970	910	400	400	720	74	48	30	140	170	230
PFNA	NE	20	--	--	--	--	--	--	--	--	--	--	--	110	64	39	52	--	--	--
PFHxS	NE	20	--	--	--	--	--	--	--	--	--	--	--	1,800	230	140	71	--	--	--
PFHpA	NE	20	--	--	--	--	--	--	--	--	--	--	--	470	68	45	31	--	--	--
PFDA	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	27	14	23	--	--	--
TOTAL 13 PFAS	70	20	225,200	200,000	32,000	40,100	122,100	65,000	13,000	17,970	73,910	25,400	32,400	8,300	2,563	976	1,907	2,840	3,970	3,630

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PFW-5												PFW-6					PRW-1	PRW-4 [3]						
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	3/31/2015	4/11/2017	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18/2020	5/11/2020	7/28/2020	10/20/2020	1/26/2021	5/19/2020	4/1/2015	3/8/2016	4/18/2016	1/9/2019	10/10/2020	4/1/2015	4/1/2015	8/4/2015	11/12/2015	1/6/2016	4/28/2016	8/11/2016	11/16/2016
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																											
PFOS	70	20	2,700	2,100	1,100	1,900	1,600	2,400	1,000	1,200	980	1,500	1,200	1,200	3,400	2,400	850	1,500	810	1,600	760	5,900	9,000	7,600	6,300	9,500	5,400
PFOA	70	20	250	170	64	150	120	26	88	120	100	120	84	120	350	470	19	400	70	150	60	550	BRL (<2000)	260	BRL (<200)	210	99
PFNA	NE	20	--	--	BRL (<8.7)	25	16	BRL (<4.9)	11	22	15	29	32	27	--	--	--	140	63	--	--	--	--	--	--	--	--
PFHxS	NE	20	--	--	240	680	630	260	360	720	610	420	310	790	--	--	--	1,100	150	--	--	--	--	--	--	--	--
PFHpA	NE	20	--	--	30	82	54	22	56	66	44	60	80	110	--	--	--	220	170	--	--	--	--	--	--	--	--
PFDA	NE	20	--	--	--	12	11	BRL (<4.1)	10	13	11	16	5	7.0	--	--	--	--	3.9	--	--	--	--	--	--	--	--
TOTAL 2s PFAS	70	20	2,950	2,270	1,434	2,849	2,431	2,708	1,525	2,141	1,760	2,145	1,711	2,254	3,750	2,870	869	3,360	1,263	1,750	820	6,450	9,000	7,860	6,300	9,710	5,499

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PRW-4 [3]							PC-0		PC-1															
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	1/4/2017	4/19/2017	8/28/2017	11/20/2017	2/14/2018	4/9/2018	6/14/2018	4/2/2015	4/24/2017	8/20/2014	6/17/2015	10/7/2015	3/30/2016	4/24/2017	2/6/2018	6/26/2018	1/11/2019	4/24/2019	7/23/2019	10/29/2019	2/19/2020	5/12/2020	7/28/2020	10/22/2020	1/27/2021	5/20/2021
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																												
PFOS	70	20	4,900	3,200	2,900	2,000	2,100	2,600	2,800	110	930	320	48,000	2,000	56,000	5,700	9,000	10,000	1,700	8,000	4,300	1,600	1,700	1,700	1,900	1,200	1,500	1,500
PFOA	70	20	95	110	100	64	27	79	120	BRL (<20)	58	--	1,100	BRL (<800)	1,200	--	370	190	140	300	150	72	180	110	63	110	59	49
PFNA	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	140	62	150	140	75	70	110	58	100	52	72
PFHxS	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	850	380	650	430	380	450	400	240	350	190	230
PFHpA	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	200	200	180	230	150	240	150	98	190	76	83
PFDA	NE	20	--	--	--	--	--	--	--											78	67	19	20	28	36	27	26	15
TOTAL 2s PFAS	70	20	4,995	3,310	3,000	2,064	2,127	2,679	2,920	110	988	320	49,100	2,000	57,200	5,700	9,370	11,380	2,482	9,358	5,317	2,296	2,660	2,498	2,395	1,977	1,903	1,949

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PC-2		PC-3		PC-4		PC-6A													PC-7					PC-8				
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	6/17/2015	4/24/2017	8/20/2014	6/17/2015	6/17/2015	3/8/2016	3/9/2016	4/27/2017	6/26/2018	1/10/2019	4/24/2019	7/23/2019	10/29/2019	2/19/2020	5/12/2020	7/29/2020	10/21/2020	1/27/2021	5/20/2021	4/2/2015	6/17/2015	10/7/2015	3/8/2016	4/27/2017	6/17/2015	10/7/2015	3/8/2016	4/24/2017	2/6/2018
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																															
PFOS	70	20	3,800	2,200	3,100	4,700	2,200	4,600	1,300	3,200	1,300	1,800	1,900	940	1,100	1,600	86	1,300	920	1,100	920	17,000	500	700	1,700	2,900	15,000	500	1,600	36,000	1,000
PFOA	70	20	220	110	180	200	79	160	110	150	60	30	68	33	62	67	4.1	37	28	35	31	3,500	27	98	140	130	2,800	370	97	--	71
PFNA	NE	20	--	--	--	--	--	--	--	--	55	25	60	36	48	65	3.8	44	44	58	45	--	--	--	--	--	--	--	--	--	--
PFHxS	NE	20	--	--	--	--	--	--	--	--	300	190	310	150	290	180	23	99	71	83	72	--	--	--	--	--	--	--	--	--	--
PFHpA	NE	20	--	--	--	--	--	--	--	--	75	37	83	45	86	71	9	43	37	43	42	--	--	--	--	--	--	--	--	--	--
PFDA	NE	20											10	BRL (<4.1)	7.4	5.9	0.7	11.0	12.0	12.0	11							--	--	--	--
TOTAL 2s PFAS	70	20	4,020	2,310	3,280	4,900	2,279	4,760	1,410	3,350	1,790	2,082	2,431	1,204	1,593	1,989	127	1,534	1,112	1,331	1,121	20,500	527	798	1,840	3,030	17800	870	1697	36000	1071

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PC-9								PC-10		PC-11														PC-12		
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	4/1/2015	10/7/2015	3/9/2016	3/30/2016	4/28/2017	1/10/2019	10/30/2019	10/21/2020	4/6/2015	4/28/2017	4/2/2015	5/12/2016	4/24/2017	2/6/2018	6/26/2018	1/10/2019	4/24/2019	7/23/2019	10/29/2019	2/19/2020	5/12/2020	7/29/2020	10/21/2020	1/27/2021	5/19/2021	6/17/2015	5/12/2016	4/26/2017
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																														
PFOS	70	20	580	510	5,300	8,100	280	1,700	2,300	1,400	790	560	4,400	32,000	3,600	4,000	9,600	14,000	200,000	68,000	22,000	18,000	12,000	9,500	7,200	2,700	2,100	1,300	1,700	1,600
PFOA	70	20	30	40	1,200	1,600	31	64	100	66	50	67	550	430	250	180	250	410	640	BRL (<240)	150	290	140	130	150	78	59	140	150	150
PFNA	NE	20	--	--	--	--	--	53	90	88	--	--	--	--	--	--	230	190	1,700	540	320	140	130	110	100	74	69	--	--	--
PFHxS	NE	20	--	--	--	--	--	360	420	200	--	--	--	--	--	--	1,500	1,500	2,400	1,200	800	1,300	720	610	640	250	170	--	--	--
PFHpA	NE	20	--	--	--	--	--	81	120	77	--	--	--	--	--	--	200	310	210	BRL (<210)	160	210	140	130	160	92	65	--	--	--
PFDA	NE	20	--	--	--	--	--	--	15	11	--	--	--	--	--	--	--	--	450	BRL (<260)	73	69	56	55	52	69	32	--	--	--
TOTAL 2s PFAS	70	20	610	550	6500	9700	311	2258	3030	1,842	840	627	4950	32430	3850	4180	11,780	16,410	204,950	69,740	23,503	20,009	13,186	10,535	8,302	3,263	2,495	1440	1850	1750

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PC-13		PC-14			PC-15			PC-16d													
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	6/17/2015	4/24/2017	8/20/2014	3/30/2016	4/28/2017	4/2/2015	4/28/2017	10/30/2019	4/2/2015	10/7/2015	2/6/2018	6/26/2018	1/10/2019	4/24/2019	7/23/2019	10/29/2019	2/19/2020	5/12/2020	7/28/2020	10/21/2020	1/27/2021	5/20/2021
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																								
PFOS	70	20	2,400	2,800	550	2,100	1,600	1,300	780	970	700	560	980	1,900	1,600	2,000	1,400	1,300	1,600	1,200	930	1,900	690	1,200
PFOA	70	20	280	170	40	250	160	100	80	55	70	84	64	150	9.3	140	33	75	130	57	99	99	46	70
PFNA	NE	20	--	--	--	--	--	--	--	52	--	--	--	100	BRL (<8.7)	110	36	79	110	63	49	62	48	83
PFHxS	NE	20	--	--	--	--	--	--	--	290	--	--	--	670	60	520	270	220	360	170	260	280	110	16
PFHpA	NE	20	--	--	--	--	--	--	--	77	--	--	--	170	13	140	74	80	92	61	68	63	54	47
PFDA	NE	20	--	--	--	--	--	--	--	4.9	--	--	--	--	--	8.7	BRL (<4.1)	7.2	7.2	8.5	11	11	5	9.2
TOTAL 13 PFAS	70	20	2680	2,970	590	2,350	1,760	1,400	860	1,444	770	644	1044	2,990	1,682	2,919	1,813	1,761	2,299	1,560	1,417	2,415	953	1,425

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PC-17			PC-18							PC-19				PC-20D	PC-21D	PC-22	
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	8/20/2014	10/7/2015	2/6/2018	6/17/2015	10/7/2015	4/27/2017	2/6/2018	1/10/2019	10/29/2019	10/21/2020	4/2/2015	3/30/2016	4/27/2017	10/30/2019	3/9/2016	3/9/2016	4/2/2015	4/28/2017
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																				
PFOS	70	20	140	230	140	1,200	900	580	890	1,500	1,500	330	3,300	1,600	2,000	1,900	3,200	230	1,200	1,400
PFOA	70	20	BRL	24	17	110	590	--	70	110	75	18	260	120	290	170	200	19	100	170
PFNA	NE	20	--	--	--	--	--	--	--	130	79	20	--	--	--	130	--	--	--	--
PFHxS	NE	20	--	--	--	--	--	--	--	540	220	57	--	--	--	450	--	--	--	--
PFHpA	NE	20	--	--	--	--	--	--	--	140	80	21	--	--	--	95	--	--	--	--
PFDA	NE	20	--	--	--	--	--	--	--	--	7.2	6.8	--	--	--	14	--	--	--	--
TOTAL 2s PFAS	70	20	140	254	157	1310	1490	580	960	2420	1,954	453	3560	1720	2290	2745	3,400	249	1300	1,570

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PC-23D	PC-24		PC-25	PC-26				PC-28											
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	6/17/2015	3/30/2016	4/28/2017	6/17/2015	6/17/2015	10/8/2015	3/8/2016	4/24/2017	3/9/2016	4/28/2017	1/10/2019	4/24/2019	7/23/2019	10/28/2019	2/19/2020	5/12/2020	7/29/2020	10/21/2020	1/27/2021	5/20/2021
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																						
PFOS	70	20	1,000	420	320	2,300	1,000	1,900	1,200	380	400	770	38	18	82	270	270	430	200	1,100	1,200	820
PFOA	70	20	73	22	33	260	210	190	98	21	27	61	BRL (<3.3)	BRL (<7.4)	190	12	BRL (<7.4)	18	12	65	48	22
PFNA	NE	20	--	--	--	--	--	--	--	--	--	--	BRL (<8.7)	BRL (<4.9)	BRL (<4.9)	9	BRL (<4.9)	15	10	49	61	33
PFHxS	NE	20	--	--	--	--	--	--	--	--	--	--	17	15	30	94	72	120	71	230	170	110
PFHpA	NE	20	--	--	--	--	--	--	--	--	--	--	20	24	25	33	23	41	30	89	66	45
PFDA	NE	20	--	--	--	--	--	--	--	--	--	--	--	BRL (<4.1)	BRL (<4.1)	BRL (<4.1)	BRL (<4.1)	2.2	BRL (<4.1)	8	10	5.6
TOTAL 13 PFAS	70	20	1073	442	353	2,560	1,210	2,090	1,298	401	427	831	75	57	327	418	365	626	323	1,541	1,555	1,036

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PC-29	PC-30														PC-31		PC-32		PC-33		PC-34S	PC-34D	
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	4/28/2017	3/9/2016	4/27/2017	2/6/2018	6/26/2018	1/10/2019	4/24/2019	7/23/2019	10/29/2019	2/19/2020	5/12/2020	7/29/2020	10/21/2020	1/27/2021	5/20/2021	3/8/2016	4/27/2017	3/30/2016	4/27/2017	3/30/2016	4/27/2017	4/14/2016	4/14/2016	4/28/2017
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																										
PFOS	70	20	1,400	980	2,500	1,900	1,600	2,200	1,200	4,300	960	1,200	880	1,100	850	580	540	1,200	12,000	1,200	960	2,700	2,100	1,300	1,400	1,500
PFOA	70	20	BRL (<4.6)	88	--	98	99	85	85	79	55	130	45	38	32	48	26	110	160	130	54	250	210	72	150	130
PFNA	NE	20	--	--	--	--	--	80	88	100	100	61	74	45	57	40	24	40	--	--	--	--	--	--	--	--	--
PFHxS	NE	20	--	--	--	--	--	510	390	340	300	220	210	180	120	100	76	64	--	--	--	--	--	--	--	--	--
PFHpA	NE	20	--	--	--	--	--	130	110	110	96	71	87	80	48	47	47	40	--	--	--	--	--	--	--	--	--
PFDA	NE	20	--	--	--	--	--	--	--	12	BRL (<4.1)	6	5.9	8.2	7.7	6.2	5.3	5.2	--	--	--	--	--	--	--	--	--
TOTAL 2s PFAS	70	20	1400	1068	2500	1998	2,419	2,873	1,847	4,875	1,373	1,707	1,238	1,371	1,075	780	715	1310	12160	1330	1014	2950	2310	1372	1550	1630

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	PC-35S	PC-35D		PC-36S				PC-36D		PC-37	PC-38							PC-39		MW-1			MW-3S	
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	4/14/2016	4/14/2016	4/28/2017	4/14/2016	1/11/2019	10/29/2019	10/22/2020	4/14/2016	4/24/2017	4/10/2017	4/24/2017	10/29/2019	5/12/2020	7/28/2020	10/21/2020	1/27/2021	5/20/2021	4/24/2017	2/19/2020	11/22/2013	6/3/2014	4/28/2017	6/3/2014	8/18/2016
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																										
PFOS	70	20	1,700	2,000	1,700	35	64	1,200	700	3,100	2,500	45	BRL (<2.6)	BRL (<5.2)	4.5	BRL (<5.2)	BRL (<5.7)	3	BRL (<5.7)	1,200	820	3,900	4,400	2,600	4,900	1,900
PFOA	70	20	130	140	97	BRL (<5.3)	BRL (<3.3)	54	36	150	120	BRL (<20)	BRL (<4.6)	BRL (<7.4)	BRL (<0.23)	BRL (<7.4)	BRL (<5.0)	BRL (<2.0)	BRL (<5.0)	46	28	320	880	290	530	690
PFNA	NE	20	--	--	--	--	BRL (<8.7)	80	57	--	--	--	--	BRL (<4.9)	BRL (<0.48)	BRL (<4.9)	BRL (<5.1)	BRL (<2.0)	BRL (<5.1)	--	61	--	--	--	--	--
PFHxS	NE	20	--	--	--	--	38	120	79	--	--	--	--	6	2.2	BRL (<5.2)	BRL (<4.4)	2	BRL (<4.4)	--	100	--	--	--	--	--
PFHpA	NE	20	--	--	--	--	BRL (<7.4)	62	42	--	--	--	--	BRL (<7.1)	BRL (<0.37)	BRL (<7.1)	BRL (<6.7)	BRL (<2.0)	BRL (<6.7)	--	28	--	--	--	--	--
PFDA	NE	20	--	--	--	--	--	11	11	--	--	--	--	BRL (<4.1)	BRL (<0.18)	BRL (<4.1)	BRL (<3.9)	BRL (<2.0)	BRL (<3.9)	--	BRL (<4.1)	--	--	--	--	--
TOTAL 13 PFAS	70	20	1830	2140	1797	35	102	1,516	925	3250	2620	45	BRL	6.1	6.7	BRL	BRL	4.3	BRL	1,246	1,037	4,220	5,280	2,890	5,430	2,590

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	MW-3D	SBV-3	MW-6		MW-7	MW-10		MW-12i	MW-12													MW-15	MW-15D	MW-19i
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	8/18/2016	11/22/2013	4/1/2015	4/25/2017	11/22/2013	11/22/2013	4/18/2016	4/24/2017	8/20/2014	4/1/2015	6/26/2018	1/11/2019	4/23/2019	7/23/2019	10/29/2019	2/19/2020	5/12/2020	7/29/2020	10/21/2020	1/27/2021	5/20/2021	4/24/2017	4/2/2015	8/20/2014
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																										
PFOS	70	20	98	1,100	5,700	2,400	3,100	2,000	1,700	490	2,500	4,800	3,000	2,700	2,800	2,800	2,300	3,100	3,500	2,900	3,900	2,300	360	19	60	BRL
PFOA	70	20	10	350	510	140	580	670	440	36	400	470	280	650	920	250	380	580	280	220	280	230	46	27	60	BRL
PFNA	NE	20	--	--	--	--	--	--	--	--	--	--	56	64	92	87	80	78	86	51	51	28	5.6	--	--	--
PFHxS	NE	20	--	--	--	--	--	--	--	--	--	--	1,200	1,500	1,700	880	1,300	1,200	1,100	900	93	630	170	--	--	--
PFHpA	NE	20	--	--	--	--	--	--	--	--	--	--	130	490	440	170	310	390	140	120	110	74	14	--	--	--
PFDA	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	16	11	10	7.5	23	18	13	21	BRL (<3.9)	--	--	--
TOTAL 2s PFAS	70	20	108	1,450	6,210	2,540	3,680	2,670	2,140	526	2,900	5,270	4,666	5,404	5,968	4,198	4,380	5,356	5,129	4,209	4,447	3,283	596	46	120	BRL

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	MW-22													MW-28S	MW-30	MW-31	MW-32	MW-35i					MW-36D	MW-37	MW-37D	MW-99i			MW-201
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	6/3/2014	4/1/2015	6/26/2018	1/11/2019	4/23/2019	7/23/2019	10/29/2019	2/19/2020	5/12/2020	7/29/2020	10/21/20020	1/27/2021	5/20/2021	4/1/2015	4/1/2015	8/18/2016	5/3/2017	8/20/2014	5/3/2017	1/10/2019	10/30/2019	10/22/2020	4/6/2015	4/26/2017	4/2/2015	4/6/2015	4/26/2017	10/29/2019	5/19/2021
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																															
PFOS	70	20	4,900	600	320	350	320	410	510	460	380	790	680	470	2,300	2,100	1,400	3,200	240	60	42	BRL (<6)	BRL (<5.2)	BRL (<5.9)	140	77	60	730	240	630	230
PFOA	70	20	530	90	30	140	160	190	150	230	120	92	160	250	150	90	130	170	36	BRL	14	BRL (<3.3)	BRL (<7.4)	BRL (<5.0)	<20	77	90	70	18	50	14
PFNA	NE	20	--	--	9	BRL (<8.7)	81	7.6	8.3	5	10	14	14	7	24	--	--	--	--	--	--	BRL (<8.7)	BRL (<4.9)	BRL (<5.1)	--	--	--	--	--	58	19
PFHxS	NE	20	--	--	130	680	600	520	690	540	330	360	740	800	570	--	--	--	--	--	--	BRL (<5.6)	6	6.3	--	--	--	--	--	340	84
PFHpA	NE	20	--	--	13	69	49	33	61	38	32	27	100	88	65	--	--	--	--	--	--	BRL (<7.4)	BRL (<7.1)	BRL (<6.7)	--	--	--	--	--	46	24
PFDA	NE	20	--	--	--	--	BRL (<4.1)	BRL (<4.1)	BRL (<4.1)	BRL (<4.1)	1	5	5	1	15	--	--	--	--	--	--	--	BRL (<4.1)	BRL (<3.9)	--	--	--	--	--	5.5	BRL (<3.9)
TOTAL 13 PFAS	70	20	5,430	690	502	1,239	1,210	1,161	1,419	1,273	873	1,288	1,699	1,616	3,124	2,190	1,530	3,370	276	60	56	BRL	6	6.3	140	154	150	800	258	1,130	371

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	MW-215
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	5/19/2021
UNITS	ng/L	ng/L	ng/L
PFAS (Method 537.2)			
PFOS	70	20	1,100
PFOA	70	20	310
PFNA	NE	20	31
PFHxS	NE	20	620
PFHpA	NE	20	110
PFDA	NE	20	11
TOTAL 12s PFAS	70	20	2182

Table 4 - Summary of Groundwater PFAS Analytical Data

Barnstable Country Fire and Rescue Training Academy

155 Flint Rock Road, Barnstable, MA

RTN 4-26179

SAMPLE ID	USEPA [1,2]	Method 1	OW-8A														FS-1SA		FS-1	RW-1		HW-1D[14]				HW-2S	OW-2A	OW-2S	OW-2D
SAMPLING DATE	Health Advisory	GW-1 Standards [4]	11/22/2013	6/3/2014	4/11/2017	8/16/2017	6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18/2020	5/11/2020	7/28/2020	10/20/2020	1/26/2021	5/19/2021	6/16/2016	5/19/2021	4/11/2017	4/1/2015	4/11/2017	5/3/2017	1/10/2019	10/28/2019	10/21/2020	5/3/2017	6/3/2014	4/14/2016	4/14/2016
UNITS	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
PFAS (Method 537.2)																														
PFOS	70	20	2,700	8,600	1,700	770	2,800	990	880	780	220	650	150	170	40	230	120	1,700	12	1,700	2,300	1,000	25	BRL (<6)	BRL (<5.2)	BRL (<5.7)	15	1,300	2,400	6
PFOA	70	20	430	1,000	2,000	120	65	420	66	55	130	62	18	12	BRL (<5.0)	290	120	550	BRL (5.0)	730	240	58	8	BRL (<3.3)	BRL (<7.4)	BRL (<5.0)	8.2	150	250	BRL (<5.3)
PFNA	NE	20	--	--	--	--	310	150	120	78	10	110	12	11	BRL (<5.1)	120	250	--	BRL (<5.1)	--	--	--	--	BRL (<8.7)	BRL (<4.9)	BRL (<5.1)	--	--	--	--
PFHxS	NE	20	--	--	--	--	250	890	140	100	750	190	77	30	11	760	330	--	BRL (<4.4)	--	--	--	--	BRL (<5.6)	BRL (<5.2)	BRL (<4.4)	--	--	--	--
PFHpA	NE	20	--	--	--	--	43	210	40	26	190	35	8.9	7.4	BRL (<6.7)	150	66	--	BRL (<6.7)	--	--	--	--	BRL (<7.4)	BRL (<7.1)	BRL (<6.7)	--	--	--	--
PFDA	NE	20	--	--	--	--	--	--	15	18	14	17	3.6	10	BRL (<3.9)	BRL (<2.0)	3.9	--	BRL (<3.9)	--	--	--	--	--	BRL (<4.1)	BRL (<3.9)	--	--	--	--
TOTAL 13 PFAS	70	20	3,130	9,600	3,700	890	3,468	2,660	1,261	1,057	1,314	1,064	270	240	51	1,550	890	2,250	12	2,430	2,540	1,058	33	BRL	BRL	BRL	23.2	1,450	2,650	6

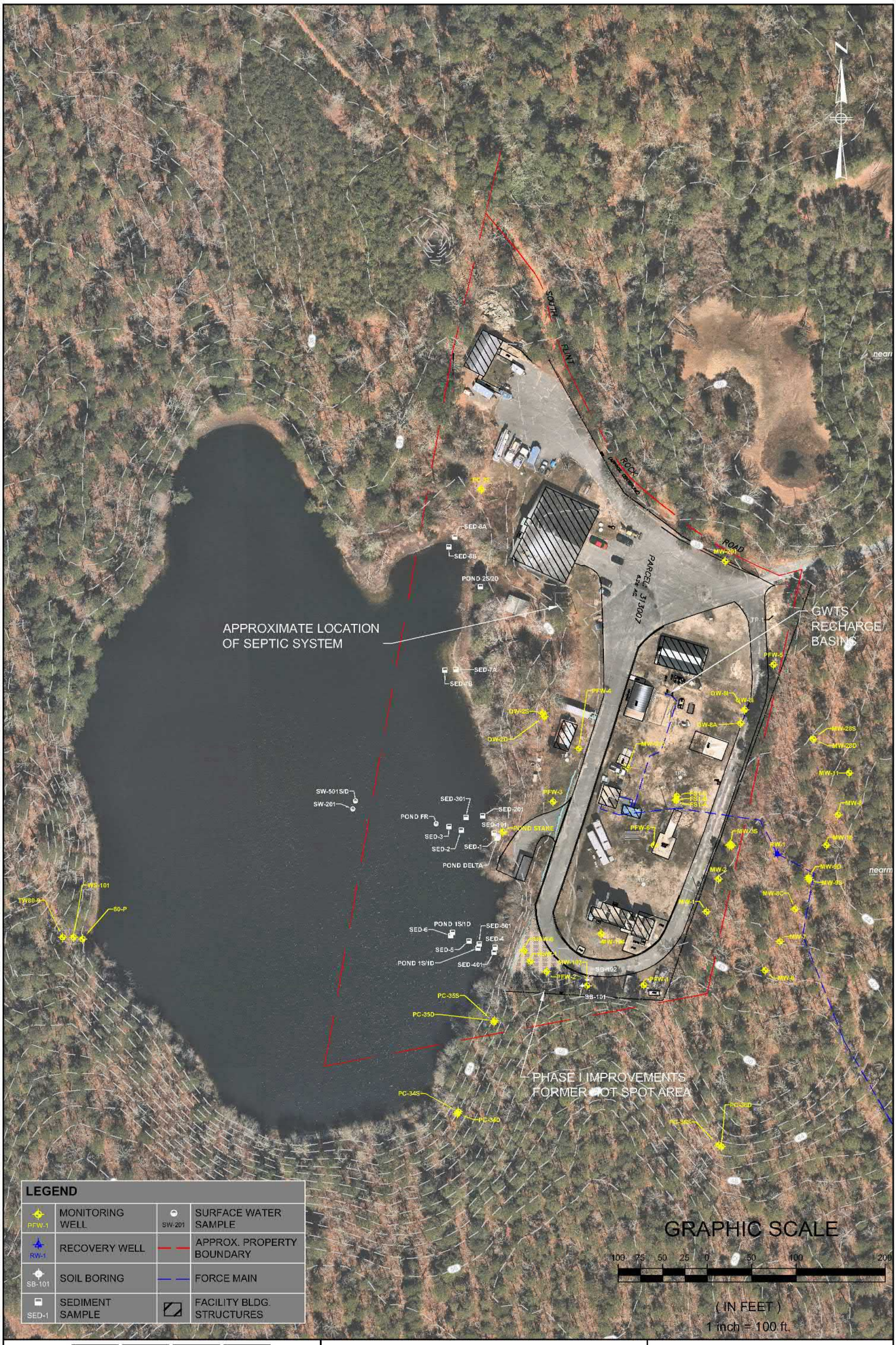
FIGURES

Figure 1
Site Location
Barnstable County Fire & Rescue Training Academy

155 South Flint Rock Road
Hyannis, Massachusetts

NOVER-ARMSTRONG ASSOCIATES, INC.

RTN 4-26179 April 2018



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BARNSTABLE FIRE & RESCUE TRAINING ACADEMY
BARNSTABLE, MA
RTN 4-26179

FIGURE 2
SITE PLAN DETAIL
FTA FACILITY

Print Date: 06/21/2021

Approximate
FTA Property Boundary

Flint Rock
Pond

Operational Recovery Well
PRW-4

Mary Dunn
Pond

N

LEGEND

- MONITORING WELL
- RECOVERY WELL
- PUBLIC WATER SUPPLY WELL (MD-1)
- GROUNDWATER CONTOUR (FEET)
- APPROX. PROPERTY BOUNDARY
- FORCE MAIN
- FACILITY BLDG. STRUCTURES

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200 100 0 100 200 400

(IN FEET)

1 inch = 200 ft.

K:\6206 BARNSTABLE COUNTY\MCP LSP BASE SERVICES FMRLY 2018-2019 SERVICES\DRAWINGFILES\XREFS\GW CONTOUR\6206_EX_BASE_MM_2020.DWG

MassDEP - Bureau of Waste Site Cleanup

Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

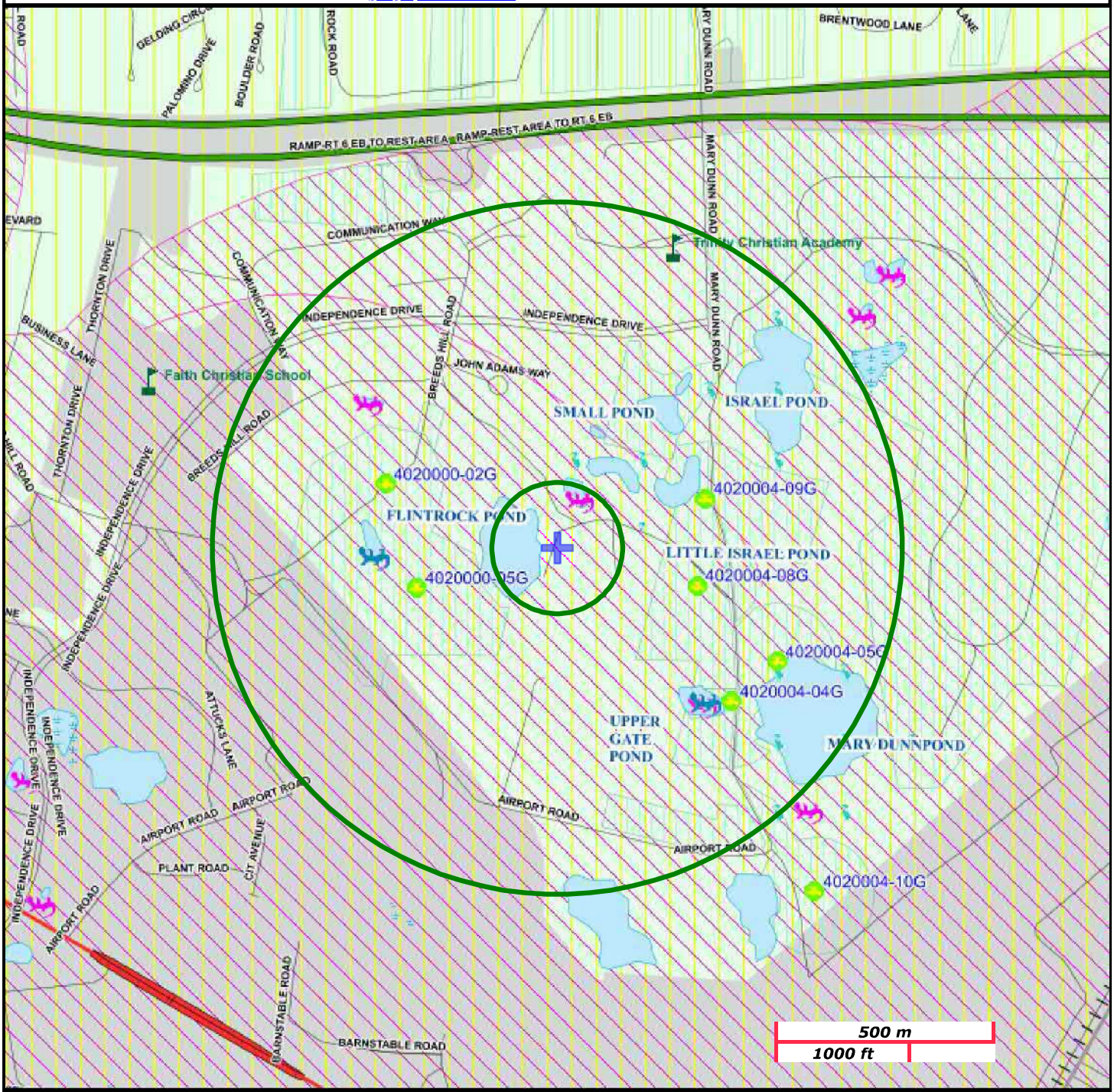
FIGURE 4

Site Information:
BARNSTABLE COUNTY FIRE & RESCUE TRAINING ACADEMY
155 SOUTH FLINT ROCK ROAD BARNSTABLE, MA
4-000026179

NAD83 UTM Meters:
4614868mN , 393038mE (Zone: 19)
April 23, 2021

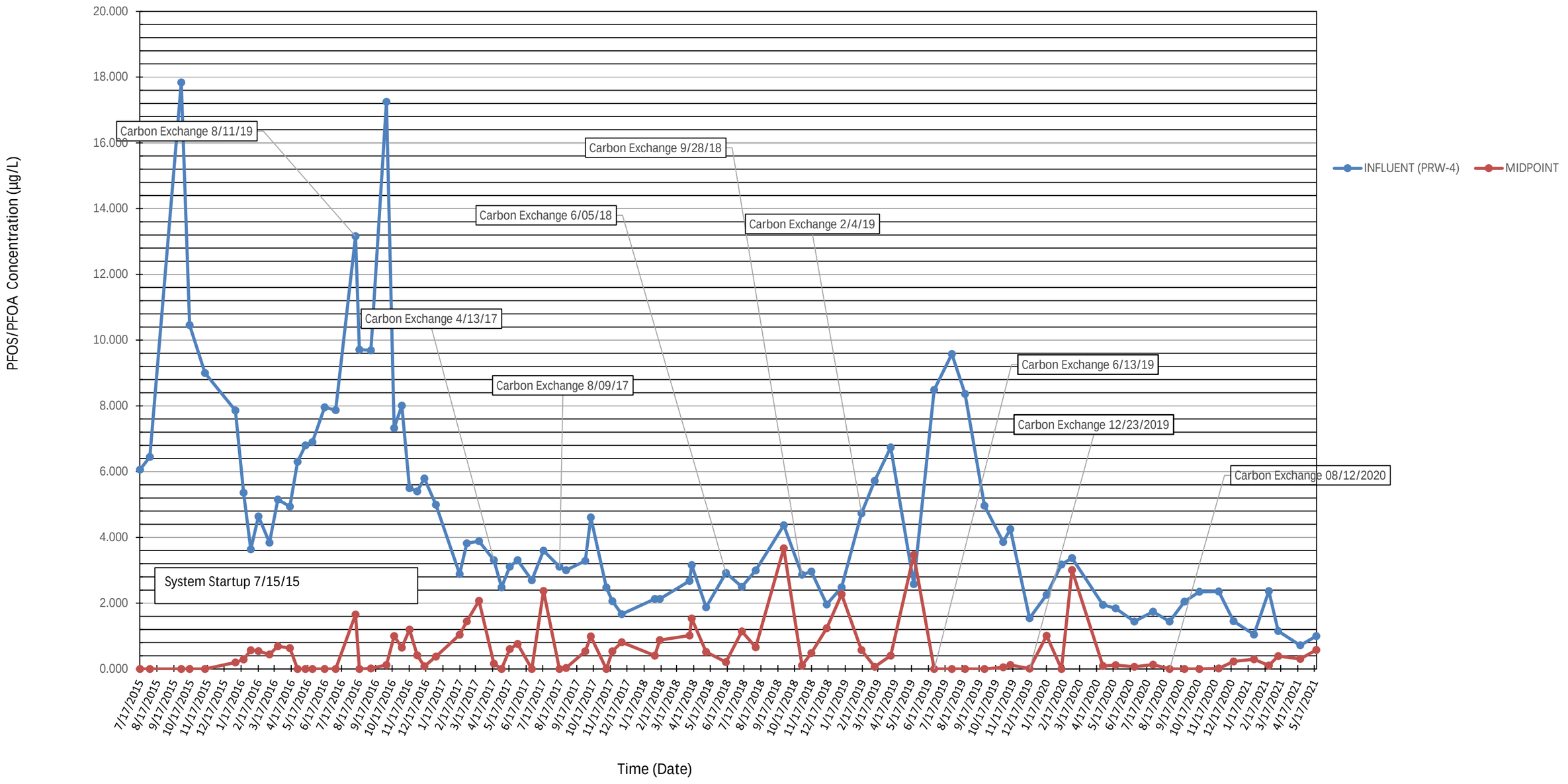
The information shown is the best available at the date of printing. However, it may be incomplete. The responsible party and LSP are ultimately responsible for ascertaining the true conditions surrounding the site. Metadata for data layers shown on this map can be found at: https://www.mass.gov/orgs/massgis-bureau-of-geographic-information.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection



Roads: Limited Access, Divided, Other Hwy, Major Road, Minor Road, Track, Trail
Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct
Basins: Major, PWS; Streams: Perennial, Intermittent, Man Made Shore, Dam
Aquifers: Medium Yield, High Yield, EPA Sole Source
Non Potential Drinking Water Source Area: Medium, High (Yield)
PWS Protection Areas: Zone II, IWPA, Zone A
Hydrography: Open Water, PWS Reservoir, Tidal Flat
Wetlands: Freshwater, Saltwater, Cranberry Bog
FEMA 100yr Floodplain; Protected Open Space; ACEC
Est. Rare Wetland Wildlife Hab; Vernal Pool: Cert., Potential
Solid Waste Landfill; PWS: Com.GW,SW, Emerg., Non-Com.

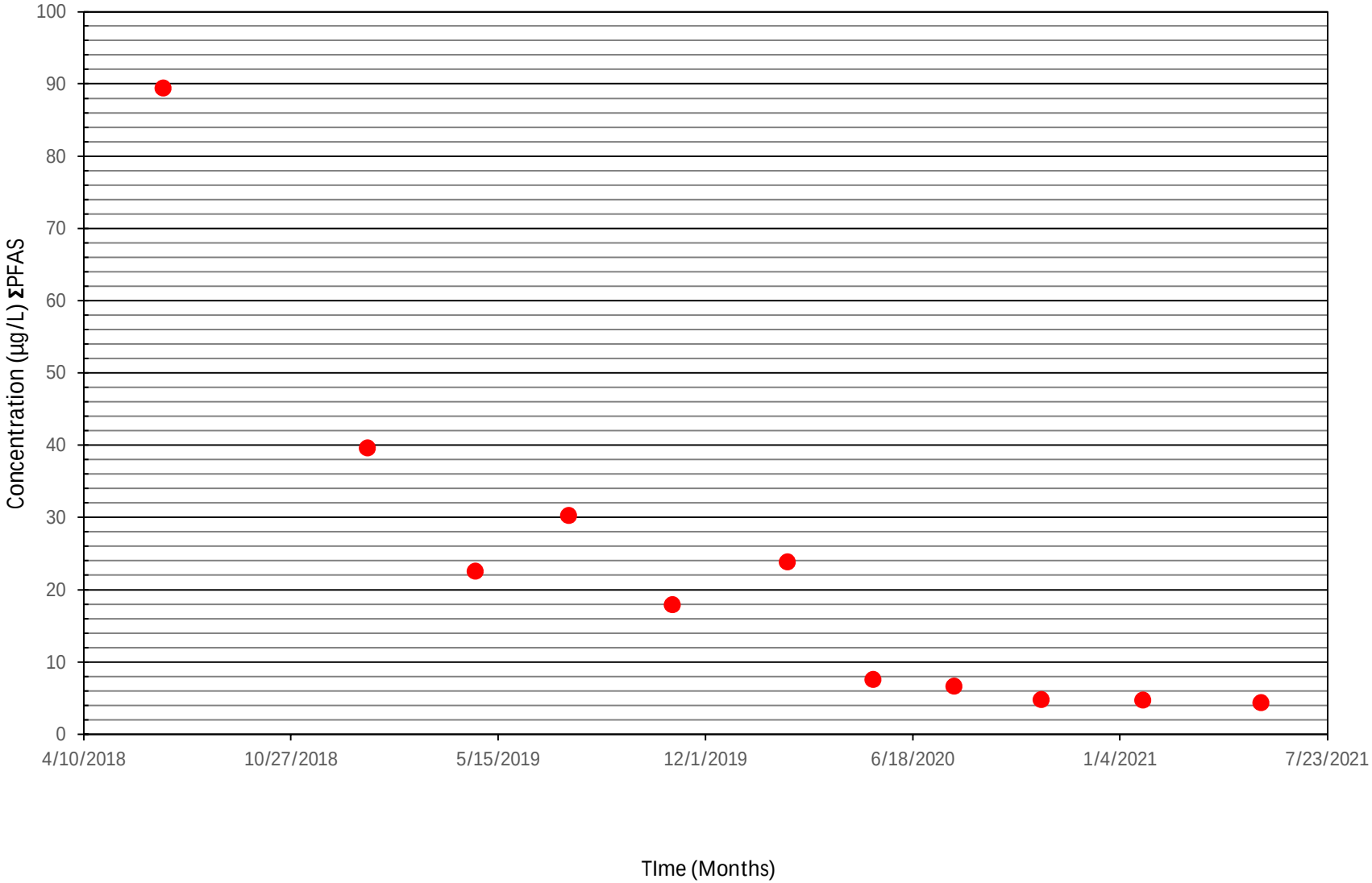
Figure 5 - BFTA GWPTS Influent and Midpoint PFAS Concentrations from 2015-2021



Barnstable County Fire & Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

Notes:
1. Concentrations depicted represent the sum of the perfluorooctanesulfonic acid (PFOS) and the perfluorooctanic acid (PFOA) compounds in micrograms per liter (µg/L).
2. Concentration data points at 0 µg/L from Midpoint sample location, indicate a sample was not collected from the Midpoint location on that date or was detected below laboratory reporting limits.

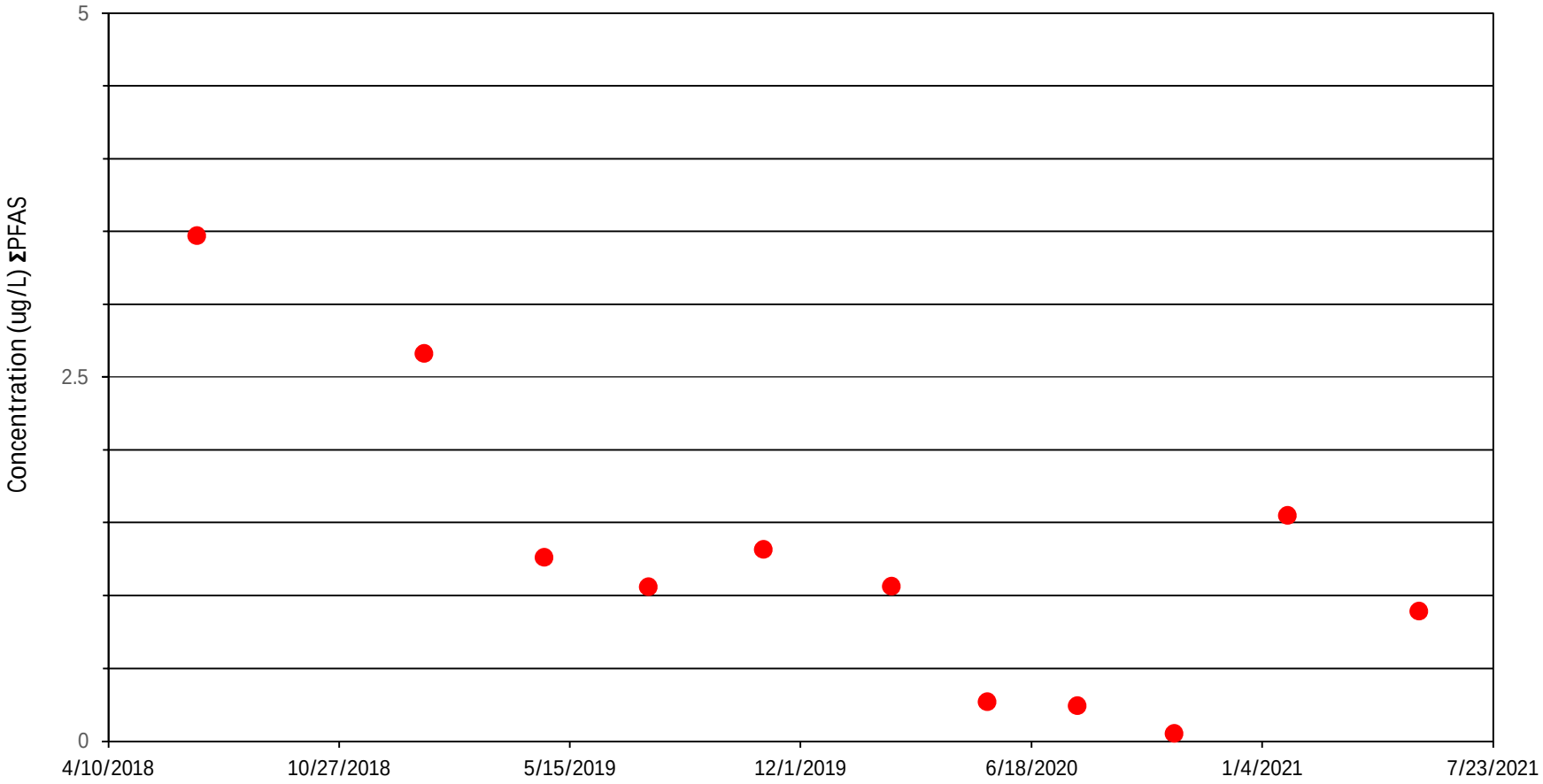
Figure 6 - ΣPFAS Concentrations in PFW-1 from June 2018 - May 2021



Barnstable County Fire & Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

Notes:
1. Concentrations depicted represent the sum of the the five (5) PFAS compounds, PFOS, PFOA, PFHpA, PFHxS, and PFNA from June 2018 to April 2019. Concentrations depicted from April 2019 to current graphical date represent the sum of the six (6) PFAS compounds PFOS, PFOA, PFHpA, PFHxS, PFNA, and PFDA.
2. Concentrations are in in micrograms per liter (µg/L) or parts per billion (ppb).

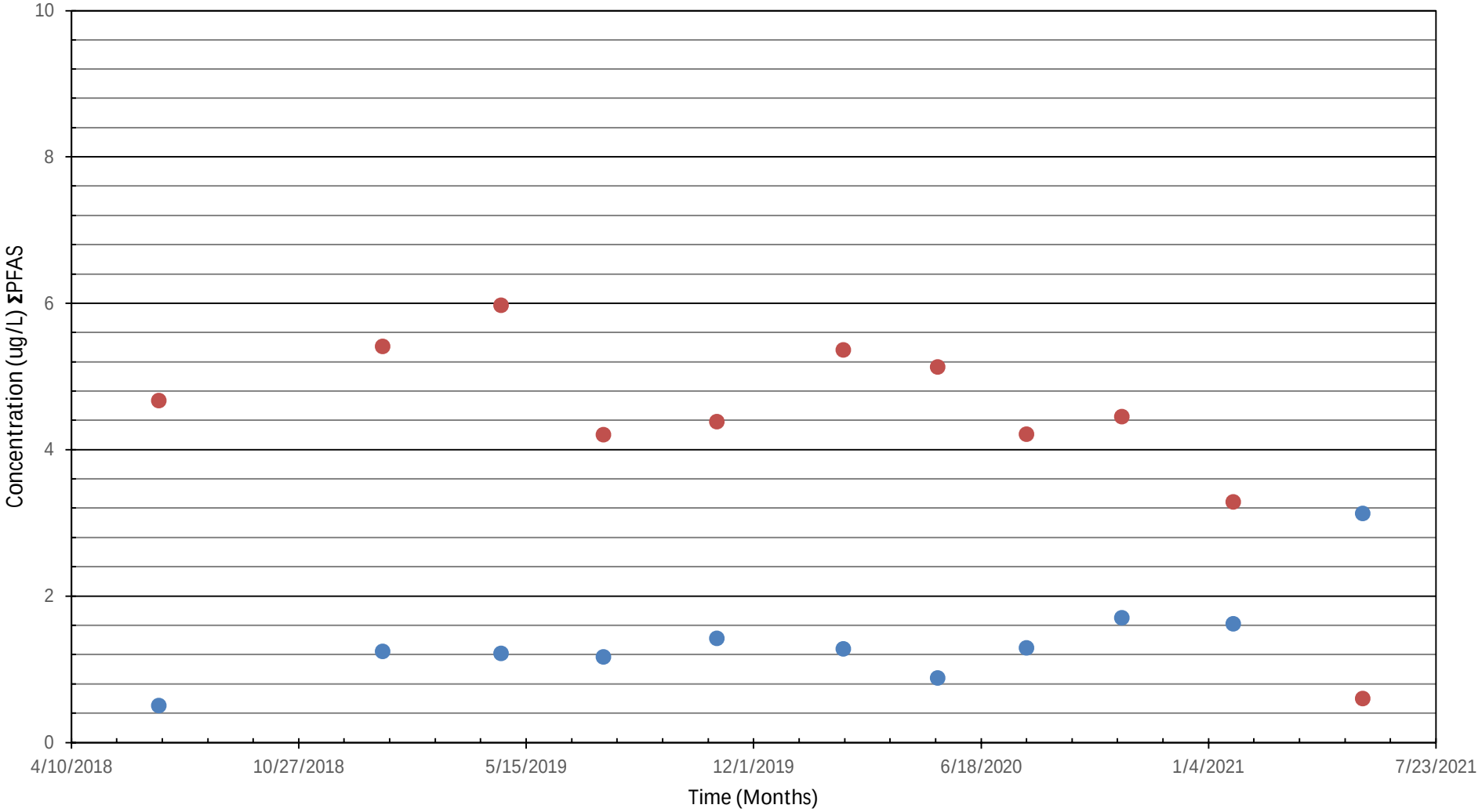
Figure 7 - ΣPFAS Concentrations in OW-8A from January 2019 - May 2021



Barnstable County Fire & Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

Notes:
1. Concentrations depicted represent the sum of the the five (5) PFAS compounds, PFOS, PFOA, PFHpA, PFHxS, and PFNA from June 2018 to April 2019. Concentrations depicted from April 2019 to current graphical date represent the sum of the six (6) PFAS compounds PFOS, PFOA, PFHpA, PFHxS, PFNA, and PFDA.
2. Concentrations are in in micrograms per liter (µg/L) or parts per billion (ppb) .

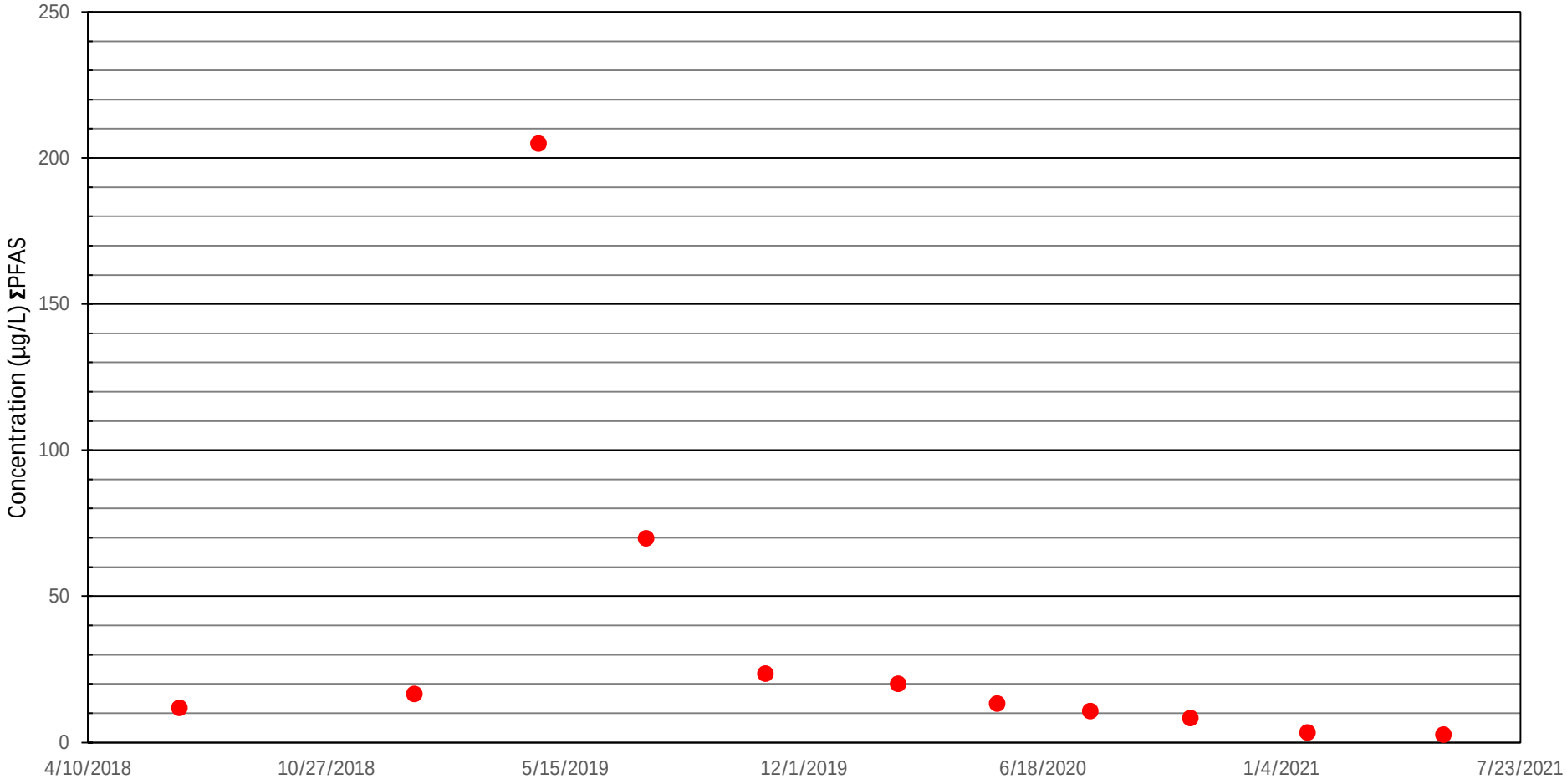
Figure 8 - ΣPFAS Concentrations in MW-12 and MW-22 from June 2018 - January 2021



Barnstable County Fire & Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

Notes:
1. Concentrations depicted represent the sum of the the five (5) PFAS compounds, PFOS, PFOA, PFHpA, PFHxS, and PFNA from June 2018 to April 2019. Concentrations depicted from April 2019 to October 2019 represent the sum of the six (6) PFAS compounds PFOS, PFOA, PFHpA, PFHxS, PFNA, and PFDA.
2. Concentrations are in in micrograms per liter (µg/L) or parts per billion (ppb).

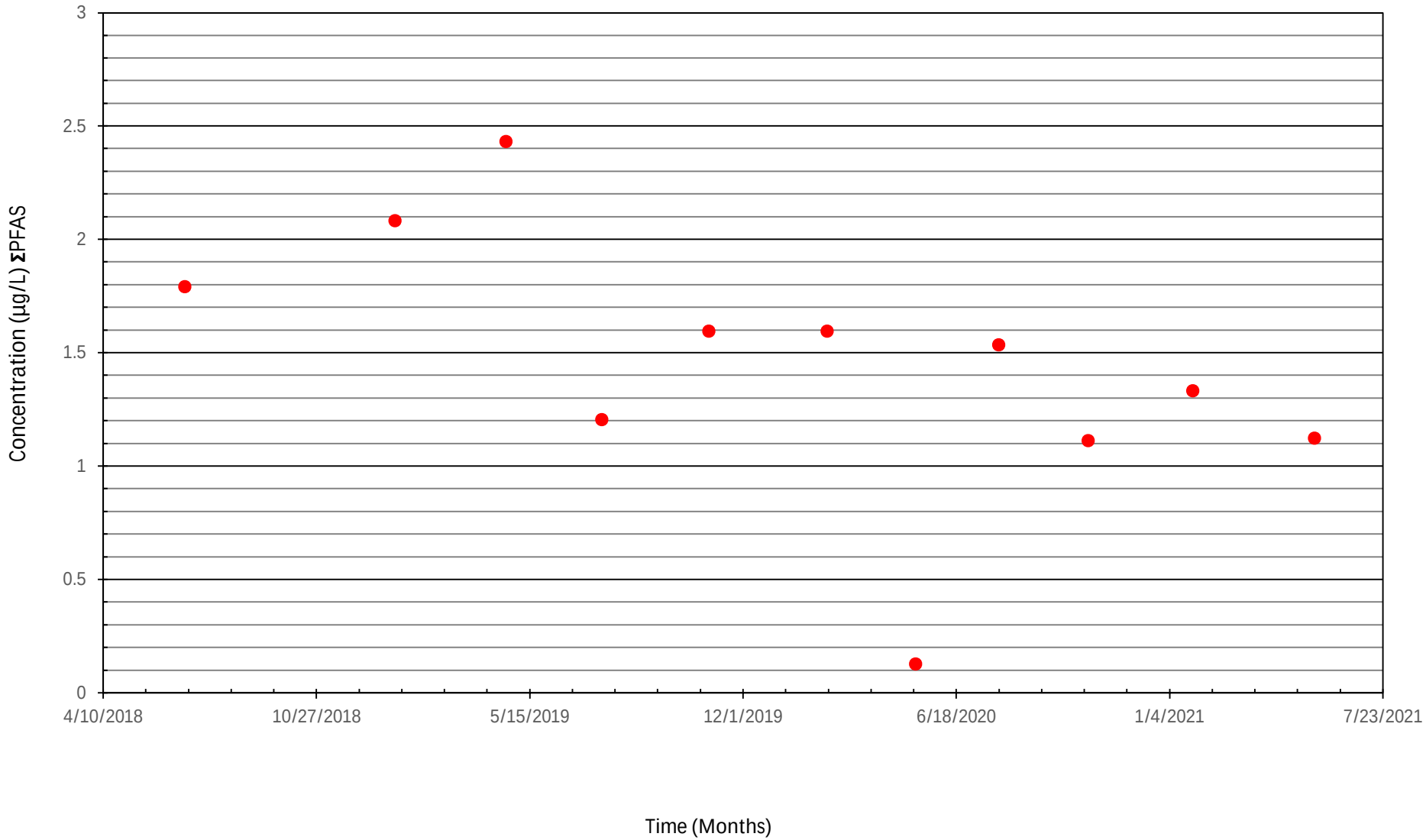
Figure 9A - ΣPFAS Concentrations in PC-11 from June 2018 - May 2021



Barnstable County Fire & Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

Notes:
1. Concentrations depicted represent the sum of the the five (5) PFAS compounds, PFOS, PFOA, PFHpA, PFHxS, and PFNA from June 2018 to April 2019. Concentrations depicted from April 2019 to October 2019 represent the sum of the six (6) PFAS compounds PFOS, PFOA, PFHpA, PFHxS, PFNA, and PFDA.
2. Concentrations are in in micrograms per liter (µg/L) or parts per billion (ppb).

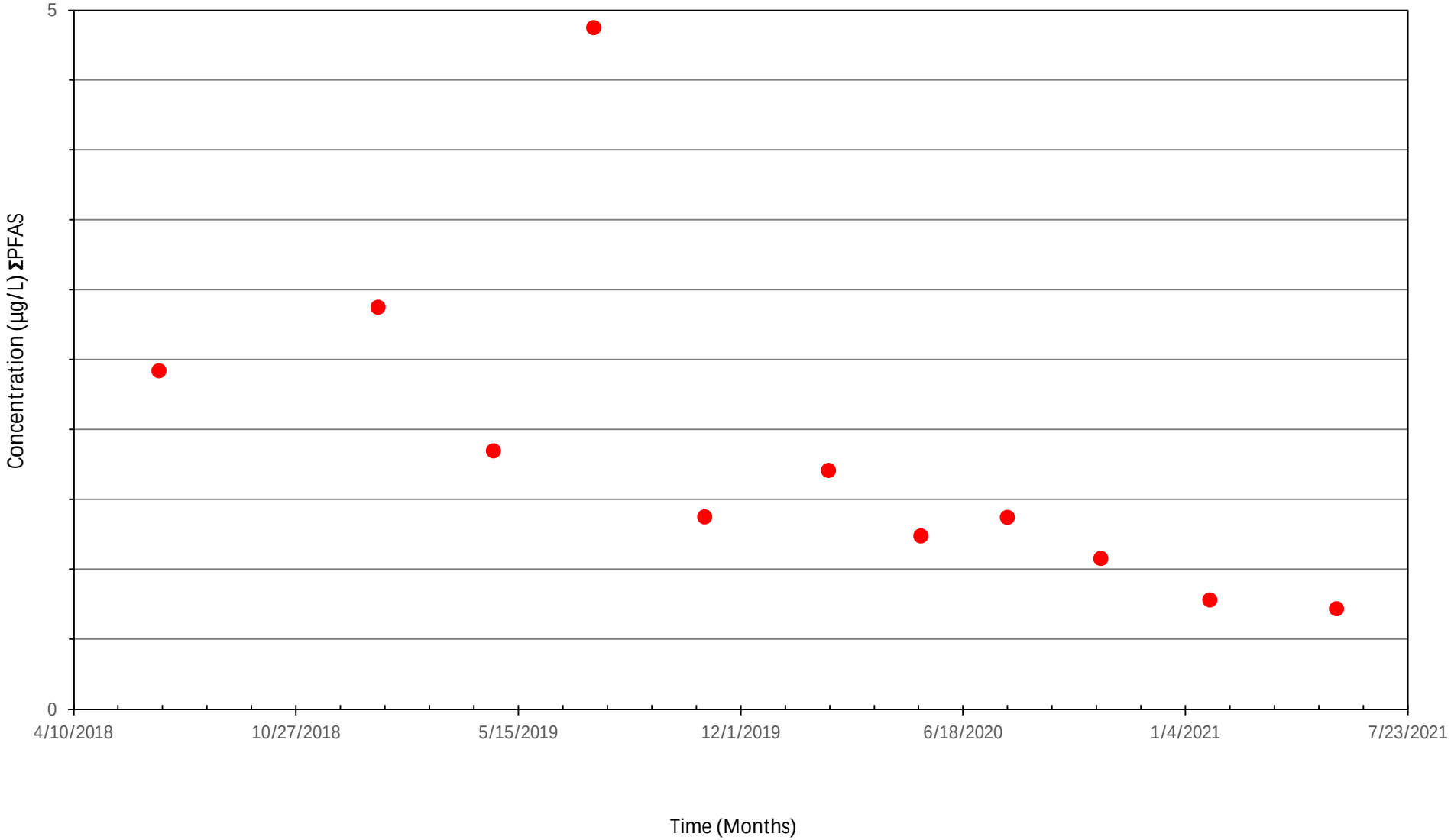
Figure 9B - ΣPFAS Concentrations in PC-6A from June 2018 -May 2021



Barnstable County Fire & Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

Notes:
1. Concentrations depicted represent the sum of the the five (5) PFAS compounds, PFOS, PFOA, PFHpA, PFHxS, and PFNA from June 2018 to April 2019. Concentrations depicted from April 2019 to October 2019 represent the sum of the six (6) PFAS compounds PFOS, PFOA, PFHpA, PFHxS, PFNA, and PFDA.
2. Concentrations are in in micrograms per liter (µg/L) or parts per billion (ppb).

Figure 9D - ΣPFAS Concentrations in PC-30 from June 2018 - May 2021



Barnstable County Fire & Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

Notes:
1. Concentrations depicted represent the sum of the the five (5) PFAS compounds, PFOS, PFOA, PFHpA, PFHxS, and PFNA from June 2018 to April 2019. Concentrations depicted from April 2019 to the graphically represented date are represented as the sum of the six (6) PFAS compounds PFOS, PFOA, PFHpA, PFHxS, PFNA, and PFDA.
2. Concentrations are in in micrograms per liter (µg/L) or parts per billion (ppb).

PFAS Concentration Plume Values			
Range ID	Minimum PFAS Concentration (ppt.)	Maximum PFAS Concentration (ppt.)	Color
1	0	20	
2	20	200	
3	200	1000	
4	1000	2000	
5	2000	2500	
6	2500	4371	

LEGEND

- MONITORING WELL
- RECOVERY WELL
- PUBLIC WATER SUPPLY WELL (MD-1)
- APPROX. PROPERTY BOUNDARY
- FORCE MAIN
- FACILITY BLDG. STRUCTURES

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FIGURE 10 - Sitewide Groundwater PFAS Concentration Plume - May 2021

Barnstable County Fire & Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA

Plot Date: 04/29/2021

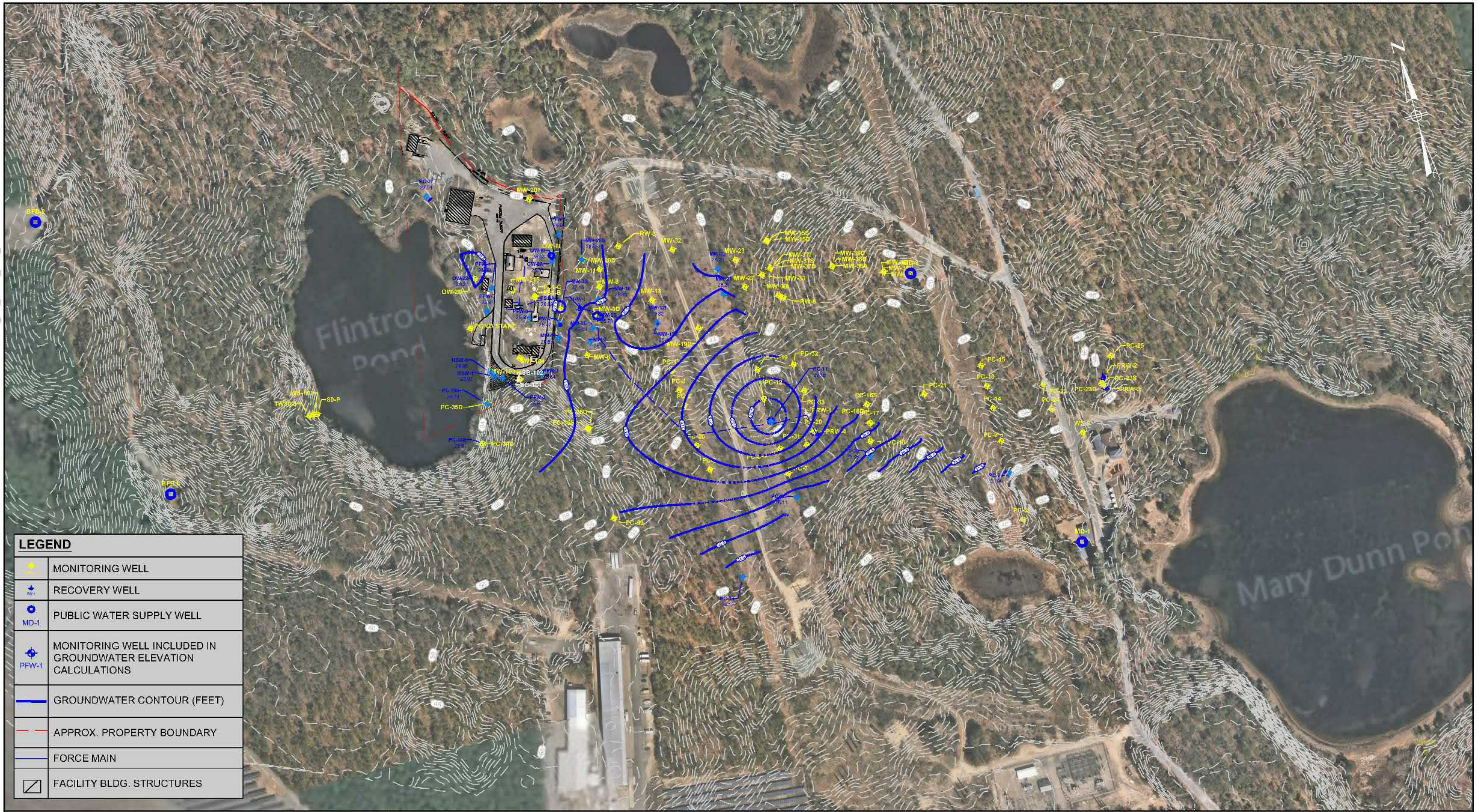
GRAPHIC SCALE

250 125 0 125 250 500

(IN FEET)

1 inch = 250 ft.

K:\6206 BARNSTABLE COUNTY\MCP LSP BASE SERVICES FMRLY 2018-2019 SERVICES\DRAWINGFILES\XREFS\GW CONTOUR\6206_EX_BASE_PFAS.DWG



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Plot Date: 04/27/2021 Drawn By: MM

GRAPHIC SCALE

250 125 0 125 250 500

(IN FEET)

1 inch = 250 ft.

K:\6206 BARNSTABLE COUNTY\MCP LSP BASE SERVICES FMRLY 2018-2019 SERVICES\DRAWINGFILES\XREFS\GW CONTOUR\6206_EX_BASE_MM_2020-1.DWG

APPENDIX A

BWSC Transmittal Form (Unsigned)

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

Immediate Response Action (IRA) Transmittal Form
Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

BWSC 105

Release Tracking Number
4 - 26179

A. SITE LOCATION:

1. Release Name/Location Aid: BARNSTABLE COUNTY FIRE TRAINING ACADEMY

2. Street Address: 155 SOUTH FLINT ROCK ROAD

3. City/Town: BARNSTABLE 4. Zip Code: 026300000

☐ 5. Check here if this location is Adequately Regulated, pursuant to 310 CMR 40.0110-0114.

☐ a. CERCLA ☐ b. HSWA Corrective Action ☐ c. Solid Waste Management

☐ d. RCRA State Program (21C Facilities)

B. THIS FORM IS BEING USED TO: (check all that apply)

1. List Submittal Date of Initial IRA Written Plan (if previously submitted): 9/26/216

☐ 2. Submit an **Initial IRA Plan**.

☐ 3. Submit a **Modified IRA Plan** of a previously submitted written IRA Plan.

☐ 4. Submit an **Imminent Hazard Evaluation**. (check one)

☐ a. An Imminent Hazard exists in connection with this Release or Threat of Release.

☐ b. An Imminent Hazard does not exist in connection with this Release or Threat of Release.

☐ c. It is unknown whether an Imminent Hazard exists in connection with this Release or Threat of Release, and further assessment activities will be undertaken.

☐ d. It is unknown whether an Imminent Hazard exists in connection with this Release or Threat of Release. However, response actions will address those conditions that could pose an Imminent Hazard.

☐ 5. Submit a request to **Terminate an Active Remedial System or Response Action(s) Taken to Address an Imminent Hazard**.

☑ 6. Submit an **IRA Status Report**

☑ 7. Submit a **Remedial Monitoring Report**. (This report can only be submitted through eDEP.)

a. Type of Report: (check one) ☐ i. Initial Report ☑ ii. Interim Report ☐ iii. Final Report

b. Frequency of Submittal: (check all that apply)

☑ i. A Remedial Monitoring Report(s) submitted monthly to address an Imminent Hazard.

☐ ii. A Remedial Monitoring Report(s) submitted monthly to address a Condition of Substantial Release Migration.

☐ iii. A Remedial Monitoring Report(s) submitted every six months, concurrent with an IRA Status Report.

☐ iv. A Remedial Monitoring Report(s) submitted annually, concurrent with an IRA Status Report.

c. Number of Remedial Systems and/or Monitoring Programs: 2

A separate BWSC105A, IRA Remedial Monitoring Report, must be filled out for each Remedial System and/or Monitoring Program addressed by this transmittal form.

☐ 8. Submit an **IRA Completion Statement**.

☐ a. Check here if future response actions addressing this Release or Threat of Release notification condition will be conducted as part of the Response Actions planned or ongoing at a Site that has already been Tier Classified under a different Release Tracking Number (RTN)

b. Provide Release Tracking Number of Tier Classified Site (Primary RTN): _____ _____

These additional response actions must occur according to the deadlines applicable to the Primary RTN. Use the Primary RTN when making all future submittals for the site unless specifically relating to this Immediate Response Action.

☐ 9. Submit a **Revised IRA Completion Statement**.

☐ 10. Submit a **Plan for the Application of Remedial Additives** near a sensitive receptor, pursuant to 310 CMR 40.0046(3).

(All sections of this transmittal form must be filled out unless otherwise noted above)

C. RELEASE OR THREAT OF RELEASE CONDITIONS THAT WARRANT IRA:

1. Media Impacted and Receptors Affected: (check all that apply) ☐ a. Paved Surface ☐ b. Basement ☐ c. School

☑ d. Public Water Supply ☑ e. Surface Water ☑ f. Zone 2 ☐ g. Private Well ☐ h. Residence ☑ i. Soil

☑ j. Groundwater ☑ k. Sediments ☐ l. Wetland ☐ m. Storm Drain ☐ n. Indoor Air ☐ o. Air

☐ p. Soil Gas ☐ q. Sub-Slab Soil Gas ☐ r. Critical Exposure Pathway ☐ s. NAPL ☐ t. Unknown

☐ r. Others Specify: _____

2. Sources of the Release or TOR: (check all that apply) ☐ a. Transformer ☐ b. Fuel Tank ☐ c. Pipe

☐ d. OHM Delivery ☐ e. AST ☐ f. Drums ☐ g. Tanker Truck ☐ h. Hose ☐ i. Line

☐ j. UST Describe: _____ ☐ k. Vehicle ☐ l. Boat/Vessel

☐ m. Unknown ☑ n. Other: FIRE FIGHTING FOAM

3. Type of Release or TOR: (check all that apply) ☐ a. Dumping ☐ b. Fire ☐ c. AST Removal ☐ d. Overfill

☐ e. Rupture ☐ f. Vehicle Accident ☐ g. Leak ☐ h. Spill ☐ i. Test failure ☐ j. TOR Only

☐ k. UST Removal Describe: _____

☐ l. Unknown ☑ m. Other: HISTORIC FOAM USE

4. Identify Oils and Hazardous Materials Released: (check all that apply) ☐ a. Oils ☐ b. Chlorinated Solvents

☐ c. Heavy Metals ☑ d. Others Specify: PFAS

D. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply, for volumes list cumulative amounts)

☑ 1. Assessment and/or Monitoring Only
☑ 2. Temporary Covers or Caps
☐ 3. Deployment of Absorbent or Containment Materials
☐ 4. Temporary Water Supplies
☐ 5. Structure Venting System/HVAC Modification System
☐ 6. Temporary Evacuation or Relocation of Residents
☐ 7. Product or NAPL Recovery
☐ 8. Fencing and Sign Posting
☑ 9. Groundwater Treatment Systems
☐ 10. Soil Vapor Extraction
☐ 11. Remedial Additives
☐ 12. Air Sparging
☐ 13. Active Exposure Pathway Mitigation System
☐ 14. Passive Exposure Pathway Mitigation System

D. DESCRIPTION OF RESPONSE ACTIONS: (cont.)

☑ 15. Excavation of Contaminated Soils.

☐ a. Re-use, Recycling or Treatment ☐ i. On Site Estimated volume in cubic yards _____

☐ ii. Off Site Estimated volume in cubic yards _____

iia. Receiving Facility: _____ Town: _____ State: _____

iib. Receiving Facility: _____ Town: _____ State: _____

iii. Describe: _____

☐ b. Store ☐ i. On Site Estimated volume in cubic yards _____

☐ ii. Off Site Estimated volume in cubic yards _____

iia. Receiving Facility: _____ Town: _____ State: _____

iib. Receiving Facility: _____ Town: _____ State: _____

☑ c. Landfill ☐ i. Cover Estimated volume in cubic yards _____

Receiving Facility: _____ Town: _____ State: _____

☑ ii. Disposal Estimated volume in cubic yards 200

Receiving Facility: TAUNTON LANDFILL Town: TAUNTON State: MA

☐ 16. Removal of Drums, Tanks, or Containers:

a. Describe Quantity and Amount: _____

b. Receiving Facility: _____ Town: _____ State: _____

c. Receiving Facility: _____ Town: _____ State: _____

☐ 17. Removal of Other Contaminated Media:

a. Specify Type and Volume: _____

☐ 18. Other Response Actions:

Describe: _____

☐ 19. Use of Innovative Technologies:

Describe: _____

E. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisionsof 309 CMR 4.02(2) and (3), and 309 CMR 4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> if Section B of this form indicates that an **Immediate Response Action Plan** is being submitted, the response action(s) that is(are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is(are) appropriate and reasonable to accomplish thepurposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B of this form indicates that an **Imminent Hazard Evaluation** is being submitted, this Imminent Hazard Evaluation was developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and the assessment activity(ies) undertaken to support this Imminent Hazard Evaluation comply(ies) with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000;

> if Section B of this form indicates that an **Immediate Response Action Status Report** and/or a **Remedial Monitoring Report** is(are) being submitted, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000,(ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B of this form indicates that an **Immediate Response Action Completion Statement** or a request to **Terminate an Active Remedial System or Response Action(s) Taken to Address an Imminent Hazard** is being submitted, the response action(s) that is(are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is(are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 1443

2. First Name: ROGERP 3. Last Name: THIBAULT

4. Telephone: 508-331-2700 5. Ext: 6. Email:

7. Signature:

8. Date: *(mm/dd/yyyy)* 9. LSP Stamp:

F. PERSON UNDERTAKING IRA:

1. Check all that apply: ☑ a. change in contact name ☐ b. change of address ☐ c. change in the person undertaking response actions

2. Name of Organization: BARNSTABLE COUNTY COMMISSIONERS

3. Contact First Name: STEPHEN 4. Last Name: TEBO

5. Street: 3195 MAIN ST 6. Title:

7. City/Town: BARNSTABLE 8. State: MA 9. Zip Code: 026301105

10. Telephone: 508-375-6643 11. Ext: 12. Email: stebo@BARNSTABLECOUNTY.ORG

G. RELATIONSHIP TO RELEASE OR THREAT OF RELEASE OF PERSON UNDERTAKING IRA:

☐ Check here to change relationship

☑ 1. RP or PRP ☑ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☐ e. Other RP or PRP Specify Relationship:

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Undertaking Response Actions: Specify Relationship:

H. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if any Remediation Waste, generated as a result of this IRA, will be stored, treated, managed, recycled or reused at the site following submission of the IRA Completion Statement. If this box is checked, you must submit one of the following plans, along with the appropriate transmittal form.

☐ a. A Release Abatement Measure (RAM) Plan (BWSC106) ☐ b. Phase IV Remedy Implementation Plan (BWSC108)

☑ 2. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by MassDEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Boardof Health were notified of the implementation of an Immediate Response Action taken to control, prevent, abate or eliminate an Imminent Hazard.

☐ 4. Check here to certify that the Chief Municipal Officer and the Local Boardof Health were notified of the submittal of a Completion Statement for an Immediate Response Action taken to control, prevent, abate or eliminate an Imminent Hazard.

☐ 5. Check here if any non-updatable information provided on this form is incorrect, e.g. Release Address/Location Aid. Send corrections to BWSC.eDEP@state.ma.us.

☑ 6. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

I. CERTIFICATION OF PERSON UNDERTAKING IRA:

1. I, _____, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form; (ii) that, based on my inquiry of the/those individual(s) immediately responsible for obtaining the information, the material information contained herein is, to the best of my knowledge, information and belief, true, accurate and complete; (iii) that, to the best of my knowledge, information and belief, I/the person(s) or entity(ies) on whose behalf this submittal is made satisfy(ies) the criteria in 310 CMR 40.0183(2); (iv) that I/the person(s) or entity(ies) on whose behalf this submittal is made have provided notice in accordance with 310 CMR 40.0183(5); and (v) that I am fully authorized to make this attestation on behalf of the person(s) or entity(ies) legally responsible for this submittal. I/the person(s) or entity(ies) on whose behalf this submittal is made is/are aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

2. By: _____ 3. Title: _____

4. For: BARNSTABLE COUNTY COMMISSIONERS 5. Date: _____ (mm/dd/yyyy)

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section F.

7. Street: _____

8. City/Town: _____ 9. State: _____ 10. Zip Code: _____

11. Telephone: _____ 12. Ext: _____ 13. Email: _____

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
IRA REMEDIAL MONITORING REPORT
Pursuant to 310 CMR 40.0400 (SUBPART D)
Remedial System or Monitoring Program: 1 of: 2

BWSC105 -A

Release Tracking Number
4 - 26179

A. DESCRIPTION OF ACTIVE OPERATION AND MAINTENANCE ACTIVITY:

1. Type of Active Operation and Maintenance Activity: (check all that apply)

☑ a. Active Remedial System: (check all that apply)

☐ i. NAPL Recovery ☐ ii. Soil Vapor Extraction/Bioventing ☐ iii. Vapor-phase Carbon Adsorption
☑ iv. Groundwater Recovery ☐ v. Dual/Multi-phase Extraction ☑ vi. Aqueous-phase Carbon Adsorption
☐ vii. Air Stripping ☐ viii. Sparging/Biosparging ☐ ix. Cat/Thermal Oxidation
☐ x. Other Describe:

☐ b. Active Exposure Pathway Elimination Measure
Active Exposure Pathway Mitigation System to address (check one): ☐ i. Indoor Air ☐ ii. Drinking Water

☐ c. Application of Remedial Additives: (check all that apply)
☐ i. To the Subsurface ☐ ii. To Groundwater (Injection) ☐ iii. To the Surface

☐ d. Active Remedial Monitoring Program Without the Application of Remedial Additives: (check all that apply; Sections C, D and E are not required; attach supporting information, data, maps and/or sketches needed by checking Section G5)
☐ i. Reactive Wall ☐ ii. Natural Attenuation ☐ iii. Other Describe:

2. Mode of Operation: (check one)
☑ a. Continuous ☐ b. Intermittent ☐ c. Pulsed ☐ d. One-time Event Only ☐ e. Other:

3. System Effluent/Discharge: (check all that apply)
☐ a. Sanitary Sewer/POTW
☑ b. Groundwater Re-infiltration/Re-injection: (check one) ☐ i. Downgradient ☑ ii. Upgradient
☐ c. Vapor-phase Discharge to Ambient Air: (check one) ☐ i. Off-gas Controls ☐ ii. No Off-gas Controls
☐ d. Drinking Water Supply
☐ e. Surface Water (including Storm Drains)
☐ f. Other Describe:

B. MONITORING FREQUENCY:

1. Reporting period that is the subject of this submittal: From: 5/1/2021 (mm/dd/yyyy) To: 5/31/2021 (mm/dd/yyyy)

2. Number of monitoring events during the reporting period: (check one)
☐ a. System Startup: (if applicable)
☐ i. Days 1, 3, 6, and then weekly thereafter, for the first month.
☐ ii. Other Describe:
☑ b. Post-system Startup (after first month) or Monitoring Program:
☑ i. Monthly
☐ ii. Quarterly
☐ iii. Annually
☐ iv. Other Describe:

☐ 3. Check here to certify that the number of required monitoring events were conducted during the reporting period.

C. EFFLUENT/DISCHARGE REGULATION: (check one to indicate how the effluent/discharge limits were established)

☐ 1. NPDES: (check one) ☐ a. Remediation General Permit ☐ b. Individual Permit
☐ c. Emergency Exclusion Effective Date of Permit: (mm/dd/yyyy)

☐ 2. MCP Performance Standard MCP Citations(s):

☑ 3. DEP Approval Letter Date of Letter: 11/16/2018 (mm/dd/yyyy)

☐ 4. Other Describe:

D. WASTEWATER TREATMENT PLANT OPERATOR: (check one)

☑ 1. Required due to Remedial Wastewater Treatment Plant in place for more than 30 days.

a. Name: TJMCGOFF b. Grade: 4

c. License No: 15570 d. License Exp. Date: 12/31/2021 (mm/dd/yyyy)

☐ 2. Not Required

☐ 3. Not Applicable

E. STATUS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM DURING REPORTING PERIOD: (check all that apply)

☑ 1. The Active Remedial System was functional one or more days during the Reporting Period.

a. Days System was Fully Functional: 31 b. GW Recovered (gals): 314496

c. NAPL Recovered (gals): d. GW Discharged (gals): 314496

e. Avg. Soil Gas Recovery Rate (scfm): f. Avg. Sparging Rate (scfm):

☐ 2. Remedial Additives: (check all that apply)

☐ a. No Remedial Additives applied during the Reporting Period.

☐ b. Enhanced Bioremediation Additives applied: (total quantity applied at the site for the current reporting period)

☐ i. Nitrogen/Phosphorus:

Name of Additive	Date	Quantity	Units

☐ ii. Peroxides:

Name of Additive	Date	Quantity	Units

☐ iii. Microorganisms:

Name of Additive	Date	Quantity	Units

☐ iv. Other:

Name of Additive	Date	Quantity	Units

☐ c. Chemical oxidation/reduction additives applied: (total quantity applied at the site for the current reporting period)

☐ i. Permanganates:

Name of Additive	Date	Quantity	Units

☐ ii. Peroxides:

Name of Additive	Date	Quantity	Units

☐ iii. Persulfates:

Name of Additive	Date	Quantity	Units

☐ iv. Other:

Name of Additive	Date	Quantity	Units

E. STATUS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM DURING REPORTING PERIOD: (cont.)

☐ d. Other additives applied: (total quantity applied at the site for the current reporting period)

Name of Additive	Date	Quantity	Units

Name of Additive	Date	Quantity	Units

☐ e. Check here if any additional Remedial Additives were applied. Attach list of additional additives and include Name of Additive, Date Applied, Quantity Applied and Units (in gals. or lbs.)

F. SHUTDOWNS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM: (check all that apply)

☐ 1. The Active Remedial System had unscheduled shutdowns on one or more occasions during the Reporting Period.

a. Number of Unscheduled Shutdowns: _____ b. Total Number of Days of Unscheduled Shutdowns: _____

c. Reason(s) for Unscheduled Shutdowns: _____

☐ 2. The Active Remedial System had scheduled shutdowns on one or more occasions during the Reporting Period.

a. Number of Scheduled Shutdowns: _____ b. Total Number of Days of Scheduled Shutdowns: _____

c. Reason(s) for Scheduled Shutdowns: _____

☐ 3. The Active Remedial System or Active Remedial Monitoring Program was permanently shutdown/discontinued during the Reporting Period.

a. Date of Final System or Monitoring Program Shutdown: _____
(mm/dd/yyyy)

☐ b. No Further Effluent Discharges.

☐ c. No Further Application of Remedial Additives planned; sufficient monitoring completed to demonstrate compliance with 310 CMR 40.0046.

☐ d. No Further Submittals Planned.

☐ e. Other: Describe: _____

G. SUMMARY STATEMENTS: (check all that apply for the current reporting period)

☑ 1. All Active Remedial System checks and effluent analyses required by the approved plan and/or permit were performed when applicable.

☑ 2. There were no significant problems or prolonged (>25% of reporting period) unscheduled shutdowns of the Active Remedial System.

☑ 3. The Active Remedial System or Active Remedial Monitoring Program operated in conformance with the MCP, and all applicable approval conditions and/or permits.

4. Indicate any Operational Problems or Notes:

☐ 5. Check here if additional/supporting Information, data, maps, and/or sketches are attached to the form.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
IRA REMEDIAL MONITORING REPORT
MEASUREMENTS
Pursuant to 310 CMR 40.0400 (SUBPART D)
Remedial System or Monitoring Program: 1 of: 2

BWSC105 -B

Release Tracking Number
4 26179

For each Point of Measurement, related to concentration indicate the highest concentration detected during the reporting period, of each oil, hazardous material and/or remedial additive.
For each Point of Measurement for pressure differentials, indicate the lowest pressure differential detected during the reporting period.

Point of Measurement	Date (mm/dd/yyyy)	Contaminant, Measurement and/or Indicator Parameter	Influent Concentration (where applicable)	Midpoint Concentration (where applicable)	(check one) ☐ Discharge ☑ GroundWater Concentration ☐ Pressure Differential	Check here, if ND/BDL	Permissible Concentration or Pressure Differential	Units	Within Permissible Limits? (Y/N)
SYSTEM	05/20/2021	PFAS	1.217	0.698		☑	0.020	UG/L	YES

☐ Check here if any additional BWSC105 B, Measurements Form(s), are needed.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
IRA REMEDIAL MONITORING REPORT
Pursuant to 310 CMR 40.0400 (SUBPART D)
Remedial System or Monitoring Program: 2 of: 2

BWSC105 -A

Release Tracking Number
4 - 26179

A. DESCRIPTION OF ACTIVE OPERATION AND MAINTENANCE ACTIVITY:

1. Type of Active Operation and Maintenance Activity: (check all that apply)

☑ a. Active Remedial System: (check all that apply)

☐ i. NAPL Recovery ☐ ii. Soil Vapor Extraction/Bioventing ☐ iii. Vapor-phase Carbon Adsorption
☑ iv. Groundwater Recovery ☐ v. Dual/Multi-phase Extraction ☑ vi. Aqueous-phase Carbon Adsorption
☐ vii. Air Stripping ☐ viii. Sparging/Biosparging ☐ ix. Cat/Thermal Oxidation
☐ x. Other Describe:

☐ b. Active Exposure Pathway Elimination Measure
Active Exposure Pathway Mitigation System to address (check one): ☐ i. Indoor Air ☐ ii. Drinking Water

☐ c. Application of Remedial Additives: (check all that apply)
☐ i. To the Subsurface ☐ ii. To Groundwater (Injection) ☐ iii. To the Surface

☐ d. Active Remedial Monitoring Program Without the Application of Remedial Additives: (check all that apply; Sections C, D and E are not required; attach supporting information, data, maps and/or sketches needed by checking Section G5)
☐ i. Reactive Wall ☐ ii. Natural Attenuation ☐ iii. Other Describe:

2. Mode of Operation: (check one)
☑ a. Continuous ☐ b. Intermittent ☐ c. Pulsed ☐ d. One-time Event Only ☐ e. Other:

3. System Effluent/Discharge: (check all that apply)
☐ a. Sanitary Sewer/POTW
☑ b. Groundwater Re-infiltration/Re-injection: (check one) ☐ i. Downgradient ☑ ii. Upgradient
☐ c. Vapor-phase Discharge to Ambient Air: (check one) ☐ i. Off-gas Controls ☐ ii. No Off-gas Controls
☐ d. Drinking Water Supply
☐ e. Surface Water (including Storm Drains)
☐ f. Other Describe:

B. MONITORING FREQUENCY:

1. Reporting period that is the subject of this submittal: From: 5/1/2021 (mm/dd/yyyy) To: 5/31/2021 (mm/dd/yyyy)

2. Number of monitoring events during the reporting period: (check one)
☐ a. System Startup: (if applicable)
☐ i. Days 1, 3, 6, and then weekly thereafter, for the first month.
☐ ii. Other Describe:
☑ b. Post-system Startup (after first month) or Monitoring Program:
☑ i. Monthly
☐ ii. Quarterly
☐ iii. Annually
☐ iv. Other Describe:

☐ 3. Check here to certify that the number of required monitoring events were conducted during the reporting period.

C. EFFLUENT/DISCHARGE REGULATION: (check one to indicate how the effluent/discharge limits were established)

☐ 1. NPDES: (check one) ☐ a. Remediation General Permit ☐ b. Individual Permit
☐ c. Emergency Exclusion Effective Date of Permit: (mm/dd/yyyy)

☐ 2. MCP Performance Standard MCP Citations(s):

☑ 3. DEP Approval Letter Date of Letter: 11/16/2018 (mm/dd/yyyy)

☐ 4. Other Describe:

D. WASTEWATER TREATMENT PLANT OPERATOR: (check one)

☑ 1. Required due to Remedial Wastewater Treatment Plant in place for more than 30 days.

a. Name: TJMCGOFF b. Grade: 4

c. License No: 15570 d. License Exp. Date: 12/31/2021 (mm/dd/yyyy)

☐ 2. Not Required

☐ 3. Not Applicable

E. STATUS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM DURING REPORTING PERIOD: (check all that apply)

☑ 1. The Active Remedial System was functional one or more days during the Reporting Period.

a. Days System was Fully Functional: 31 b. GW Recovered (gals): 408117

c. NAPL Recovered (gals): d. GW Discharged (gals): 408117

e. Avg. Soil Gas Recovery Rate (scfm): f. Avg. Sparging Rate (scfm):

☐ 2. Remedial Additives: (check all that apply)

☐ a. No Remedial Additives applied during the Reporting Period.

☐ b. Enhanced Bioremediation Additives applied: (total quantity applied at the site for the current reporting period)

☐ i. Nitrogen/Phosphorus:

Name of Additive	Date	Quantity	Units

☐ ii. Peroxides:

Name of Additive	Date	Quantity	Units

☐ iii. Microorganisms:

Name of Additive	Date	Quantity	Units

☐ iv. Other:

Name of Additive	Date	Quantity	Units

☐ c. Chemical oxidation/reduction additives applied: (total quantity applied at the site for the current reporting period)

☐ i. Permanganates:

Name of Additive	Date	Quantity	Units

☐ ii. Peroxides:

Name of Additive	Date	Quantity	Units

☐ iii. Persulfates:

Name of Additive	Date	Quantity	Units

☐ iv. Other:

Name of Additive	Date	Quantity	Units

E. STATUS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM DURING REPORTING PERIOD: (cont.)

☐ d. Other additives applied: (total quantity applied at the site for the current reporting period)

Name of Additive	Date	Quantity	Units

Name of Additive	Date	Quantity	Units

☐ e. Check here if any additional Remedial Additives were applied. Attach list of additional additives and include Name of Additive, Date Applied, Quantity Applied and Units (in gals. or lbs.)

F. SHUTDOWNS OF ACTIVE REMEDIAL SYSTEM OR ACTIVE REMEDIAL MONITORING PROGRAM: (check all that apply)

☐ 1. The Active Remedial System had unscheduled shutdowns on one or more occasions during the Reporting Period.

a. Number of Unscheduled Shutdowns: _____ b. Total Number of Days of Unscheduled Shutdowns: _____

c. Reason(s) for Unscheduled Shutdowns: _____

☐ 2. The Active Remedial System had scheduled shutdowns on one or more occasions during the Reporting Period.

a. Number of Scheduled Shutdowns: _____ b. Total Number of Days of Scheduled Shutdowns: _____

c. Reason(s) for Scheduled Shutdowns: _____

☐ 3. The Active Remedial System or Active Remedial Monitoring Program was permanently shutdown/discontinued during the Reporting Period.

a. Date of Final System or Monitoring Program Shutdown: _____
(mm/dd/yyyy)

☐ b. No Further Effluent Discharges.

☐ c. No Further Application of Remedial Additives planned; sufficient monitoring completed to demonstrate compliance with 310 CMR 40.0046.

☐ d. No Further Submittals Planned.

☐ e. Other: Describe: _____

G. SUMMARY STATEMENTS: (check all that apply for the current reporting period)

☑ 1. All Active Remedial System checks and effluent analyses required by the approved plan and/or permit were performed when applicable.

☑ 2. There were no significant problems or prolonged (>25% of reporting period) unscheduled shutdowns of the Active Remedial System.

☑ 3. The Active Remedial System or Active Remedial Monitoring Program operated in conformance with the MCP, and all applicable approval conditions and/or permits.

4. Indicate any Operational Problems or Notes:

☐ 5. Check here if additional/supporting Information, data, maps, and/or sketches are attached to the form.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
IRA REMEDIAL MONITORING REPORT
MEASUREMENTS
Pursuant to 310 CMR 40.0400 (SUBPART D)
Remedial System or Monitoring Program: 2 of: 2

BWSC105 -B

Release Tracking Number
4 26179

For each Point of Measurement, related to concentration indicate the highest concentration detected during the reporting period, of each oil, hazardous material and/or remedial additive.
For each Point of Measurement for pressure differentials, indicate the lowest pressure differential detected during the reporting period.

Point of Measurement	Date (mm/dd/yyyy)	Contaminant, Measurement and/or Indicator Parameter	Influent Concentration (where applicable)	Midpoint Concentration (where applicable)	(check one) ☐ Discharge ☑ GroundWater Concentration ☐ Pressure Differential	Check here, if ND/BDL	Permissible Concentration or Pressure Differential	Units	Within Permissible Limits? (Y/N)
SYSTEM	05/20/2021	PFAS	1.217	0	0.062	☐	0.020	UG/L	NO

☐ Check here if any additional BWSC105 B, Measurements Form(s), are needed.

APPENDIX B

Laboratory Reports/Certificates of Analysis

Your Project #: 6206
Site Location: BARNSTABLE, MA
Your C.O.C. #: n/a

Attention: Steven Tebo

Barnstable County
3195 Main Street
PO Box 427
Barnstable, MA
USA 02630

Report Date: 2021/06/01
Report #: R6657392
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1E0304
Received: 2021/05/25, 13:43

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Low level PFOS and PFOA by SPE/LCMS (1)	5	2021/05/28	2021/05/29	CAM SOP-00894	EPA 537 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Per- and polyfluoroalkyl substances (PFAS) identified as surrogates on the certificate of analysis represent the extracted internal standard.

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Your Project #: 6206
Site Location: BARNSTABLE, MA
Your C.O.C. #: n/a

Attention: Steven Tebo

Barnstable County
3195 Main Street
PO Box 427
Barnstable, MA
USA 02630

Report Date: 2021/06/01
Report #: R6657392
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1E0304
Received: 2021/05/25, 13:43

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Lori Dufour, Project Manager
Email: Lori.Dufour@bureauveritas.com
Phone# (905) 817-5700
==========
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		PQO460			PQO461			
Sampling Date		2021/05/20 11:55			2021/05/20 12:00			
COC Number		n/a			n/a			
	UNITS	INFLUENT PRW-4	RDL	MDL	SYSTEM#1 MIDPOINT	RDL	MDL	QC Batch
Perfluorinated Compounds								
Perfluorobutanoic acid (PFBA)	ng/L	17	2.0	0.67	8.4	2.0	0.67	7380557
Perfluoropentanoic acid (PFPeA)	ng/L	53	2.0	0.52	31	2.0	0.52	7377524
Perfluorohexanoic acid (PFHxA)	ng/L	59	2.0	0.70	32	2.0	0.70	7377524
Perfluoroheptanoic acid (PFHpA)	ng/L	37	2.0	0.51	21	2.0	0.51	7377524
Perfluorooctanoic acid (PFOA)	ng/L	32	2.0	0.49	19	2.0	0.49	7377524
Perfluorononanoic acid (PFNA)	ng/L	38	2.0	0.80	20	2.0	0.80	7377524
Perfluorodecanoic acid (PFDA)	ng/L	10	2.0	0.64	6.2	2.0	0.64	7377524
Perfluoroundecanoic acid (PFUnA)	ng/L	49	2.0	0.77	30	2.0	0.77	7377524
Perfluorododecanoic acid (PFDoA)	ng/L	<0.59	2.0	0.59	<0.59	2.0	0.59	7377524
Perfluorotridecanoic acid (PFTRDA)	ng/L	<0.48	2.0	0.48	<0.48	2.0	0.48	7377524
Perfluorotetradecanoic acid(PFTEDA)	ng/L	<0.37	2.0	0.37	<0.37	2.0	0.37	7377524
Perfluorobutanesulfonic acid (PFBS)	ng/L	5.6	2.0	0.47	1.7	2.0	0.47	7380557
Perfluoropentanesulfonic acid PFPes	ng/L	11	2.0	0.73	6.7	2.0	0.73	7377524
Perfluorohexanesulfonic acid(PFHxS)	ng/L	130	20	5.3	72	2.0	0.53	7377524
Perfluoroheptanesulfonic acid PFHpS	ng/L	6.3	2.0	0.57	3.9	2.0	0.57	7377524
Perfluorooctanesulfonic acid (PFOS)	ng/L	970	20	4.3	560	20	4.3	7377524
Perfluorononanesulfonic acid (PFNS)	ng/L	<0.64	2.0	0.64	<0.64	2.0	0.64	7377524
Perfluorodecanesulfonic acid (PFDS)	ng/L	<0.53	2.0	0.53	<0.53	2.0	0.53	7377524
Perfluorooctane Sulfonamide (PFOSA)	ng/L	4.1	4.0	0.81	2.4	4.0	0.81	7377524
6:2 Fluorotelomer sulfonic acid	ng/L	72	4.0	0.59	40	4.0	0.59	7377524
8:2 Fluorotelomer sulfonic acid	ng/L	130	40	7.5	76	4.0	0.75	7377524
Surrogate Recovery (%)								
13C2-6:2-Fluorotelomersulfonic Acid	%	69	N/A	N/A	80	N/A	N/A	7377524
13C2-8:2-Fluorotelomersulfonic Acid	%	69	N/A	N/A	73	N/A	N/A	7377524
13C2-Perfluorodecanoic acid	%	74	N/A	N/A	79	N/A	N/A	7377524
13C2-Perfluorododecanoic acid	%	68	N/A	N/A	68	N/A	N/A	7377524
13C2-Perfluorohexanoic acid	%	78	N/A	N/A	84	N/A	N/A	7377524
13C2-perfluorotetradecanoic acid	%	55	N/A	N/A	55	N/A	N/A	7377524
13C2-Perfluoroundecanoic acid	%	68	N/A	N/A	71	N/A	N/A	7377524
13C3-Perfluorobutanesulfonic acid	%	86	N/A	N/A	84	N/A	N/A	7380557
13C4-Perfluorobutanoic acid	%	77	N/A	N/A	72	N/A	N/A	7380557
13C4-Perfluoroheptanoic acid	%	75	N/A	N/A	84	N/A	N/A	7377524
13C4-Perfluorooctanesulfonic acid	%	93	N/A	N/A	91	N/A	N/A	7377524

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		PQO460			PQO461			
Sampling Date		2021/05/20 11:55			2021/05/20 12:00			
COC Number		n/a			n/a			
	UNITS	INFLUENT PRW-4	RDL	MDL	SYSTEM#1 MIDPOINT	RDL	MDL	QC Batch
13C4-Perfluorooctanoic acid	%	75	N/A	N/A	80	N/A	N/A	7377524
13C5-Perfluorononanoic acid	%	71	N/A	N/A	80	N/A	N/A	7377524
13C5-Perfluoropentanoic acid	%	78	N/A	N/A	83	N/A	N/A	7377524
13C8-Perfluorooctane Sulfonamide	%	22	N/A	N/A	36	N/A	N/A	7377524
18O2-Perfluorohexanesulfonic acid	%	97	N/A	N/A	150	N/A	N/A	7377524

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		PQO462		PQO463			
Sampling Date		2021/05/20 12:05		2021/05/20 12:10			
COC Number		n/a		n/a			
	UNITS	SYSTEM#1 EFFLUENT	QC Batch	SYSTEM#2 MIDPOINT	RDL	MDL	QC Batch
Perfluorinated Compounds							
Perfluorobutanoic acid (PFBA)	ng/L	<0.67	7380557	<0.67	2.0	0.67	7380557
Perfluoropentanoic acid (PFPeA)	ng/L	0.71	7377524	<0.52	2.0	0.52	7377524
Perfluorohexanoic acid (PFHxA)	ng/L	<0.70	7377524	<0.70	2.0	0.70	7377524
Perfluoroheptanoic acid (PFHpA)	ng/L	<0.51	7377524	<0.51	2.0	0.51	7377524
Perfluorooctanoic acid (PFOA)	ng/L	<0.49	7377524	<0.49	2.0	0.49	7377524
Perfluorononanoic acid (PFNA)	ng/L	<0.80	7377524	<0.80	2.0	0.80	7377524
Perfluorodecanoic acid (PFDA)	ng/L	<0.64	7377524	<0.64	2.0	0.64	7377524
Perfluoroundecanoic acid (PFUnA)	ng/L	<0.77	7377524	<0.77	2.0	0.77	7377524
Perfluorododecanoic acid (PFDoA)	ng/L	<0.59	7377524	<0.59	2.0	0.59	7377524
Perfluorotridecanoic acid (PFTRDA)	ng/L	<0.48	7380557	<0.48	2.0	0.48	7380557
Perfluorotetradecanoic acid(PFTEDA)	ng/L	<0.37	7380557	<0.37	2.0	0.37	7380557
Perfluorobutanesulfonic acid (PFBS)	ng/L	<0.47	7380557	<0.47	2.0	0.47	7380557
Perfluoropentanesulfonic acid PFPes	ng/L	<0.73	7377524	<0.73	2.0	0.73	7377524
Perfluorohexanesulfonic acid(PFHxS)	ng/L	<0.53	7377524	<0.53	2.0	0.53	7377524
Perfluoroheptanesulfonic acid PFHpS	ng/L	<0.57	7377524	<0.57	2.0	0.57	7377524
Perfluorooctanesulfonic acid (PFOS)	ng/L	<0.43	7377524	<0.43	2.0	0.43	7377524
Perfluorononanesulfonic acid (PFNS)	ng/L	<0.64	7377524	<0.64	2.0	0.64	7377524
Perfluorodecanesulfonic acid (PFDS)	ng/L	<0.53	7377524	<0.53	2.0	0.53	7377524
Perfluorooctane Sulfonamide (PFOSA)	ng/L	<0.81	7380557	<0.81	4.0	0.81	7377524
6:2 Fluorotelomer sulfonic acid	ng/L	<0.59	7377524	<0.59	4.0	0.59	7377524
8:2 Fluorotelomer sulfonic acid	ng/L	<0.75	7377524	<0.75	4.0	0.75	7377524
Surrogate Recovery (%)							
13C2-6:2-Fluorotelomersulfonic Acid	%	76	7377524	80	N/A	N/A	7377524
13C2-8:2-Fluorotelomersulfonic Acid	%	72	7377524	70	N/A	N/A	7377524
13C2-Perfluorodecanoic acid	%	67	7377524	69	N/A	N/A	7377524
13C2-Perfluorododecanoic acid	%	58	7377524	61	N/A	N/A	7377524
13C2-Perfluorohexanoic acid	%	80	7377524	79	N/A	N/A	7377524
13C2-perfluorotetradecanoic acid	%	45 (1)	7380557	59	N/A	N/A	7380557
13C2-Perfluoroundecanoic acid	%	61	7377524	65	N/A	N/A	7377524

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the extracted internal standard analyte. When considered together, these QC data suggest that matrix interferences may be biasing the data low for the associated native analytes (PFTrDA, PFTeDA).

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BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		PQO462		PQO463			
Sampling Date		2021/05/20 12:05		2021/05/20 12:10			
COC Number		n/a		n/a			
	UNITS	SYSTEM#1 EFFLUENT	QC Batch	SYSTEM#2 MIDPOINT	RDL	MDL	QC Batch
13C3-Perfluorobutanesulfonic acid	%	80	7380557	86	N/A	N/A	7380557
13C4-Perfluorobutanoic acid	%	69	7380557	77	N/A	N/A	7380557
13C4-Perfluoroheptanoic acid	%	78	7377524	76	N/A	N/A	7377524
13C4-Perfluorooctanesulfonic acid	%	92	7377524	91	N/A	N/A	7377524
13C4-Perfluorooctanoic acid	%	72	7377524	72	N/A	N/A	7377524
13C5-Perfluorononanoic acid	%	68	7377524	68	N/A	N/A	7377524
13C5-Perfluoropentanoic acid	%	79	7377524	76	N/A	N/A	7377524
13C8-Perfluorooctane Sulfonamide	%	31	7380557	23	N/A	N/A	7377524
18O2-Perfluorohexanesulfonic acid	%	97	7377524	93	N/A	N/A	7377524

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		PQO464			
Sampling Date		2021/05/20 12:15			
COC Number		n/a			
	UNITS	SYSTEM#2 EFFLUENT	RDL	MDL	QC Batch
Perfluorinated Compounds					
Perfluorobutanoic acid (PFBA)	ng/L	24	2.0	0.67	7380557
Perfluoropentanoic acid (PFPeA)	ng/L	31	2.0	0.52	7377524
Perfluorohexanoic acid (PFHxA)	ng/L	17	2.0	0.70	7377524
Perfluoroheptanoic acid (PFHpA)	ng/L	4.9	2.0	0.51	7377524
Perfluorooctanoic acid (PFOA)	ng/L	3.1	2.0	0.49	7377524
Perfluorononanoic acid (PFNA)	ng/L	2.4	2.0	0.80	7377524
Perfluorodecanoic acid (PFDA)	ng/L	<0.64	2.0	0.64	7377524
Perfluoroundecanoic acid (PFUnA)	ng/L	2.6	2.0	0.77	7377524
Perfluorododecanoic acid (PFDoA)	ng/L	<0.59	2.0	0.59	7377524
Perfluorotridecanoic acid (PFTRDA)	ng/L	<0.48	2.0	0.48	7377524
Perfluorotetradecanoic acid(PFTEDA)	ng/L	<0.37	2.0	0.37	7377524
Perfluorobutanesulfonic acid (PFBS)	ng/L	<0.47	2.0	0.47	7380557
Perfluoropentanesulfonic acid PFPes	ng/L	1.4	2.0	0.73	7377524
Perfluorohexanesulfonic acid(PFHxS)	ng/L	9.1	2.0	0.53	7377524
Perfluoroheptanesulfonic acid PFHpS	ng/L	<0.57	2.0	0.57	7377524
Perfluorooctanesulfonic acid (PFOS)	ng/L	42	2.0	0.43	7377524
Perfluorononanesulfonic acid (PFNS)	ng/L	<0.64	2.0	0.64	7377524
Perfluorodecanesulfonic acid (PFDS)	ng/L	<0.53	2.0	0.53	7377524
Perfluorooctane Sulfonamide (PFOSA)	ng/L	<0.81	4.0	0.81	7377524
6:2 Fluorotelomer sulfonic acid	ng/L	5.2	4.0	0.59	7377524
8:2 Fluorotelomer sulfonic acid	ng/L	5.5	4.0	0.75	7377524
Surrogate Recovery (%)					
13C2-6:2-Fluorotelomersulfonic Acid	%	85	N/A	N/A	7377524
13C2-8:2-Fluorotelomersulfonic Acid	%	77	N/A	N/A	7377524
13C2-Perfluorodecanoic acid	%	76	N/A	N/A	7377524
13C2-Perfluorododecanoic acid	%	64	N/A	N/A	7377524
13C2-Perfluorohexanoic acid	%	84	N/A	N/A	7377524
13C2-perfluorotetradecanoic acid	%	56	N/A	N/A	7377524
13C2-Perfluoroundecanoic acid	%	70	N/A	N/A	7377524
13C3-Perfluorobutanesulfonic acid	%	85	N/A	N/A	7380557
13C4-Perfluorobutanoic acid	%	74	N/A	N/A	7380557
13C4-Perfluoroheptanoic acid	%	86	N/A	N/A	7377524
13C4-Perfluorooctanesulfonic acid	%	97	N/A	N/A	7377524

RDL = Reportable Detection Limit
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N/A = Not Applicable

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BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

RESULTS OF ANALYSES OF WATER

BV Labs ID		PQO464			
Sampling Date		2021/05/20 12:15			
COC Number		n/a			
	UNITS	SYSTEM#2 EFFLUENT	RDL	MDL	QC Batch
13C4-Perfluorooctanoic acid	%	80	N/A	N/A	7377524
13C5-Perfluorononanoic acid	%	76	N/A	N/A	7377524
13C5-Perfluoropentanoic acid	%	81	N/A	N/A	7377524
13C8-Perfluorooctane Sulfonamide	%	29	N/A	N/A	7377524
18O2-Perfluorohexanesulfonic acid	%	98	N/A	N/A	7377524

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

TEST SUMMARY

BV Labs ID: PQO460
Sample ID: INFLUENT PRW-4
Matrix: Water
Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	7377524	2021/05/28	2021/05/29	Adnan Khan

BV Labs ID: PQO461
Sample ID: SYSTEM#1 MIDPOINT
Matrix: Water
Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	7377524	2021/05/28	2021/05/29	Adnan Khan

BV Labs ID: PQO462
Sample ID: SYSTEM#1 EFFLUENT
Matrix: Water
Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	7377524	2021/05/28	2021/05/29	Adnan Khan

BV Labs ID: PQO463
Sample ID: SYSTEM#2 MIDPOINT
Matrix: Water
Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	7377524	2021/05/28	2021/05/29	Adnan Khan

BV Labs ID: PQO464
Sample ID: SYSTEM#2 EFFLUENT
Matrix: Water
Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Low level PFOS and PFOA by SPE/LCMS	LCMS	7377524	2021/05/28	2021/05/29	Adnan Khan

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BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

GENERAL COMMENTS

Samples received in cooler 1 of 2 were received with elevated temperature. Client consented to proceed with analysis.

Sample PQO460 [INFLUENT PRW-4] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, sample required dilution. Detection limits were adjusted accordingly.

Sample PQO461 [SYSTEM#1 MIDPOINT] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, sample required dilution. Detection limits were adjusted accordingly.

Sample PQO460, Low level PFOS and PFOA by SPE/LCMS: Test repeated.
Sample PQO461, Low level PFOS and PFOA by SPE/LCMS: Test repeated.
Sample PQO462, Low level PFOS and PFOA by SPE/LCMS: Test repeated.
Sample PQO463, Low level PFOS and PFOA by SPE/LCMS: Test repeated.
Sample PQO464, Low level PFOS and PFOA by SPE/LCMS: Test repeated.

Results relate only to the items tested.

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BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
7377524	AKH	Spiked Blank	13C2-6:2-Fluorotelomersulfonic Acid	2021/05/29		77	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/05/29		72	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/05/29		71	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/05/29		63	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/05/29		80	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/05/29		59	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/05/29		68	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/05/29		77	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/05/29		92	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/05/29		75	%	50 - 150
			13C5-Perfluorononanoic acid	2021/05/29		71	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/05/29		79	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/05/29		28	%	20 - 130
			18O2-Perfluorohexanesulfonic acid	2021/05/29		88	%	50 - 150
			Perfluoropentanoic acid (PFPeA)	2021/05/29		94	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2021/05/29		95	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2021/05/29		95	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2021/05/29		93	%	70 - 130
			Perfluorononanoic acid (PFNA)	2021/05/29		105	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2021/05/29		96	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2021/05/29		95	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2021/05/29		94	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/05/29		97	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/05/29		89	%	70 - 130
			Perfluoropentanesulfonic acid PFPes	2021/05/29		112	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2021/05/29		98	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2021/05/29		110	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2021/05/29		94	%	70 - 130
			Perfluorononanesulfonic acid (PFNS)	2021/05/29		111	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2021/05/29		102	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/05/29		96	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2021/05/29		96	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2021/05/29		99	%	70 - 130
7377524	AKH	Spiked Blank DUP	13C2-6:2-Fluorotelomersulfonic Acid	2021/05/29		79	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/05/29		76	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/05/29		77	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/05/29		67	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/05/29		83	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/05/29		63	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/05/29		71	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/05/29		80	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/05/29		91	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/05/29		78	%	50 - 150
			13C5-Perfluorononanoic acid	2021/05/29		75	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/05/29		81	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/05/29		19 (1)	%	20 - 130
			18O2-Perfluorohexanesulfonic acid	2021/05/29		92	%	50 - 150
			Perfluoropentanoic acid (PFPeA)	2021/05/29		96	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2021/05/29		94	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2021/05/29		95	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2021/05/29		95	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorononanoic acid (PFNA)	2021/05/29		104	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2021/05/29		93	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2021/05/29		95	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2021/05/29		93	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/05/29		98	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/05/29		90	%	70 - 130
			Perfluoropentanesulfonic acid PFPes	2021/05/29		114	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2021/05/29		97	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2021/05/29		109	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2021/05/29		99	%	70 - 130
			Perfluorononanesulfonic acid (PFNS)	2021/05/29		108	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2021/05/29		99	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/05/29		100	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2021/05/29		94	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2021/05/29		95	%	70 - 130
7377524	AKH	RPD	Perfluoropentanoic acid (PFPeA)	2021/05/29	2.0		%	30
			Perfluorohexanoic acid (PFHxA)	2021/05/29	0.32		%	30
			Perfluoroheptanoic acid (PFHpA)	2021/05/29	0.22		%	30
			Perfluorooctanoic acid (PFOA)	2021/05/29	2.1		%	30
			Perfluorononanoic acid (PFNA)	2021/05/29	1.3		%	30
			Perfluorodecanoic acid (PFDA)	2021/05/29	2.6		%	30
			Perfluoroundecanoic acid (PFUnA)	2021/05/29	0.26		%	30
			Perfluorododecanoic acid (PFDoA)	2021/05/29	0.13		%	30
			Perfluorotridecanoic acid (PFTRDA)	2021/05/29	1.7		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2021/05/29	0.88		%	30
			Perfluoropentanesulfonic acid PFPes	2021/05/29	1.7		%	30
			Perfluorohexanesulfonic acid(PFHxS)	2021/05/29	1.7		%	30
			Perfluoroheptanesulfonic acid PFHpS	2021/05/29	1.1		%	30
			Perfluorooctanesulfonic acid (PFOS)	2021/05/29	4.3		%	30
			Perfluorononanesulfonic acid (PFNS)	2021/05/29	2.5		%	30
			Perfluorodecanesulfonic acid (PFDS)	2021/05/29	3.3		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2021/05/29	4.1		%	30
			6:2 Fluorotelomer sulfonic acid	2021/05/29	2.3		%	30
			8:2 Fluorotelomer sulfonic acid	2021/05/29	4.8		%	30
7377524	AKH	Method Blank	13C2-6:2-Fluorotelomersulfonic Acid	2021/05/29		104	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/05/29		102	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/05/29		103	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/05/29		97	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/05/29		107	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/05/29		86	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/05/29		98	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/05/29		108	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/05/29		107	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/05/29		103	%	50 - 150
			13C5-Perfluorononanoic acid	2021/05/29		102	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/05/29		100	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/05/29		45	%	20 - 130
			18O2-Perfluorohexanesulfonic acid	2021/05/29		101	%	50 - 150
			Perfluoropentanoic acid (PFPeA)	2021/05/29	<0.52		ng/L	
			Perfluorohexanoic acid (PFHxA)	2021/05/29	<0.70		ng/L	
			Perfluoroheptanoic acid (PFHpA)	2021/05/29	<0.51		ng/L	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorooctanoic acid (PFOA)	2021/05/29	<0.49		ng/L	
			Perfluorononanoic acid (PFNA)	2021/05/29	<0.80		ng/L	
			Perfluorodecanoic acid (PFDA)	2021/05/29	<0.64		ng/L	
			Perfluoroundecanoic acid (PFUnA)	2021/05/29	<0.77		ng/L	
			Perfluorododecanoic acid (PFDoA)	2021/05/29	<0.59		ng/L	
			Perfluorotridecanoic acid (PFTRDA)	2021/05/29	<0.48		ng/L	
			Perfluorotetradecanoic acid(PFTEDA)	2021/05/29	<0.37		ng/L	
			Perfluoropentanesulfonic acid PFPes	2021/05/29	<0.73		ng/L	
			Perfluorohexanesulfonic acid(PFHxS)	2021/05/29	<0.53		ng/L	
			Perfluoroheptanesulfonic acid PFHpS	2021/05/29	<0.57		ng/L	
			Perfluorooctanesulfonic acid (PFOS)	2021/05/29	<0.43		ng/L	
			Perfluorononanesulfonic acid (PFNS)	2021/05/29	<0.64		ng/L	
			Perfluorodecanesulfonic acid (PFDS)	2021/05/29	<0.53		ng/L	
			Perfluorooctane Sulfonamide (PFOSA)	2021/05/29	<0.81		ng/L	
			6:2 Fluorotelomer sulfonic acid	2021/05/29	<0.59		ng/L	
			8:2 Fluorotelomer sulfonic acid	2021/05/29	<0.75		ng/L	
7380557	YPL	Spiked Blank	13C2-perfluorotetradecanoic acid	2021/06/01		78	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/06/01		82	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/06/01		87	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/06/01		69	%	20 - 130
			Perfluorobutanoic acid (PFBA)	2021/06/01		104	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01		101	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01		102	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01		107	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01		99	%	70 - 130
7380557	YPL	Spiked Blank DUP	13C2-perfluorotetradecanoic acid	2021/06/01		70	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/06/01		70	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/06/01		82	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/06/01		58	%	20 - 130
			Perfluorobutanoic acid (PFBA)	2021/06/01		104	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01		105	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01		104	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01		107	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01		98	%	70 - 130
7380557	YPL	RPD	Perfluorobutanoic acid (PFBA)	2021/06/01	0.15		%	30
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01	4.6		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01	1.4		%	30
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01	0.40		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01	1.7		%	30
7380557	YPL	Method Blank	13C2-perfluorotetradecanoic acid	2021/06/01		80	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/06/01		90	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/06/01		92	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/06/01		54	%	20 - 130
			Perfluorobutanoic acid (PFBA)	2021/06/01	<0.67		ng/L	
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01	<0.48		ng/L	
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01	<0.37		ng/L	
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01	<0.47		ng/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01	<0.81		ng/L	

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL) which may result in increased variability of the associated native analyte result (PFOSA).

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BV Labs Job #: C1E0304
Report Date: 2021/06/01

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA
Sampler Initials: MM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Colm McNamara, Senior Analyst, Liquid Chromatography

Sin Chii Chia, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

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6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
CAM FCD-01191/6

CHAIN OF CUSTODY RECORD

Page ___ of ___

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	Barnstable County	Company Name:	BETA Group	Quotation #:		[X] Regular TAT (5-7 days) Most analyses
Contact Name:	Priscilla Ellis/Steve Tebo	Contact Name:	Roger Thibault/Mykel Mendes	P.O. #/ AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	3195 Main Street	Address:	701 GEORGE WASH. HWY	Project #:	6206	Rush TAT (Surcharges will be applied)
	Barnstable, MA		LINCOLN, RI 02865	Site Location:	Barnstable, MA , USA	[ ] 1 Day [ ] 2 Days [ ] 3-4 Days
Phone:	Fax:	Phone:	401-333-2382 Fax:	Site #:		
Email:	pellis@barnstablecounty.com	Email:	mmendes@beta-inc.com; rthibault@beta-inc.com	Site Location Province:		Date Required:
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY				Sampled By:	Mykel Mendes,	Rush Confirmation #:

Regulation 153	Other Regulations
[ ] Table 1 [ ] Res/Park [ ] Med/ Fine	[ ] CCME [ ] Sanitary Sewer Bylaw
[ ] Table 2 [ ] Ind/Comm [ ] Coarse	[ ] MISA [ ] Storm Sewer Bylaw
[ ] Table 3 [ ] Agri/ Other	[ ] PWQO Region
[ ] Table ____	[X] Other (Specify) USA, MASSDEP
FOR RSC (PLEASE CIRCLE) Y / N	[ ] REG 558 (MIN. 3 DAY TAT REQUIRED)
	[ ] REG 406 Table ____

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	BTEX/ PHC F1	PHCs F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 ICPMS METALS	REG 153 METALS (Hg, Cr VI, ICPMS Metals, HWS - B)	USEPA 537 M (TOTAL PFAS)	HOLD- DO NOT ANALYZE	COMMENTS
1	INFLUENT PRW-4	5/20/2021	1155	GW	2								X		USE LOWER RDLS
2	SYSTEM #1 MIDPOINT	5/20/2021	1200	GW	2								X		USE LOWER RDLS
3	SYSTEM #1 EFFLUENT	5/20/2021	1205	GW	2								X		USE LOWER RDLS
4	SYSTEM #2 MIDPOINT	5/20/2021	1210	GW	2								X		USE LOWER RDLS
5	SYSTEM #2 EFFLUENT	5/20/2021	1215	GW	2								X		USE LOWER RDLS
6															
7															
8															
9															
10															

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
Y	Y	12.9/5/3
		12.7/8.7/4.7

COOLING MEDIA PRESENT: Y / N

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Mykel Mendes Mykel Mendes	21/05/24	1115		20/5/25	13:43

25-May-21 13:43
Lori Dufour
C1E0304
VBV ENV-652

Your Project #: 6206
Site Location: BARNSTABLE, MA, USA
Your C.O.C. #: N/A

Attention: Steven Tebo

Barnstable County
3195 Main Street
PO Box 427
Barnstable, MA
USA 02630

Report Date: 2021/06/03
Report #: R6659976
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1E0320
Received: 2021/05/25, 13:45

Sample Matrix: Water
Samples Received: 19

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
PFAS in water by SPE/LCMS (1)	5	2021/05/27	2021/05/29	CAM SOP-00894	EPA 537 m
PFAS in water by SPE/LCMS (1)	6	2021/05/30	2021/06/01	CAM SOP-00894	EPA 537 m
PFAS in water by SPE/LCMS (1)	8	2021/05/31	2021/06/01	CAM SOP-00894	EPA 537 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Per- and polyfluoroalkyl substances (PFAS) identified as surrogates on the certificate of analysis represent the extracted internal standard.

Your Project #: 6206
Site Location: BARNSTABLE, MA, USA
Your C.O.C. #: N/A

Attention: Steven Tebo

Barnstable County
3195 Main Street
PO Box 427
Barnstable, MA
USA 02630

Report Date: 2021/06/03
Report #: R6659976
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1E0320
Received: 2021/05/25, 13:45

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Lori Dufour, Project Manager
Email: Lori.Dufour@bureauveritas.com
Phone# (905) 817-5700
==========
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO577	PQO578	PQO579			PQO580			
Sampling Date		2021/05/20 12:10	2021/05/19 11:15	2021/05/19 10:40			2021/05/19 11:25			
	UNITS	PFW-1	HSW-6	PFW-5	RDL	MDL	OW-8A	RDL	MDL	QC Batch
Perfluorinated Compounds										
Perfluorobutanoic acid (PFBA)	ug/L	0.11	0.13	0.068	0.020	0.0039	0.027	0.020	0.0039	7374960
Perfluoropentanoic acid (PFPeA)	ug/L	0.48	0.48	0.21	0.020	0.0067	0.077	0.020	0.0067	7374960
Perfluorohexanoic acid (PFHxA)	ug/L	0.50	0.60	0.24	0.020	0.0053	0.11	0.020	0.0053	7374960
Perfluoroheptanoic acid (PFHpA)	ug/L	0.25	0.15	0.11	0.020	0.0067	0.066	0.020	0.0067	7374960
Perfluorooctanoic acid (PFOA)	ug/L	0.16	0.18	0.12	0.020	0.0050	0.12	0.020	0.0050	7374960
Perfluorononanoic acid (PFNA)	ug/L	0.066	0.047	0.027	0.020	0.0051	0.025	0.020	0.0051	7374960
Perfluorodecanoic acid (PFDA)	ug/L	0.045	0.019	0.0070	0.020	0.0039	<0.0039	0.020	0.0039	7374960
Perfluoroundecanoic acid (PFUnA)	ug/L	0.19	0.14	0.029	0.020	0.0062	<0.0062	0.020	0.0062	7374960
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0080	<0.0080	<0.0080	0.020	0.0080	<0.0080	0.020	0.0080	7374960
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0064	<0.0064	<0.0064	0.020	0.0064	<0.0064	0.020	0.0064	7374960
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0068	<0.0068	<0.0068	0.020	0.0068	<0.0068	0.020	0.0068	7374960
Perfluorobutanesulfonic acid (PFBS)	ug/L	0.065	0.032	0.054	0.020	0.0056	0.0060	0.020	0.0056	7374960
Perfluorohexanesulfonic acid(PFHxS)	ug/L	0.75	0.44	0.79	0.020	0.0044	0.33	0.020	0.0044	7374960
Perfluoroheptanesulfonic acid PFHpS	ug/L	0.031	0.011	0.017	0.020	0.0065	<0.0065	0.020	0.0065	7374960
Perfluorooctanesulfonic acid (PFOS)	ug/L	3.1	2.7	1.2	0.20	0.057	0.12	0.020	0.0057	7374960
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0064	<0.0064	<0.0064	0.020	0.0064	<0.0064	0.020	0.0064	7374960
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0056	<0.0036	0.039	0.020	0.0036	<0.0036	0.020	0.0036	7374960
EtFOSA	ug/L	<0.0070	<0.0070	<0.0070	0.020	0.0070	<0.0070	0.020	0.0070	7374960
MeFOSA	ug/L	<0.0078	<0.0078	<0.0078	0.020	0.0078	<0.0078	0.020	0.0078	7374960
EtFOSE	ug/L	<0.0071	<0.0071	<0.0071	0.020	0.0071	<0.0071	0.020	0.0071	7374960
MeFOSE	ug/L	<0.0070	<0.0070	<0.0070	0.020	0.0070	<0.0070	0.020	0.0070	7374960
6:2 Fluorotelomer sulfonic acid	ug/L	0.40	0.66	0.073	0.020	0.0065	0.013	0.020	0.0065	7374960
8:2 Fluorotelomer sulfonic acid	ug/L	0.80	0.28	0.14	0.020	0.0067	<0.0067	0.020	0.0067	7374960
Surrogate Recovery (%)										
13C2-6:2-Fluorotelomersulfonic Acid	%	93	93	91	N/A	N/A	98	N/A	N/A	7374960
13C2-8:2-Fluorotelomersulfonic Acid	%	93	87	87	N/A	N/A	99	N/A	N/A	7374960
13C2-Perfluorodecanoic acid	%	79	75	76	N/A	N/A	86	N/A	N/A	7374960
13C2-Perfluorododecanoic acid	%	81	71	78	N/A	N/A	83	N/A	N/A	7374960
13C2-Perfluorohexanoic acid	%	81	76	75	N/A	N/A	81	N/A	N/A	7374960
13C2-perfluorotetradecanoic acid	%	87	67	68	N/A	N/A	82	N/A	N/A	7374960
13C2-Perfluoroundecanoic acid	%	78	70	73	N/A	N/A	80	N/A	N/A	7374960
13C3-Perfluorobutanesulfonic acid	%	86	82	84	N/A	N/A	89	N/A	N/A	7374960
13C4-Perfluorobutanoic acid	%	83	76	78	N/A	N/A	78	N/A	N/A	7374960
13C4-Perfluoroheptanoic acid	%	82	80	77	N/A	N/A	83	N/A	N/A	7374960

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO577	PQO578	PQO579			PQO580			
Sampling Date		2021/05/20 12:10	2021/05/19 11:15	2021/05/19 10:40			2021/05/19 11:25			
	UNITS	PFW-1	HSW-6	PFW-5	RDL	MDL	OW-8A	RDL	MDL	QC Batch
13C4-Perfluorooctanesulfonic acid	%	88	81	86	N/A	N/A	88	N/A	N/A	7374960
13C4-Perfluorooctanoic acid	%	83	81	77	N/A	N/A	84	N/A	N/A	7374960
13C5-Perfluorononanoic acid	%	84	80	77	N/A	N/A	83	N/A	N/A	7374960
13C5-Perfluoropentanoic acid	%	78	75	73	N/A	N/A	79	N/A	N/A	7374960
13C8-Perfluorooctane Sulfonamide	%	93	88	87	N/A	N/A	95	N/A	N/A	7374960
18O2-Perfluorohexanesulfonic acid	%	83	83	80	N/A	N/A	88	N/A	N/A	7374960
D3-MeFOSA	%	53	50	47 (1)	N/A	N/A	60	N/A	N/A	7374960
D5-EtFOSA	%	52	48 (2)	46 (2)	N/A	N/A	60	N/A	N/A	7374960
D7-MeFOSE	%	76	70	65	N/A	N/A	78	N/A	N/A	7374960
D9-EtFOSE	%	73	67	65	N/A	N/A	78	N/A	N/A	7374960

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the extracted internal standard analyte. When considered together, these QC data suggest that matrix interferences may be increasing the variability of the associated native analyte result (MeFOSA).
(2) Extracted internal standard analyte recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the extracted internal standard analyte. When considered together, these QC data suggest that matrix interferences may be increasing the variability of the associated native analyte result (EtFOSA).

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO581				PQO582		PQO583			
Sampling Date		2021/05/19 09:55				2021/05/19 12:00		2021/05/19 08:00			
	UNITS	MW-201	RDL	MDL	QC Batch	MW-215	QC Batch	DUPLICATE	RDL	MDL	QC Batch
Perfluorinated Compounds											
Perfluorobutanoic acid (PFBA)	ug/L	0.018	0.020	0.0039	7374960	0.043	7379405	0.086	0.020	0.0039	7379215
Perfluoropentanoic acid (PFPeA)	ug/L	0.052	0.020	0.0067	7374960	0.13	7379405	0.37	0.020	0.0067	7379215
Perfluorohexanoic acid (PFHxA)	ug/L	0.037	0.020	0.0053	7374960	0.16	7379405	0.38	0.020	0.0053	7379215
Perfluoroheptanoic acid (PFHpA)	ug/L	0.024	0.020	0.0067	7374960	0.11	7379405	0.19	0.020	0.0067	7379215
Perfluorooctanoic acid (PFOA)	ug/L	0.014	0.020	0.0050	7374960	0.31	7379405	0.12	0.020	0.0050	7379215
Perfluorononanoic acid (PFNA)	ug/L	0.019	0.020	0.0051	7374960	0.031	7379405	0.060	0.020	0.0051	7379215
Perfluorodecanoic acid (PFDA)	ug/L	<0.0039	0.020	0.0039	7374960	0.011	7379405	0.043	0.020	0.0039	7379215
Perfluoroundecanoic acid (PFUnA)	ug/L	<0.0062	0.020	0.0062	7374960	0.034	7379405	0.17	0.020	0.0062	7379215
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0080	0.020	0.0080	7374960	<0.0080	7379405	<0.0080	0.020	0.0080	7379215
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0064	0.020	0.0064	7374960	<0.0064	7379405	<0.0064	0.020	0.0064	7379215
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0068	0.020	0.0068	7374960	<0.0068	7379405	<0.0068	0.020	0.0068	7379215
Perfluorobutanesulfonic acid (PFBS)	ug/L	<0.0056	0.020	0.0056	7374960	0.012	7379405	0.051	0.020	0.0056	7379215
Perfluorohexanesulfonic acid(PFHxS)	ug/L	0.084	0.020	0.0044	7374960	0.62	7379405	0.60	0.020	0.0044	7379215
Perfluoroheptanesulfonic acid PFHpS	ug/L	<0.0065	0.020	0.0065	7374960	0.019	7379405	0.024	0.020	0.0065	7379215
Perfluorooctanesulfonic acid (PFOS)	ug/L	0.23	0.020	0.0057	7374960	1.1	7379405	3.7	0.20	0.057	7379215
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0064	0.020	0.0064	7374960	<0.0064	7379405	<0.0064	0.020	0.0064	7379215
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.0036	0.020	0.0036	7374960	0.50	7379405	0.0082	0.020	0.0036	7379215
EtFOSA	ug/L	<0.0070	0.020	0.0070	7374960	<0.0070	7382994	<0.0070	0.020	0.0070	7379215
MeFOSA	ug/L	<0.0078	0.020	0.0078	7374960	<0.0078	7382994	<0.0078	0.020	0.0078	7379215
EtFOSE	ug/L	<0.0071	0.020	0.0071	7374960	<0.0071	7379405	<0.0071	0.020	0.0071	7379215
MeFOSE	ug/L	<0.0070	0.020	0.0070	7374960	<0.0070	7379405	<0.0070	0.020	0.0070	7379215
6:2 Fluorotelomer sulfonic acid	ug/L	<0.0065	0.020	0.0065	7374960	0.042	7379405	0.32	0.020	0.0065	7379215
8:2 Fluorotelomer sulfonic acid	ug/L	<0.0067	0.020	0.0067	7374960	0.059	7379405	0.75	0.020	0.0067	7379215
Surrogate Recovery (%)											
13C2-6:2-Fluorotelomersulfonic Acid	%	91	N/A	N/A	7374960	89	7379405	99	N/A	N/A	7379215
13C2-8:2-Fluorotelomersulfonic Acid	%	87	N/A	N/A	7374960	82	7379405	93	N/A	N/A	7379215
13C2-Perfluorodecanoic acid	%	73	N/A	N/A	7374960	79	7379405	95	N/A	N/A	7379215
13C2-Perfluorododecanoic acid	%	70	N/A	N/A	7374960	76	7379405	97	N/A	N/A	7379215
13C2-Perfluorohexanoic acid	%	80	N/A	N/A	7374960	89	7379405	103	N/A	N/A	7379215
13C2-perfluorotetradecanoic acid	%	40 (1)	N/A	N/A	7374960	56	7379405	95	N/A	N/A	7379215
13C2-Perfluoroundecanoic acid	%	70	N/A	N/A	7374960	76	7379405	95	N/A	N/A	7379215

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the extracted internal standard analyte. When considered together, these QC data suggest that matrix interferences may be increasing the variability of the associated native analyte result (PFTeDA, PFTrDA).

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO581				PQO582		PQO583			
Sampling Date		2021/05/19 09:55				2021/05/19 12:00		2021/05/19 08:00			
	UNITS	MW-201	RDL	MDL	QC Batch	MW-215	QC Batch	DUPLICATE	RDL	MDL	QC Batch
13C3-Perfluorobutanesulfonic acid	%	83	N/A	N/A	7374960	94	7379405	103	N/A	N/A	7379215
13C4-Perfluorobutanoic acid	%	79	N/A	N/A	7374960	86	7379405	97	N/A	N/A	7379215
13C4-Perfluoroheptanoic acid	%	79	N/A	N/A	7374960	89	7379405	104	N/A	N/A	7379215
13C4-Perfluorooctanesulfonic acid	%	82	N/A	N/A	7374960	89	7379405	84	N/A	N/A	7379215
13C4-Perfluorooctanoic acid	%	78	N/A	N/A	7374960	88	7379405	103	N/A	N/A	7379215
13C5-Perfluorononanoic acid	%	78	N/A	N/A	7374960	87	7379405	104	N/A	N/A	7379215
13C5-Perfluoropentanoic acid	%	75	N/A	N/A	7374960	88	7379405	101	N/A	N/A	7379215
13C8-Perfluorooctane Sulfonamide	%	87	N/A	N/A	7374960	75	7379405	89	N/A	N/A	7379215
18O2-Perfluorohexanesulfonic acid	%	83	N/A	N/A	7374960	92	7379405	103	N/A	N/A	7379215
D3-MeFOSA	%	54	N/A	N/A	7374960	59	7382994	67	N/A	N/A	7379215
D5-EtFOSA	%	54	N/A	N/A	7374960	58	7382994	65	N/A	N/A	7379215
D7-MeFOSE	%	72	N/A	N/A	7374960	73	7379405	81	N/A	N/A	7379215
D9-EtFOSE	%	67	N/A	N/A	7374960	69	7379405	80	N/A	N/A	7379215

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO584			PQO585	PQO586			
Sampling Date		2021/05/19 14:00			2021/05/20 11:15	2021/05/19 14:20			
	UNITS	RINSATE 1	RDL	MDL	PC-1	PC-11	RDL	MDL	QC Batch
Perfluorinated Compounds									
Perfluorobutanoic acid (PFBA)	ug/L	<0.0039	0.020	0.0039	0.032	0.028	0.020	0.0039	7379215
Perfluoropentanoic acid (PFPeA)	ug/L	<0.0067	0.020	0.0067	0.091	0.086	0.020	0.0067	7379215
Perfluorohexanoic acid (PFHxA)	ug/L	<0.0053	0.020	0.0053	0.10	0.097	0.020	0.0053	7379215
Perfluoroheptanoic acid (PFHpA)	ug/L	<0.0067	0.020	0.0067	0.083	0.065	0.020	0.0067	7379215
Perfluorooctanoic acid (PFOA)	ug/L	<0.0050	0.020	0.0050	0.049	0.059	0.020	0.0050	7379215
Perfluorononanoic acid (PFNA)	ug/L	<0.0051	0.020	0.0051	0.072	0.069	0.020	0.0051	7379215
Perfluorodecanoic acid (PFDA)	ug/L	<0.0039	0.020	0.0039	0.015	0.032	0.020	0.0039	7379215
Perfluoroundecanoic acid (PFUnA)	ug/L	<0.0062	0.020	0.0062	0.35	0.17	0.020	0.0062	7379215
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0080	0.020	0.0080	<0.0080	<0.0080	0.020	0.0080	7379215
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0064	0.020	0.0064	<0.0064	<0.0064	0.020	0.0064	7379215
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0068	0.020	0.0068	<0.0068	<0.0068	0.020	0.0068	7379215
Perfluorobutanesulfonic acid (PFBS)	ug/L	<0.0056	0.020	0.0056	0.011	0.0071	0.020	0.0056	7379215
Perfluorohexanesulfonic acid(PFHxS)	ug/L	<0.0044	0.020	0.0044	0.23	0.17	0.020	0.0044	7379215
Perfluoroheptanesulfonic acid PFHpS	ug/L	<0.0065	0.020	0.0065	0.013	0.011	0.020	0.0065	7379215
Perfluorooctanesulfonic acid (PFOS)	ug/L	<0.0057	0.020	0.0057	1.5	2.1	0.20	0.057	7379215
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0064	0.020	0.0064	<0.0064	<0.0064	0.020	0.0064	7379215
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.0036	0.020	0.0036	0.0089	0.015	0.020	0.0036	7379215
EtFOSA	ug/L	<0.0070	0.020	0.0070	<0.0070	<0.0070	0.020	0.0070	7379215
MeFOSA	ug/L	<0.0078	0.020	0.0078	<0.0078	<0.0078	0.020	0.0078	7379215
EtFOSE	ug/L	<0.0071	0.020	0.0071	<0.0071	<0.0071	0.020	0.0071	7379215
MeFOSE	ug/L	<0.0070	0.020	0.0070	<0.0070	<0.0070	0.020	0.0070	7379215
6:2 Fluorotelomer sulfonic acid	ug/L	<0.0065	0.020	0.0065	0.16	0.11	0.020	0.0065	7379215
8:2 Fluorotelomer sulfonic acid	ug/L	<0.0067	0.020	0.0067	0.31	0.30	0.020	0.0067	7379215
Surrogate Recovery (%)									
13C2-6:2-Fluorotelomersulfonic Acid	%	87	N/A	N/A	97	99	N/A	N/A	7379215
13C2-8:2-Fluorotelomersulfonic Acid	%	104	N/A	N/A	87	93	N/A	N/A	7379215
13C2-Perfluorodecanoic acid	%	100	N/A	N/A	86	90	N/A	N/A	7379215
13C2-Perfluorododecanoic acid	%	98	N/A	N/A	79	84	N/A	N/A	7379215
13C2-Perfluorohexanoic acid	%	105	N/A	N/A	99	97	N/A	N/A	7379215
13C2-perfluorotetradecanoic acid	%	80	N/A	N/A	67	72	N/A	N/A	7379215
13C2-Perfluoroundecanoic acid	%	100	N/A	N/A	82	85	N/A	N/A	7379215
13C3-Perfluorobutanesulfonic acid	%	104	N/A	N/A	105	100	N/A	N/A	7379215
13C4-Perfluorobutanoic acid	%	100	N/A	N/A	89	85	N/A	N/A	7379215
13C4-Perfluoroheptanoic acid	%	104	N/A	N/A	98	98	N/A	N/A	7379215

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO584			PQO585	PQO586			
Sampling Date		2021/05/19 14:00			2021/05/20 11:15	2021/05/19 14:20			
	UNITS	RINSATE 1	RDL	MDL	PC-1	PC-11	RDL	MDL	QC Batch
13C4-Perfluorooctanesulfonic acid	%	96	N/A	N/A	99	94	N/A	N/A	7379215
13C4-Perfluorooctanoic acid	%	103	N/A	N/A	96	98	N/A	N/A	7379215
13C5-Perfluorononanoic acid	%	101	N/A	N/A	96	96	N/A	N/A	7379215
13C5-Perfluoropentanoic acid	%	101	N/A	N/A	99	97	N/A	N/A	7379215
13C8-Perfluorooctane Sulfonamide	%	89	N/A	N/A	84	86	N/A	N/A	7379215
18O2-Perfluorohexanesulfonic acid	%	103	N/A	N/A	99	101	N/A	N/A	7379215
D3-MeFOSA	%	63	N/A	N/A	66	77	N/A	N/A	7379215
D5-EtFOSA	%	60	N/A	N/A	66	73	N/A	N/A	7379215
D7-MeFOSE	%	72	N/A	N/A	78	81	N/A	N/A	7379215
D9-EtFOSE	%	73	N/A	N/A	77	80	N/A	N/A	7379215

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO594	PQO595				PQO596			
Sampling Date		2021/05/20 09:15	2021/05/20 09:10				2021/05/20 10:00			
	UNITS	PC-38	MW-12	RDL	MDL	QC Batch	MW-22	RDL	MDL	QC Batch
Perfluorinated Compounds										
Perfluorobutanoic acid (PFBA)	ug/L	<0.0039	0.0057	0.020	0.0039	7379215	0.028	0.020	0.0039	7379405
Perfluoropentanoic acid (PFPeA)	ug/L	<0.0067	0.017	0.020	0.0067	7379215	0.097	0.020	0.0067	7379405
Perfluorohexanoic acid (PFHxA)	ug/L	<0.0053	0.029	0.020	0.0053	7379215	0.12	0.020	0.0053	7379405
Perfluoroheptanoic acid (PFHpA)	ug/L	<0.0067	0.014	0.020	0.0067	7379215	0.065	0.020	0.0067	7379405
Perfluorooctanoic acid (PFOA)	ug/L	<0.0050	0.046	0.020	0.0050	7379215	0.15	0.020	0.0050	7379405
Perfluorononanoic acid (PFNA)	ug/L	<0.0051	0.0056	0.020	0.0051	7379215	0.024	0.020	0.0051	7379405
Perfluorodecanoic acid (PFDA)	ug/L	<0.0039	<0.0039	0.020	0.0039	7379215	0.015	0.020	0.0039	7379405
Perfluoroundecanoic acid (PFUnA)	ug/L	<0.0062	<0.0062	0.020	0.0062	7379215	0.022	0.020	0.0062	7379405
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0080	<0.0080	0.020	0.0080	7379215	<0.0080	0.020	0.0080	7379405
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0064	<0.0064	0.020	0.0064	7379215	<0.0064	0.020	0.0064	7382994
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0068	<0.0068	0.020	0.0068	7379215	<0.0068	0.020	0.0068	7382994
Perfluorobutanesulfonic acid (PFBS)	ug/L	<0.0056	<0.0056	0.020	0.0056	7379215	0.0091	0.020	0.0056	7379405
Perfluorohexanesulfonic acid(PFHxS)	ug/L	<0.0044	0.17	0.020	0.0044	7379215	0.57	0.020	0.0044	7379405
Perfluoroheptanesulfonic acid PFHpS	ug/L	<0.0065	<0.0065	0.020	0.0065	7379215	0.018	0.020	0.0065	7379405
Perfluorooctanesulfonic acid (PFOS)	ug/L	<0.0057	0.36	0.020	0.0057	7379215	2.3	0.20	0.057	7379405
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0064	<0.0064	0.020	0.0064	7379215	<0.0064	0.020	0.0064	7379405
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.0036	0.0099	0.020	0.0036	7379215	0.095	0.020	0.0036	7379405
EtFOSA	ug/L	<0.0070	<0.0070	0.020	0.0070	7379215	<0.0070	0.020	0.0070	7382994
MeFOSA	ug/L	<0.0078	<0.0078	0.020	0.0078	7379215	<0.0078	0.020	0.0078	7382994
EtFOSE	ug/L	<0.0071	<0.0071	0.020	0.0071	7379215	<0.0071	0.020	0.0071	7379405
MeFOSE	ug/L	<0.0070	<0.0070	0.020	0.0070	7379215	<0.0070	0.020	0.0070	7379405
6:2 Fluorotelomer sulfonic acid	ug/L	<0.0065	<0.0065	0.020	0.0065	7379215	0.11	0.020	0.0065	7379405
8:2 Fluorotelomer sulfonic acid	ug/L	<0.0067	<0.0067	0.020	0.0067	7379215	0.11	0.020	0.0067	7379405
Surrogate Recovery (%)										
13C2-6:2-Fluorotelomersulfonic Acid	%	107	100	N/A	N/A	7379215	78	N/A	N/A	7379405
13C2-8:2-Fluorotelomersulfonic Acid	%	101	96	N/A	N/A	7379215	73	N/A	N/A	7379405
13C2-Perfluorodecanoic acid	%	96	88	N/A	N/A	7379215	74	N/A	N/A	7379405
13C2-Perfluorododecanoic acid	%	89	81	N/A	N/A	7379215	61	N/A	N/A	7379405
13C2-Perfluorohexanoic acid	%	103	98	N/A	N/A	7379215	84	N/A	N/A	7379405
13C2-perfluorotetradecanoic acid	%	64	62	N/A	N/A	7379215	49 (1)	N/A	N/A	7382994
13C2-Perfluoroundecanoic acid	%	92	84	N/A	N/A	7379215	71	N/A	N/A	7379405
13C3-Perfluorobutanesulfonic acid	%	105	101	N/A	N/A	7379215	89	N/A	N/A	7379405

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL) which may result in increased variability of the associated native analyte result (PFTeDA).

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO594	PQO595				PQO596			
Sampling Date		2021/05/20 09:15	2021/05/20 09:10				2021/05/20 10:00			
	UNITS	PC-38	MW-12	RDL	MDL	QC Batch	MW-22	RDL	MDL	QC Batch
13C4-Perfluorobutanoic acid	%	98	93	N/A	N/A	7379215	75	N/A	N/A	7379405
13C4-Perfluoroheptanoic acid	%	105	99	N/A	N/A	7379215	81	N/A	N/A	7379405
13C4-Perfluorooctanesulfonic acid	%	95	90	N/A	N/A	7379215	80	N/A	N/A	7379405
13C4-Perfluorooctanoic acid	%	99	97	N/A	N/A	7379215	79	N/A	N/A	7379405
13C5-Perfluorononanoic acid	%	100	93	N/A	N/A	7379215	79	N/A	N/A	7379405
13C5-Perfluoropentanoic acid	%	102	97	N/A	N/A	7379215	82	N/A	N/A	7379405
13C8-Perfluorooctane Sulfonamide	%	91	82	N/A	N/A	7379215	68	N/A	N/A	7379405
18O2-Perfluorohexanesulfonic acid	%	104	100	N/A	N/A	7379215	88	N/A	N/A	7379405
D3-MeFOSA	%	75	53	N/A	N/A	7379215	47 (1)	N/A	N/A	7382994
D5-EtFOSA	%	70	51	N/A	N/A	7379215	40 (2)	N/A	N/A	7382994
D7-MeFOSE	%	79	66	N/A	N/A	7379215	66	N/A	N/A	7379405
D9-EtFOSE	%	79	63	N/A	N/A	7379215	65	N/A	N/A	7379405

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL) which may result in increased variability of the associated native analyte result (MeFOSA).
(2) Extracted internal standard analyte recovery was below the defined lower control limit (LCL) which may result in increased variability of the associated native analyte result (EtFOSA).

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO597			PQO598	PQO599	PQO600			
Sampling Date		2021/05/20 10:30			2021/05/20 09:30	2021/05/20 12:00	2021/05/20 11:10			
	UNITS	PC-16D	RDL	MDL	PC-30	PC-6A	PC-28	RDL	MDL	QC Batch
Perfluorinated Compounds										
Perfluorobutanoic acid (PFBA)	ug/L	0.026	0.020	0.0039	0.019	0.021	0.017	0.020	0.0039	7379405
Perfluoropentanoic acid (PFPeA)	ug/L	0.088	0.020	0.0067	0.050	0.055	0.046	0.020	0.0067	7379405
Perfluorohexanoic acid (PFHxA)	ug/L	0.090	0.020	0.0053	0.059	0.055	0.045	0.020	0.0053	7379405
Perfluoroheptanoic acid (PFHpA)	ug/L	0.047	0.020	0.0067	0.040	0.042	0.045	0.020	0.0067	7379405
Perfluorooctanoic acid (PFOA)	ug/L	0.070	0.020	0.0050	0.026	0.031	0.022	0.020	0.0050	7379405
Perfluorononanoic acid (PFNA)	ug/L	0.083	0.020	0.0051	0.040	0.045	0.033	0.020	0.0051	7379405
Perfluorodecanoic acid (PFDA)	ug/L	0.0092	0.020	0.0039	0.0052	0.011	0.0056	0.020	0.0039	7379405
Perfluoroundecanoic acid (PFUnA)	ug/L	0.015	0.020	0.0062	0.019	0.040	0.046	0.020	0.0062	7379405
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0080	0.020	0.0080	<0.0080	<0.0080	<0.0080	0.020	0.0080	7379405
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0064	0.020	0.0064	<0.0064	<0.0064	<0.0064	0.020	0.0064	7379405
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0068	0.020	0.0068	<0.0068	<0.0068	<0.0068	0.020	0.0068	7379405
Perfluorobutanesulfonic acid (PFBS)	ug/L	0.010	0.020	0.0056	<0.0056	<0.0056	<0.0056	0.020	0.0056	7379405
Perfluorohexanesulfonic acid(PFHxS)	ug/L	0.22	0.020	0.0044	0.064	0.072	0.11	0.020	0.0044	7379405
Perfluoroheptanesulfonic acid PFHpS	ug/L	0.016	0.020	0.0065	<0.0065	<0.0065	<0.0065	0.020	0.0065	7379405
Perfluorooctanesulfonic acid (PFOS)	ug/L	1.2	0.20	0.057	0.54	0.92	0.82	0.020	0.0057	7379405
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0064	0.020	0.0064	<0.0064	<0.0064	<0.0064	0.020	0.0064	7379405
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.0036	0.020	0.0036	<0.0036	<0.0036	<0.0036	0.020	0.0036	7379405
EtFOSA	ug/L	<0.0070	0.020	0.0070	<0.0070	<0.0070	<0.0070	0.020	0.0070	7382994
MeFOSA	ug/L	<0.0078	0.020	0.0078	<0.0078	<0.0078	<0.0078	0.020	0.0078	7382994
EtFOSE	ug/L	<0.0071	0.020	0.0071	<0.0071	<0.0071	<0.0071	0.020	0.0071	7379405
MeFOSE	ug/L	<0.0070	0.020	0.0070	<0.0070	<0.0070	<0.0070	0.020	0.0070	7379405
6:2 Fluorotelomer sulfonic acid	ug/L	0.080	0.020	0.0065	0.013	0.17	0.025	0.020	0.0065	7379405
8:2 Fluorotelomer sulfonic acid	ug/L	0.011	0.020	0.0067	<0.0067	0.0073	<0.0067	0.020	0.0067	7379405
Surrogate Recovery (%)										
13C2-6:2-Fluorotelomersulfonic Acid	%	91	N/A	N/A	90	91	92	N/A	N/A	7379405
13C2-8:2-Fluorotelomersulfonic Acid	%	80	N/A	N/A	80	86	88	N/A	N/A	7379405
13C2-Perfluorodecanoic acid	%	79	N/A	N/A	76	81	86	N/A	N/A	7379405
13C2-Perfluorododecanoic acid	%	77	N/A	N/A	72	73	77	N/A	N/A	7379405
13C2-Perfluorohexanoic acid	%	90	N/A	N/A	90	96	94	N/A	N/A	7379405
13C2-perfluorotetradecanoic acid	%	60	N/A	N/A	68	61	65	N/A	N/A	7379405
13C2-Perfluoroundecanoic acid	%	74	N/A	N/A	70	75	83	N/A	N/A	7379405
13C3-Perfluorobutanesulfonic acid	%	90	N/A	N/A	95	97	94	N/A	N/A	7379405
13C4-Perfluorobutanoic acid	%	79	N/A	N/A	82	88	87	N/A	N/A	7379405
13C4-Perfluoroheptanoic acid	%	90	N/A	N/A	91	94	93	N/A	N/A	7379405

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO597			PQO598	PQO599	PQO600			
Sampling Date		2021/05/20 10:30			2021/05/20 09:30	2021/05/20 12:00	2021/05/20 11:10			
	UNITS	PC-16D	RDL	MDL	PC-30	PC-6A	PC-28	RDL	MDL	QC Batch
13C4-Perfluorooctanesulfonic acid	%	85	N/A	N/A	79	84	85	N/A	N/A	7379405
13C4-Perfluorooctanoic acid	%	88	N/A	N/A	88	92	91	N/A	N/A	7379405
13C5-Perfluorononanoic acid	%	87	N/A	N/A	86	93	92	N/A	N/A	7379405
13C5-Perfluoropentanoic acid	%	89	N/A	N/A	90	93	91	N/A	N/A	7379405
13C8-Perfluorooctane Sulfonamide	%	70	N/A	N/A	70	74	74	N/A	N/A	7379405
18O2-Perfluorohexanesulfonic acid	%	95	N/A	N/A	94	99	95	N/A	N/A	7379405
D3-MeFOSA	%	57	N/A	N/A	46 (1)	57	54	N/A	N/A	7382994
D5-EtFOSA	%	51	N/A	N/A	40 (2)	52	50	N/A	N/A	7382994
D7-MeFOSE	%	70	N/A	N/A	67	70	66	N/A	N/A	7379405
D9-EtFOSE	%	67	N/A	N/A	67	71	65	N/A	N/A	7379405

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL) which may result in increased variability of the associated native analyte result (MeFOSA).
(2) Extracted internal standard analyte recovery was below the defined lower control limit (LCL) which may result in increased variability of the associated native analyte result (EtFOSA).

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PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO601	PQO602			
Sampling Date		2021/05/19 13:40	2021/05/20 11:45			
	UNITS	FS-19	RINSATE 2	RDL	MDL	QC Batch
Perfluorinated Compounds						
Perfluorobutanoic acid (PFBA)	ug/L	<0.0039	<0.0039	0.020	0.0039	7379405
Perfluoropentanoic acid (PFPeA)	ug/L	<0.0067	<0.0067	0.020	0.0067	7379405
Perfluorohexanoic acid (PFHxA)	ug/L	<0.0053	<0.0053	0.020	0.0053	7379405
Perfluoroheptanoic acid (PFHpA)	ug/L	<0.0067	<0.0067	0.020	0.0067	7379405
Perfluorooctanoic acid (PFOA)	ug/L	<0.0050	<0.0050	0.020	0.0050	7379405
Perfluorononanoic acid (PFNA)	ug/L	<0.0051	<0.0051	0.020	0.0051	7379405
Perfluorodecanoic acid (PFDA)	ug/L	<0.0039	<0.0039	0.020	0.0039	7379405
Perfluoroundecanoic acid (PFUnA)	ug/L	<0.0062	<0.0062	0.020	0.0062	7379405
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0080	<0.0080	0.020	0.0080	7379405
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0064	<0.0064	0.020	0.0064	7379405
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0068	<0.0068	0.020	0.0068	7379405
Perfluorobutanesulfonic acid (PFBS)	ug/L	<0.0056	<0.0056	0.020	0.0056	7379405
Perfluorohexanesulfonic acid(PFHxS)	ug/L	<0.0044	<0.0044	0.020	0.0044	7379405
Perfluoroheptanesulfonic acid PFHpS	ug/L	<0.0065	<0.0065	0.020	0.0065	7379405
Perfluorooctanesulfonic acid (PFOS)	ug/L	0.012	<0.0057	0.020	0.0057	7379405
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0064	<0.0064	0.020	0.0064	7379405
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.0036	<0.0036	0.020	0.0036	7379405
EtFOSA	ug/L	<0.0070	<0.0070	0.020	0.0070	7382994
MeFOSA	ug/L	<0.0078	<0.0078	0.020	0.0078	7382994
EtFOSE	ug/L	<0.0071	<0.0071	0.020	0.0071	7379405
MeFOSE	ug/L	<0.0070	<0.0070	0.020	0.0070	7379405
6:2 Fluorotelomer sulfonic acid	ug/L	0.016	<0.0065	0.020	0.0065	7379405
8:2 Fluorotelomer sulfonic acid	ug/L	<0.0067	<0.0067	0.020	0.0067	7379405
Surrogate Recovery (%)						
13C2-6:2-Fluorotelomersulfonic Acid	%	90	93	N/A	N/A	7379405
13C2-8:2-Fluorotelomersulfonic Acid	%	91	89	N/A	N/A	7379405
13C2-Perfluorodecanoic acid	%	86	85	N/A	N/A	7379405
13C2-Perfluorododecanoic acid	%	73	76	N/A	N/A	7379405
13C2-Perfluorohexanoic acid	%	92	91	N/A	N/A	7379405
13C2-perfluorotetradecanoic acid	%	68	70	N/A	N/A	7379405
13C2-Perfluoroundecanoic acid	%	78	82	N/A	N/A	7379405
13C3-Perfluorobutanesulfonic acid	%	94	94	N/A	N/A	7379405
13C4-Perfluorobutanoic acid	%	86	88	N/A	N/A	7379405
13C4-Perfluoroheptanoic acid	%	90	90	N/A	N/A	7379405

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		PQO601	PQO602			
Sampling Date		2021/05/19 13:40	2021/05/20 11:45			
	UNITS	FS-19	RINSATE 2	RDL	MDL	QC Batch
13C4-Perfluorooctanesulfonic acid	%	86	85	N/A	N/A	7379405
13C4-Perfluorooctanoic acid	%	90	89	N/A	N/A	7379405
13C5-Perfluorononanoic acid	%	91	89	N/A	N/A	7379405
13C5-Perfluoropentanoic acid	%	91	91	N/A	N/A	7379405
13C8-Perfluorooctane Sulfonamide	%	76	75	N/A	N/A	7379405
18O2-Perfluorohexanesulfonic acid	%	93	95	N/A	N/A	7379405
D3-MeFOSA	%	50	53	N/A	N/A	7382994
D5-EtFOSA	%	48 (1)	51	N/A	N/A	7382994
D7-MeFOSE	%	68	64	N/A	N/A	7379405
D9-EtFOSE	%	70	61	N/A	N/A	7379405

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL) which may result in increased variability of the associated native analyte result (EtFOSA).

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

TEST SUMMARY

BV Labs ID: PQO577
Sample ID: PFW-1
Matrix: Water
Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7374960	2021/05/27	2021/05/29	Adnan Khan

BV Labs ID: PQO578
Sample ID: HSW-6
Matrix: Water
Collected: 2021/05/19
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7374960	2021/05/27	2021/05/29	Adnan Khan

BV Labs ID: PQO579
Sample ID: PFW-5
Matrix: Water
Collected: 2021/05/19
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7374960	2021/05/27	2021/05/29	Adnan Khan

BV Labs ID: PQO580
Sample ID: OW-8A
Matrix: Water
Collected: 2021/05/19
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7374960	2021/05/27	2021/05/29	Adnan Khan

BV Labs ID: PQO581
Sample ID: MW-201
Matrix: Water
Collected: 2021/05/19
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7374960	2021/05/27	2021/05/29	Adnan Khan

BV Labs ID: PQO582
Sample ID: MW-215
Matrix: Water
Collected: 2021/05/19
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379405	2021/05/31	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO583
Sample ID: DUPLICATE
Matrix: Water
Collected: 2021/05/19
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379215	2021/05/30	2021/06/01	Xinhe Xing (Helena)

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TEST SUMMARY

BV Labs ID: PQO584 **Collected:** 2021/05/19
Sample ID: RINSATE 1 **Shipped:**
Matrix: Water **Received:** 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379215	2021/05/30	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO585 **Collected:** 2021/05/20
Sample ID: PC-1 **Shipped:**
Matrix: Water **Received:** 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379215	2021/05/30	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO586 **Collected:** 2021/05/19
Sample ID: PC-11 **Shipped:**
Matrix: Water **Received:** 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379215	2021/05/30	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO594 **Collected:** 2021/05/20
Sample ID: PC-38 **Shipped:**
Matrix: Water **Received:** 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379215	2021/05/30	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO595 **Collected:** 2021/05/20
Sample ID: MW-12 **Shipped:**
Matrix: Water **Received:** 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379215	2021/05/30	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO596 **Collected:** 2021/05/20
Sample ID: MW-22 **Shipped:**
Matrix: Water **Received:** 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379405	2021/05/31	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO597 **Collected:** 2021/05/20
Sample ID: PC-16D **Shipped:**
Matrix: Water **Received:** 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379405	2021/05/31	2021/06/01	Xinhe Xing (Helena)

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

TEST SUMMARY

BV Labs ID: PQO598
Sample ID: PC-30
Matrix: Water

Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379405	2021/05/31	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO599
Sample ID: PC-6A
Matrix: Water

Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379405	2021/05/31	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO600
Sample ID: PC-28
Matrix: Water

Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379405	2021/05/31	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO601
Sample ID: FS-19
Matrix: Water

Collected: 2021/05/19
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379405	2021/05/31	2021/06/01	Xinhe Xing (Helena)

BV Labs ID: PQO602
Sample ID: RINSATE 2
Matrix: Water

Collected: 2021/05/20
Shipped:
Received: 2021/05/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	7379405	2021/05/31	2021/06/01	Xinhe Xing (Helena)

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GENERAL COMMENTS

Samples received in cooler 1 of 2 were received with elevated temperature. Client consented to proceed with analysis.

Sample PQO577 [PFW-1] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample PQO578 [HSW-6] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample PQO579 [PFW-5] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample PQO582 [MW-215] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample PQO583 [DUPLICATE] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample PQO585 [PC-1] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample PQO586 [PC-11] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample PQO596 [MW-22] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample PQO597 [PC-16D] : Per- and polyfluoroalkyl substances (PFAS): Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limits were adjusted accordingly.

Sample PQO582, PFAS in water by SPE/LCMS: Test repeated.
Sample PQO596, PFAS in water by SPE/LCMS: Test repeated.
Sample PQO597, PFAS in water by SPE/LCMS: Test repeated.
Sample PQO598, PFAS in water by SPE/LCMS: Test repeated.
Sample PQO599, PFAS in water by SPE/LCMS: Test repeated.
Sample PQO600, PFAS in water by SPE/LCMS: Test repeated.
Sample PQO601, PFAS in water by SPE/LCMS: Test repeated.
Sample PQO602, PFAS in water by SPE/LCMS: Test repeated.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
7374960	AKH	Spiked Blank	13C2-6:2-Fluorotelomersulfonic Acid	2021/05/29		94	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/05/29		93	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/05/29		86	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/05/29		84	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/05/29		87	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/05/29		85	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/05/29		82	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/05/29		88	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/05/29		91	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/05/29		89	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/05/29		89	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/05/29		89	%	50 - 150
			13C5-Perfluorononanoic acid	2021/05/29		89	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/05/29		88	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/05/29		89	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2021/05/29		86	%	50 - 150
			D3-MeFOSA	2021/05/29		60	%	50 - 150
			D5-EtFOSA	2021/05/29		57	%	50 - 150
			D7-MeFOSE	2021/05/29		81	%	50 - 150
			D9-EtFOSE	2021/05/29		79	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2021/05/29		103	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2021/05/29		103	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2021/05/29		104	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2021/05/29		103	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2021/05/29		103	%	70 - 130
			Perfluorononanoic acid (PFNA)	2021/05/29		100	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2021/05/29		102	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2021/05/29		105	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2021/05/29		102	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/05/29		98	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/05/29		99	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2021/05/29		100	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2021/05/29		102	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2021/05/29		97	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2021/05/29		101	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2021/05/29		96	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/05/29		100	%	70 - 130
			EtFOSA	2021/05/29		90	%	70 - 130
			MeFOSA	2021/05/29		93	%	70 - 130
			EtFOSE	2021/05/29		95	%	70 - 130
			MeFOSE	2021/05/29		96	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2021/05/29		104	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2021/05/29		101	%	70 - 130
7374960	AKH	Spiked Blank DUP	13C2-6:2-Fluorotelomersulfonic Acid	2021/05/29		100	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/05/29		99	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/05/29		88	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/05/29		89	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/05/29		92	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/05/29		85	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/05/29		87	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/05/29		89	%	50 - 150

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			13C4-Perfluorobutanoic acid	2021/05/29		94	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/05/29		93	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/05/29		91	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/05/29		95	%	50 - 150
			13C5-Perfluorononanoic acid	2021/05/29		94	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/05/29		92	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/05/29		93	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2021/05/29		88	%	50 - 150
			D3-MeFOSA	2021/05/29		60	%	50 - 150
			D5-EtFOSA	2021/05/29		58	%	50 - 150
			D7-MeFOSE	2021/05/29		81	%	50 - 150
			D9-EtFOSE	2021/05/29		77	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2021/05/29		100	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2021/05/29		99	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2021/05/29		99	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2021/05/29		98	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2021/05/29		97	%	70 - 130
			Perfluorononanoic acid (PFNA)	2021/05/29		94	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2021/05/29		99	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2021/05/29		100	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2021/05/29		97	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/05/29		99	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/05/29		97	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2021/05/29		99	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2021/05/29		100	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2021/05/29		93	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2021/05/29		102	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2021/05/29		94	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/05/29		96	%	70 - 130
			EtFOSA	2021/05/29		90	%	70 - 130
			MeFOSA	2021/05/29		93	%	70 - 130
			EtFOSE	2021/05/29		93	%	70 - 130
			MeFOSE	2021/05/29		92	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2021/05/29		99	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2021/05/29		98	%	70 - 130
7374960	AKH	RPD	Perfluorobutanoic acid (PFBA)	2021/05/29	3.1		%	30
			Perfluoropentanoic acid (PFPeA)	2021/05/29	4.1		%	30
			Perfluorohexanoic acid (PFHxA)	2021/05/29	4.9		%	30
			Perfluoroheptanoic acid (PFHpA)	2021/05/29	4.5		%	30
			Perfluorooctanoic acid (PFOA)	2021/05/29	5.4		%	30
			Perfluorononanoic acid (PFNA)	2021/05/29	6.4		%	30
			Perfluorodecanoic acid (PFDA)	2021/05/29	2.6		%	30
			Perfluoroundecanoic acid (PFUnA)	2021/05/29	4.6		%	30
			Perfluorododecanoic acid (PFDoA)	2021/05/29	5.2		%	30
			Perfluorotridecanoic acid (PFTRDA)	2021/05/29	0.92		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2021/05/29	1.4		%	30
			Perfluorobutanesulfonic acid (PFBS)	2021/05/29	0.91		%	30
			Perfluorohexanesulfonic acid(PFHxS)	2021/05/29	1.7		%	30
			Perfluoroheptanesulfonic acid PFHpS	2021/05/29	4.1		%	30
			Perfluorooctanesulfonic acid (PFOS)	2021/05/29	0.27		%	30
			Perfluorodecanesulfonic acid (PFDS)	2021/05/29	2.5		%	30

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorooctane Sulfonamide (PFOSA)	2021/05/29	4.8		%	30
			EtFOSA	2021/05/29	0.90		%	30
			MeFOSA	2021/05/29	0.56		%	30
			EtFOSE	2021/05/29	1.6		%	30
			MeFOSE	2021/05/29	4.7		%	30
			6:2 Fluorotelomer sulfonic acid	2021/05/29	5.0		%	30
			8:2 Fluorotelomer sulfonic acid	2021/05/29	2.8		%	30
7374960	AKH	Method Blank	13C2-6:2-Fluorotelomersulfonic Acid	2021/05/29		100	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/05/29		95	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/05/29		87	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/05/29		87	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/05/29		91	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/05/29		85	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/05/29		85	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/05/29		87	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/05/29		91	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/05/29		94	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/05/29		88	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/05/29		91	%	50 - 150
			13C5-Perfluorononanoic acid	2021/05/29		89	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/05/29		90	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/05/29		96	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2021/05/29		87	%	50 - 150
			D3-MeFOSA	2021/05/29		67	%	50 - 150
			D5-EtFOSA	2021/05/29		65	%	50 - 150
			D7-MeFOSE	2021/05/29		83	%	50 - 150
			D9-EtFOSE	2021/05/29		81	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2021/05/29	<0.0039		ug/L	
			Perfluoropentanoic acid (PFPeA)	2021/05/29	<0.0067		ug/L	
			Perfluorohexanoic acid (PFHxA)	2021/05/29	<0.0053		ug/L	
			Perfluoroheptanoic acid (PFHpA)	2021/05/29	<0.0067		ug/L	
			Perfluorooctanoic acid (PFOA)	2021/05/29	<0.0050		ug/L	
			Perfluorononanoic acid (PFNA)	2021/05/29	<0.0051		ug/L	
			Perfluorodecanoic acid (PFDA)	2021/05/29	<0.0039		ug/L	
			Perfluoroundecanoic acid (PFUnA)	2021/05/29	<0.0062		ug/L	
			Perfluorododecanoic acid (PFDoA)	2021/05/29	<0.0080		ug/L	
			Perfluorotridecanoic acid (PFTRDA)	2021/05/29	<0.0064		ug/L	
			Perfluorotetradecanoic acid(PFTEDA)	2021/05/29	<0.0068		ug/L	
			Perfluorobutanesulfonic acid (PFBS)	2021/05/29	<0.0056		ug/L	
			Perfluorohexanesulfonic acid(PFHxS)	2021/05/29	<0.0044		ug/L	
			Perfluoroheptanesulfonic acid PFHpS	2021/05/29	<0.0065		ug/L	
			Perfluorooctanesulfonic acid (PFOS)	2021/05/29	<0.0057		ug/L	
			Perfluorodecanesulfonic acid (PFDS)	2021/05/29	<0.0064		ug/L	
			Perfluorooctane Sulfonamide (PFOSA)	2021/05/29	<0.0036		ug/L	
			EtFOSA	2021/05/29	<0.0070		ug/L	
			MeFOSA	2021/05/29	<0.0078		ug/L	
			EtFOSE	2021/05/29	<0.0071		ug/L	
			MeFOSE	2021/05/29	<0.0070		ug/L	
			6:2 Fluorotelomer sulfonic acid	2021/05/29	<0.0065		ug/L	
			8:2 Fluorotelomer sulfonic acid	2021/05/29	<0.0067		ug/L	
7379215	XIN	Spiked Blank	13C2-6:2-Fluorotelomersulfonic Acid	2021/06/01		86	%	50 - 150

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			13C2-8:2-Fluorotelomersulfonic Acid	2021/06/01		90	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/06/01		103	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/06/01		99	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/06/01		106	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/06/01		98	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/06/01		105	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/06/01		101	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/06/01		97	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/06/01		107	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/06/01		94	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/06/01		105	%	50 - 150
			13C5-Perfluorononanoic acid	2021/06/01		107	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/06/01		102	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/06/01		82	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2021/06/01		99	%	50 - 150
			D3-MeFOSA	2021/06/01		78	%	50 - 150
			D5-EtFOSA	2021/06/01		75	%	50 - 150
			D7-MeFOSE	2021/06/01		88	%	50 - 150
			D9-EtFOSE	2021/06/01		93	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2021/06/01		84	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2021/06/01		82	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2021/06/01		81	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2021/06/01		84	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2021/06/01		84	%	70 - 130
			Perfluorononanoic acid (PFNA)	2021/06/01		90	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2021/06/01		80	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2021/06/01		81	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2021/06/01		81	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01		81	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01		81	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01		81	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2021/06/01		85	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2021/06/01		74	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2021/06/01		83	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2021/06/01		70	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01		80	%	70 - 130
			EtFOSA	2021/06/01		76	%	70 - 130
			MeFOSA	2021/06/01		75	%	70 - 130
			EtFOSE	2021/06/01		75	%	70 - 130
			MeFOSE	2021/06/01		81	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2021/06/01		87	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2021/06/01		83	%	70 - 130
7379215	XIN	Spiked Blank DUP	13C2-6:2-Fluorotelomersulfonic Acid	2021/06/01		98	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/06/01		96	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/06/01		103	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/06/01		102	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/06/01		104	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/06/01		99	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/06/01		102	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/06/01		103	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/06/01		99	%	50 - 150

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			13C4-Perfluoroheptanoic acid	2021/06/01		107	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/06/01		93	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/06/01		106	%	50 - 150
			13C5-Perfluorononanoic acid	2021/06/01		107	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/06/01		104	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/06/01		88	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2021/06/01		105	%	50 - 150
			D3-MeFOSA	2021/06/01		78	%	50 - 150
			D5-EtFOSA	2021/06/01		77	%	50 - 150
			D7-MeFOSE	2021/06/01		87	%	50 - 150
			D9-EtFOSE	2021/06/01		90	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2021/06/01		80	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2021/06/01		78	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2021/06/01		80	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2021/06/01		80	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2021/06/01		80	%	70 - 130
			Perfluorononanoic acid (PFNA)	2021/06/01		87	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2021/06/01		78	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2021/06/01		78	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2021/06/01		76	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01		78	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01		78	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01		77	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2021/06/01		79	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2021/06/01		74	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2021/06/01		83	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2021/06/01		70	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01		78	%	70 - 130
			EtFOSA	2021/06/01		76	%	70 - 130
			MeFOSA	2021/06/01		75	%	70 - 130
			EtFOSE	2021/06/01		74	%	70 - 130
			MeFOSE	2021/06/01		81	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2021/06/01		77	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2021/06/01		80	%	70 - 130
7379215	XIN	RPD	Perfluorobutanoic acid (PFBA)	2021/06/01	4.5		%	30
			Perfluoropentanoic acid (PFPeA)	2021/06/01	4.4		%	30
			Perfluorohexanoic acid (PFHxA)	2021/06/01	1.2		%	30
			Perfluoroheptanoic acid (PFHpA)	2021/06/01	4.3		%	30
			Perfluorooctanoic acid (PFOA)	2021/06/01	5.3		%	30
			Perfluorononanoic acid (PFNA)	2021/06/01	3.4		%	30
			Perfluorodecanoic acid (PFDA)	2021/06/01	2.8		%	30
			Perfluoroundecanoic acid (PFUnA)	2021/06/01	2.8		%	30
			Perfluorododecanoic acid (PFDoA)	2021/06/01	6.9		%	30
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01	3.1		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01	4.4		%	30
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01	4.1		%	30
			Perfluorohexanesulfonic acid(PFHxS)	2021/06/01	7.6		%	30
			Perfluoroheptanesulfonic acid PFHpS	2021/06/01	0.20		%	30
			Perfluorooctanesulfonic acid (PFOS)	2021/06/01	0.74		%	30
			Perfluorodecanesulfonic acid (PFDS)	2021/06/01	0.53		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01	2.9		%	30

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			EtFOSA	2021/06/01	0.14		%	30
			MeFOSA	2021/06/01	0.30		%	30
			EtFOSE	2021/06/01	1.6		%	30
			MeFOSE	2021/06/01	0.26		%	30
			6:2 Fluorotelomer sulfonic acid	2021/06/01	12		%	30
			8:2 Fluorotelomer sulfonic acid	2021/06/01	4.2		%	30
7379215	XIN	Method Blank	13C2-6:2-Fluorotelomersulfonic Acid	2021/06/01		86	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/06/01		81	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/06/01		105	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/06/01		104	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/06/01		108	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/06/01		101	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/06/01		107	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/06/01		98	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/06/01		98	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/06/01		113	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/06/01		90	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/06/01		111	%	50 - 150
			13C5-Perfluorononanoic acid	2021/06/01		114	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/06/01		106	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/06/01		79	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2021/06/01		100	%	50 - 150
			D3-MeFOSA	2021/06/01		72	%	50 - 150
			D5-EtFOSA	2021/06/01		70	%	50 - 150
			D7-MeFOSE	2021/06/01		94	%	50 - 150
			D9-EtFOSE	2021/06/01		90	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2021/06/01	<0.0039		ug/L	
			Perfluoropentanoic acid (PFPeA)	2021/06/01	<0.0067		ug/L	
			Perfluorohexanoic acid (PFHxA)	2021/06/01	<0.0053		ug/L	
			Perfluoroheptanoic acid (PFHpA)	2021/06/01	<0.0067		ug/L	
			Perfluorooctanoic acid (PFOA)	2021/06/01	<0.0050		ug/L	
			Perfluorononanoic acid (PFNA)	2021/06/01	<0.0051		ug/L	
			Perfluorodecanoic acid (PFDA)	2021/06/01	<0.0039		ug/L	
			Perfluoroundecanoic acid (PFUnA)	2021/06/01	<0.0062		ug/L	
			Perfluorododecanoic acid (PFDoA)	2021/06/01	<0.0080		ug/L	
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01	<0.0064		ug/L	
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01	<0.0068		ug/L	
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01	<0.0056		ug/L	
			Perfluorohexanesulfonic acid(PFHxS)	2021/06/01	<0.0044		ug/L	
			Perfluoroheptanesulfonic acid PFHpS	2021/06/01	<0.0065		ug/L	
			Perfluorooctanesulfonic acid (PFOS)	2021/06/01	<0.0057		ug/L	
			Perfluorodecanesulfonic acid (PFDS)	2021/06/01	<0.0064		ug/L	
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01	<0.0036		ug/L	
			EtFOSA	2021/06/01	<0.0070		ug/L	
			MeFOSA	2021/06/01	<0.0078		ug/L	
			EtFOSE	2021/06/01	<0.0071		ug/L	
			MeFOSE	2021/06/01	<0.0070		ug/L	
			6:2 Fluorotelomer sulfonic acid	2021/06/01	<0.0065		ug/L	
			8:2 Fluorotelomer sulfonic acid	2021/06/01	<0.0067		ug/L	
7379405	XIN	Spiked Blank	13C2-6:2-Fluorotelomersulfonic Acid	2021/06/01		95	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/06/01		92	%	50 - 150

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			13C2-Perfluorodecanoic acid	2021/06/01		93	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/06/01		87	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/06/01		98	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/06/01		85	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/06/01		88	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/06/01		95	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/06/01		94	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/06/01		95	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/06/01		90	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/06/01		94	%	50 - 150
			13C5-Perfluorononanoic acid	2021/06/01		96	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/06/01		95	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/06/01		86	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2021/06/01		95	%	50 - 150
			D7-MeFOSE	2021/06/01		81	%	50 - 150
			D9-EtFOSE	2021/06/01		77	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2021/06/01		87	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2021/06/01		86	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2021/06/01		87	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2021/06/01		87	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2021/06/01		88	%	70 - 130
			Perfluorononanoic acid (PFNA)	2021/06/01		94	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2021/06/01		86	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2021/06/01		86	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2021/06/01		86	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01		85	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01		84	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01		86	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2021/06/01		88	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2021/06/01		84	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2021/06/01		88	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2021/06/01		81	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01		85	%	70 - 130
			EtFOSE	2021/06/01		85	%	70 - 130
			MeFOSE	2021/06/01		83	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2021/06/01		86	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2021/06/01		90	%	70 - 130
7379405	XIN	Spiked Blank DUP	13C2-6:2-Fluorotelomersulfonic Acid	2021/06/01		86	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/06/01		85	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/06/01		85	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/06/01		79	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/06/01		90	%	50 - 150
			13C2-perfluorotetradecanoic acid	2021/06/01		76	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/06/01		82	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/06/01		93	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/06/01		90	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/06/01		89	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/06/01		83	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/06/01		88	%	50 - 150
			13C5-Perfluorononanoic acid	2021/06/01		89	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/06/01		90	%	50 - 150

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			13C8-Perfluorooctane Sulfonamide	2021/06/01		58	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2021/06/01		91	%	50 - 150
			D7-MeFOSE	2021/06/01		54	%	50 - 150
			D9-EtFOSE	2021/06/01		51	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2021/06/01		87	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2021/06/01		86	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2021/06/01		88	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2021/06/01		87	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2021/06/01		87	%	70 - 130
			Perfluorononanoic acid (PFNA)	2021/06/01		93	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2021/06/01		87	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2021/06/01		86	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2021/06/01		86	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01		86	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01		84	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01		81	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2021/06/01		86	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2021/06/01		85	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2021/06/01		90	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2021/06/01		84	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01		85	%	70 - 130
			EtFOSE	2021/06/01		86	%	70 - 130
			MeFOSE	2021/06/01		86	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2021/06/01		90	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2021/06/01		90	%	70 - 130
7379405	XIN	RPD	Perfluorobutanoic acid (PFBA)	2021/06/01	0.26		%	30
			Perfluoropentanoic acid (PFPeA)	2021/06/01	0.35		%	30
			Perfluorohexanoic acid (PFHxA)	2021/06/01	0.65		%	30
			Perfluoroheptanoic acid (PFHpA)	2021/06/01	0.23		%	30
			Perfluorooctanoic acid (PFOA)	2021/06/01	0.96		%	30
			Perfluorononanoic acid (PFNA)	2021/06/01	1.6		%	30
			Perfluorodecanoic acid (PFDA)	2021/06/01	1.9		%	30
			Perfluoroundecanoic acid (PFUnA)	2021/06/01	0.17		%	30
			Perfluorododecanoic acid (PFDoA)	2021/06/01	0.31		%	30
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01	0.99		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01	0.48		%	30
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01	5.0		%	30
			Perfluorohexanesulfonic acid(PFHxS)	2021/06/01	2.7		%	30
			Perfluoroheptanesulfonic acid PFHpS	2021/06/01	1.6		%	30
			Perfluorooctanesulfonic acid (PFOS)	2021/06/01	2.2		%	30
			Perfluorodecanesulfonic acid (PFDS)	2021/06/01	3.8		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01	0.38		%	30
			EtFOSE	2021/06/01	1.3		%	30
			MeFOSE	2021/06/01	3.6		%	30
			6:2 Fluorotelomer sulfonic acid	2021/06/01	4.2		%	30
			8:2 Fluorotelomer sulfonic acid	2021/06/01	0.23		%	30
7379405	XIN	Method Blank	13C2-6:2-Fluorotelomersulfonic Acid	2021/06/01		90	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2021/06/01		83	%	50 - 150
			13C2-Perfluorodecanoic acid	2021/06/01		81	%	50 - 150
			13C2-Perfluorododecanoic acid	2021/06/01		74	%	50 - 150
			13C2-Perfluorohexanoic acid	2021/06/01		86	%	50 - 150

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			13C2-perfluorotetradecanoic acid	2021/06/01		71	%	50 - 150
			13C2-Perfluoroundecanoic acid	2021/06/01		77	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2021/06/01		87	%	50 - 150
			13C4-Perfluorobutanoic acid	2021/06/01		83	%	50 - 150
			13C4-Perfluoroheptanoic acid	2021/06/01		87	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2021/06/01		78	%	50 - 150
			13C4-Perfluorooctanoic acid	2021/06/01		85	%	50 - 150
			13C5-Perfluorononanoic acid	2021/06/01		87	%	50 - 150
			13C5-Perfluoropentanoic acid	2021/06/01		85	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2021/06/01		76	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2021/06/01		86	%	50 - 150
			D7-MeFOSE	2021/06/01		67	%	50 - 150
			D9-EtFOSE	2021/06/01		66	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2021/06/01	<0.0039		ug/L	
			Perfluoropentanoic acid (PFPeA)	2021/06/01	<0.0067		ug/L	
			Perfluorohexanoic acid (PFHxA)	2021/06/01	<0.0053		ug/L	
			Perfluoroheptanoic acid (PFHpA)	2021/06/01	<0.0067		ug/L	
			Perfluorooctanoic acid (PFOA)	2021/06/01	<0.0050		ug/L	
			Perfluorononanoic acid (PFNA)	2021/06/01	<0.0051		ug/L	
			Perfluorodecanoic acid (PFDA)	2021/06/01	<0.0039		ug/L	
			Perfluoroundecanoic acid (PFUnA)	2021/06/01	<0.0062		ug/L	
			Perfluorododecanoic acid (PFDoA)	2021/06/01	<0.0080		ug/L	
			Perfluorotridecanoic acid (PFTRDA)	2021/06/01	<0.0064		ug/L	
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/01	<0.0068		ug/L	
			Perfluorobutanesulfonic acid (PFBS)	2021/06/01	<0.0056		ug/L	
			Perfluorohexanesulfonic acid(PFHxS)	2021/06/01	<0.0044		ug/L	
			Perfluoroheptanesulfonic acid PFHpS	2021/06/01	<0.0065		ug/L	
			Perfluorooctanesulfonic acid (PFOS)	2021/06/01	<0.0057		ug/L	
			Perfluorodecanesulfonic acid (PFDS)	2021/06/01	<0.0064		ug/L	
			Perfluorooctane Sulfonamide (PFOSA)	2021/06/01	<0.0036		ug/L	
			EtFOSE	2021/06/01	<0.0071		ug/L	
			MeFOSE	2021/06/01	<0.0070		ug/L	
			6:2 Fluorotelomer sulfonic acid	2021/06/01	<0.0065		ug/L	
			8:2 Fluorotelomer sulfonic acid	2021/06/01	<0.0067		ug/L	
7382994	YPL	Spiked Blank	13C2-perfluorotetradecanoic acid	2021/06/02		81	%	50 - 150
			D3-MeFOSA	2021/06/02		53	%	50 - 150
			D5-EtFOSA	2021/06/02		48 (1)	%	50 - 150
			Perfluorotridecanoic acid (PFTRDA)	2021/06/02		109	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/02		108	%	70 - 130
			EtFOSA	2021/06/02		90	%	70 - 130
			MeFOSA	2021/06/02		91	%	70 - 130
7382994	YPL	Spiked Blank DUP	13C2-perfluorotetradecanoic acid	2021/06/02		80	%	50 - 150
			D3-MeFOSA	2021/06/02		52	%	50 - 150
			D5-EtFOSA	2021/06/02		48 (1)	%	50 - 150
			Perfluorotridecanoic acid (PFTRDA)	2021/06/02		105	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/02		106	%	70 - 130
			EtFOSA	2021/06/02		87	%	70 - 130
			MeFOSA	2021/06/02		88	%	70 - 130
7382994	YPL	RPD	Perfluorotridecanoic acid (PFTRDA)	2021/06/02	3.0		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/02	1.7		%	30
			EtFOSA	2021/06/02	4.2		%	30

BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			MeFOSA	2021/06/02	2.7		%	30
7382994	YPL	Method Blank	13C2-perfluorotetradecanoic acid	2021/06/02		85	%	50 - 150
			D3-MeFOSA	2021/06/02		47 (2)	%	50 - 150
			D5-EtFOSA	2021/06/02		41 (1)	%	50 - 150
			Perfluorotridecanoic acid (PFTRDA)	2021/06/02	<0.0064		ug/L	
			Perfluorotetradecanoic acid(PFTEDA)	2021/06/02	<0.0068		ug/L	
			EtFOSA	2021/06/02	<0.0070		ug/L	
			MeFOSA	2021/06/02	<0.0078		ug/L	

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL) which may result in increased variability of the associated native analyte result (EtFOSA).

(2) Extracted internal standard analyte recovery was below the defined lower control limit (LCL) which may result in increased variability of the associated native analyte result (MeFOSA).

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BV Labs Job #: C1E0320
Report Date: 2021/06/03

Barnstable County
Client Project #: 6206
Site Location: BARNSTABLE, MA, USA
Sampler Initials: MM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Colm McNamara, Senior Analyst, Liquid Chromatography

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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CAM FCD-01191/6

CHAIN OF CUSTODY RECORD

Invoice Information
Company Name: Barnstable County
Contact Name: Priscilla Ellis/Steve Tebo
Address: 3195 Main Street, Barnstable, MA
Phone: Fax:
Email: pellis@barnstablecounty.com

Report Information (if differs from invoice)
Company Name: BETA Group
Contact Name: Roger Thibault/Mykel Mendes
Address:
Phone: 401-333-2382 Fax:
Email: mmendes@beta-inc.com; rthibault@beta-inc.com

Project Information (where applicable)
Quotation #:
P.O. #/ AFE#:
Project #: 6206
Site Location: Barnstable, MA , USA
Site #:
Site Location Province:
Sampled By: Mykel Mendes, C. Oien

Turnaround Time (TAT) Required
☐ Regular TAT (5-7 days) Most analyses
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Rush TAT (Surcharges will be applied)
☐ 1 Day ☐ 2 Days ☐ 3-4 Days
Date Required:
Rush Confirmation #:

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153
☐ Table 1 ☐ Res/Park ☐ Med/ Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/ Other
☐ Table ____
FOR RSC (PLEASE CIRCLE) Y / N

Other Regulations
☐ CCME ☐ Sanitary Sewer Bylaw
☐ MISA ☐ Storm Sewer Bylaw
☐ PWQO Region
☐ Other (Specify)
☐ REG 558 (MIN. 3 DAY TAT REQUIRED)
☐ REG 406 Table

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

LABORATORY USE ONLY
CUSTODY SEAL: Present Y / N; Intact
COOLER TEMPERATURES: 12.5 | 8.3 | 11.7 | 8.7 | 8.5
COOLING MEDIA PRESENT: Y / N

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	BTEX / PHC F1	PHCs F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 ICPMS METALS	REG 153 METALS (Hg, Cr VI, ICPMS Metals, HWS - B)	USEPA 537 M PFAS							HOLD- DO NOT ANALYZE
1	PFW-1	21/05/20	1210	GW	2								X							
2	HSW-6	21/05/19	1115	GW	2								X							
3	PFW-5	21/05/19	1040	GW	2								X							
4	OW-8A	21/05/19	1125	GW	2								X							
5	MW-201	2021/05/19	0955	GW	2								X							
6	MW-215	21/05/19	1200	GW	2								X							
7	Duplicate	21/05/19	0800	GW	2								X							
8	Rinsate 1	21/05/19	1400	AQ	2								X							
9	PC-1	21/05/20	1115	GW	2								X							
10	PC-11	21/05/19	1420	GW	2								X							

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Mykel Mendes Mykel Mendes	21/05/24	1130		2021/05/25	13:45

25-May-21 13:45
Lori Dufour
C1E0320
VBV ENV-652

BUREAU VERITAS

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Turnaround Time (TAT) Required

[x] Regular TAT (5-7 days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)
[ ] 1 Day [ ] 2 Days [ ] 3-4 Days

Date Required:
Rush Confirmation #:

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153

[ ] Table 1 [ ] Res/Park [ ] Med/ Fine
[ ] Table 2 [ ] Ind/Comm [ ] Coarse
[ ] Table 3 [ ] Agri/ Other
[ ] Table ____
FOR RSC (PLEASE CIRCLE) Y / N

Other Regulations

[ ] CCME [ ] Sanitary Sewer Bylaw
[ ] MISA [ ] Storm Sewer Bylaw
[ ] PWQO Region
[ ] Other (Specify)
[ ] REG 558 (MIN. 3 DAY TAT REQUIRED)
[ ] REG 406 Table

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

Analysis Requested

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact)
COOLER TEMPERATURES
COOLING MEDIA PRESENT: Y / N

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	BTEX/ PHC F1	PHCs F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 ICPMS METALS	REG 153 METALS (Hg, Cr VI, ICPMS Metals, HWS - B)	HOLD- DO NOT ANALYZE	COMMENTS
1	PC-38	21/05/20	0915	GW										
2	MW-12	21/05/20	0910	GW										
3	MW-22	21/05/20	1000	GW										
4	PC-16D	21/05/20	1030	GW										
5	PC-30	21/05/20	0930	GW										
6	PC-6A	21/05/20	1200	GW										
7	PC-28	21/05/20	1110	GW										
8	FS-1a	21/05/19	1340	GW										
9	rinsate 2	21/05/20	1145	GW										
10														

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	BV JOB #
Mykel Mendes Mykel Mendes	21/05/24	1130				

APPENDIX C

Public Notifications

July 2021

Mark S. Ells, Town Manager
Town of Barnstable
200 Main Street
Hyannis, MA 02601

RE: Immediate Response Action Status and Remedial Monitoring Report #54
Barnstable County Fire and Rescue Training Academy
155 South Flint Rock Road
Barnstable, Massachusetts
DEP Release Tracking No. 4-26179
Project File #6206

Dear Mr. Ells,

As required by the Massachusetts Contingency Plan (MCP) 310 CMR 40.1403(3)(e) and 40.1403(6), BETA Group, Inc.(BETA) is notifying you on behalf of our client, Barnstable County, that an Immediate Response Action (IRA) Status and Remedial Monitoring Report (RMR) No. 54 is being submitted to the Massachusetts Department of Environmental Protection – Bureau of Waste Site Cleanup (MassDEP – BWSC) for the release site referenced as the Barnstable County Fire and Rescue Training Academy (BCFRTA) located at 155 South Flint Rock Road in Barnstable, Massachusetts (the site). This Report summarizes the IRA activities that occurred during the May 2021 monthly reporting period.

Pursuant to the Massachusetts Contingency Plan (310 CMR 40.0480), an Initial Site Investigation has been performed at the site. A release of oils and/or hazardous materials has occurred at the site. In August 2016, MassDEP Southeast Regional Office issued a Notice of Responsibility (NOR) to Barnstable County, as current owner and operator of the Barnstable County Fire and Rescue Training Academy (BCFRTA), that the detection of elevated concentrations of poly- and perfluorylalkyl substances (PFAS) in groundwater at the site constituted a release under the MCP. MassDEP issued Release Tracking Number (RTN) 4-26179 to this release. As summarized in the NOR, based on the detected PFAS concentrations in soil and groundwater at the BCFRTA and the inferred groundwater flow, MassDEP determined that the releases of PFAS from the use of aqueous film-forming foam (AFFF) at the BCFRTA is a source of PFAS detected in the Mary Dunn wells.

During the May 2021 reporting period, the two treatment systems, GWTS #1 and GWTS #2, were in operation for all or portions of 31 days. The overall (average) system flow rate and gallons of groundwater treated are based on the available Effluent flow totalizer readings reported for both systems by the O&M contractor. For the May 2021 reporting period both systems treated an approximate combined 0.71 million gallons of groundwater from the downgradient recovery well PRW-4 at an average, total (of the two systems) effluent flow rate of 15.4 gpm. Based on the total 0.71 million gallons treated, approximately 0.003 kilograms of PFAS were estimated to have been removed from the plume area.

BETA Group Inc.
701 George Washington Highway, Lincoln, RI 02865
P : 401.333.2832 |F: 401.333.9225 |W: beta-inc.com

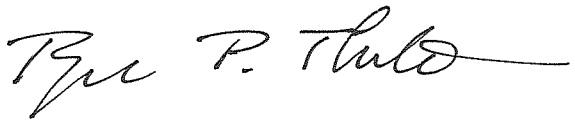
At this time, IRA activities are ongoing. Continuing IRA activities will include operation and monitoring of the on--Site Groundwater Pump and Treatment Systems (GWPTS), including performance sampling of GWPTS, review and evaluation of the on-Site GWPTS operation and maintenance activities as they affect groundwater treatment, and periodic groundwater monitoring. Additional details regarding the continuing IRA activities are included in the IRA Status and RMR No. 54 report document.

The IRA Status and RMR document is available electronically via the searchable sites database of the MassGOV / MassDEP website via the following link:

https://eeaonline.eea.state.ma.us/portal#!/wastesite/4-0026179

If you have any questions or comments, please do not hesitate to contact our office.

Sincerely,
BETA Group, Inc.



Roger P. Thibault, P.E., LSP
Senior Environmental Engineer

Copies: Mass Department of Environmental Protection
Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347

Thomas Mckean, Director
Town of Barnstable Health Division
200 Main Street
Hyannis, MA 02601

Hans Keijser, Supervisor
Town of Barnstable Water Supply Division
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