IMMEDIATE RESPONSE ACTION STATUS REPORT No. 39

Barnstable County Fire and Rescue Training Academy
155 South Flint Rock Road
Barnstable, Massachusetts
MassDEP Release Tracking No. 4-26179
Project No. 6206

Prepared For:

Barnstable County
Barnstable, Massachusetts
c/o Jack Yunits, Barnstable County Administrator
3195 Main Street
Barnstable, Massachusetts

Submitted To:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347

April 2020

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April, 2020

Bureau of Waste Site Cleanup
Southeast Regional Office
Massachusetts Department of Environmental Protection
C/o Angela Gallagher
20 Riverside Drive
Lakeville, MA 02347

RE: Immediate Response Action Status and Remedial Monitoring Report #39
Barnstable County Fire Training FTA Facility
155 South Flint Rock Road, Barnstable, Massachusetts
DEP Release Tracking No. 4-26179
Project Number #6206

Dear Ms. Gallagher:

BETA Group, Inc. (BETA) has prepared this Immediate Response Action (IRA) Status and Remedial Monitoring Report (RMR) No. 39 for the Disposal Site referenced as the Barnstable Country Fire and Rescue Training FTA (FTA) Facility located at 155 South Flint Rock Road in Hyannis, MA (the Site). This document has been prepared on behalf of our client, Barnstable County, and was completed in accordance with Massachusetts Contingency Plan (MCP) - 310 CMR 40.0000.

This is the 39th monthly IRA RMR Status report. It documents the IRA/RMR activities being conducted to address a release of PFOS/PFOA to groundwater, soils, surface water, and sediments located at the Site. A potential Imminent Hazard (IH) condition and Condition of Substantial Release Migration were previously identified at the Site. This report specifically addresses the status of the Site groundwater pumping and treatment systems (GWPTS) during the monthly reporting period from February 1 to February 29, 2019, and the groundwater monitoring sampling results from February 2020 quarterly groundwater sampling event.

If you have any questions upon review of this plan, please contact us at your convenience. Thank you.

Sincerely,

BETA Group, Inc.

Mykel D. Mendes
Project Engineer

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

cc: MassDEP/BWSC

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Jack Yunits, Barnstable County Administrator
Steve Tebo, Barnstable County Interim Assistant Administrator and Director of Facilities

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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. 39 that addresses a release of potentially 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 focusing on the groundwater pumping and treatment system at the Site for the month of February 2020. In addition, this status report describes the activities and results of the Site-wide groundwater monitoring conducted in February 2020.

This (IRA) Status and Remedial Monitoring Report (RMR) No. 39 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:

Jack Yunits, County Administrator
Barnstable County
3195 Main Street
Barnstable, MA 02630

Telephone: 508-375-6643
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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:

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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. See 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 (formerly used for live fire suppression training, which has ceased), along with several sheds and outbuildings formerly 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 has been used for public safety training since the 1950's. The FTA has 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. A portion of Flint Rock Pond is within the property boundary 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 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. Refer to Figure 3.

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 between approximately 2,200 feet to the southwest (closest point of runway 15 – 33) and 1,300 southwest (closest edge of airport property) of 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 currently is restricted to classroom training activities, 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 but 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 (such as 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 conservatively 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 in recent testing beneath unpaved areas at depths ranging from approximately less than 0 to 15 feet below the ground surface. Therefore, impacted soils at the FTA are considered "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". Until recent cessation of firefighting / rescue training activities at the FTA, impacted soil could potentially be disturbed during training ; however, on-Site training activities involved a relatively short duration of high intensity use by personnel who are not employed at the Site. Currently, only limited activities occur at the FTA related to maintenance. These activities may infrequently disturb bare soil, but only infrequently, and may be conducted by employees. However, these activities would only be of "low intensity." Based on these factors, for current, limited Site uses and updated analytical data, soils at the FTA portion of the Disposal Site remain 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. As noted above, only groundwater impacts are of concern at this time outside of the FTA portion of the Site.

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

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.

As detailed in the October 2019 Reporting Period IRA Status and RMR reports, which reported the most recent October 2019 groundwater monitoring data for locations across the Disposal Site, 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. The results from October 2019, monitoring event are presented and depicted in the IRA Status and RMR No. 35. IRA Status and RMR reports have been submitted monthly since December 13, 2016.

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 in July 2015 to help remediate and contain the PFAS migration from the FTA. 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. The approximate locations of key components of the GWPTS that are located on the FTA are shown on Figure 2 – Site Plan -FTA Facility, updated for this submittal. 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.

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; as depicted in 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. Figure 2 depicts the approximate location of the recharge basins. As appropriate to prevent breakthrough of the PFAS compounds of current concern, the GAC is periodically changed out. 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 & Technology, LLC of Millbury, MA (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 the system to check the system's 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 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.

Data, prepared previously by the Cape Cod Commission and compiled in the Phase I ISI report by Nover-Armstrong, indicates that it is likely that PFOS and PFOA migration through groundwater in a southeasterly direction from the FTA Site towards the Mary Dunn well field is occurring. The Cape Cod Commission previously identified a plume of the highest concentrations approximately 200 feet wide. The average PFOS concentration in groundwater beneath a broad portion of the Site downgradient of the former Hot Spot area was reported in the IRA Plan to be approximately 3,000 ng/L.

Based on the compiled Phase I Initial Site Investigation data, Nover-Armstrong 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 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.

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.

3.3 Flintrock Pond Assessments

Per the Order of Conditions: Special Conditions of Approval (SE3-5606), Item 17, the Town of Barnstable Conservation Commission requires the submission of new testing results for PFAS in Flintrock Pond." In November 2018 and March 2019, BETA conducted surface water and sediment sampling at Flintrock Pond. Concentrations of the total summed of the five PFAs chemicals (PFOS, PFOA, PFNA, PFHxS, and PFHpA) were documented in the pond surface water above the MassDEP ORS Guideline during both November and March sampling events; however, it should be noted that the US EPA HA and the MassDEP ORS Guideline do not directly apply to surface waters. Elevated concentrations of the total summed of the five PFAs chemicals (PFOS, PFOA, PFNA, PFHxS, and PFHpA) were documented in the pond sediments; however, no MassDEP or US EPA regulatory standards or guidelines are available for comparison. Concentrations of PFAS documented within Pond sediments are dominated by the PFOS fraction and increase with distance from the Pond's bank and appear to be consistent with the 2015 data. Refer to the previously completed IRA Status Reports submitted to MassDEP for complete information on the ongoing assessment of Flintrock Pond.

Refer to Table 1A and Table 1B for a summary of the surface water and sediment sampling conducted to date at Flintrock Pond.

In response to Commission input and to meet MCP requirements, a comprehensive assessment program for the pond is under development. 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 will be part of the Phase II Comprehensive Site Assessment and the pond's ecological risk assessment.

To note, PFAS are an "emerging contaminant" and scientific data are continuously evolving. At this time, a significant body of scientific information indicates that PFAS are highly stable compounds. A significant aspect of the concerns over PFAS is that they do not readily degrade or naturally attenuate, are not readily chemically altered, and are persistent in the environment. These characteristics indicate that relatively frequent repeat sampling in similar locations may be of limited utility. The historic sampling data obtained and presented from Flintrock Pond display these characteristics; PFAS concentrations have not significantly changed in between sampling rounds and the data are not significantly different from the historic data collected in 2015, with some exceptions. However, 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.

3.4 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 in aqueous and soil samples with laboratory detection and reporting limits below the applicable risk standards. 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 Massachusetts regulated PFAS compounds (PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFDA) based on the MassDEP MCP PFAS risk standards, (effective December 27, 2019). At this time, several other state regulations recognize these specific six PFAS compounds as contaminants of concern. BETA presents the tabulated data and includes the laboratory analytical reports (or Certificates of Analysis) for that reporting period in all MCP submittals, including the monthly IRA Status and RMR reports; the summary data tables, and laboratory analytical reports are included as attachments to all submittals.

3.5 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, Barnstable County designated the Site as a PIP site and began 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 presented and distributed. Additionally, comments were received by the County on the Draft Plan for a minimum of 20 days after the distribution of this Draft Plan per 310 CMR 40.1405(5)(b). 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 completed and submitted to MassDEP on June 27, 2019. As stated in the Final PIP, prior to the completion of a major regulatory milestone, public comment will be solicited, and comments received will potentially be incorporated prior to the implementation of the milestone/response action. As a result, the August 2019 IRA Plan Modification was previously submitted to MassDEP in draft and following the receipt of public comments the Plan was finalized in December 2019.

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, 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.

Additionally, 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. This capping work was mandated as an IRA Plan Modification by MassDEP. This work was designated the Phase I Stormwater Management Improvements/IRA Plan Modification.

The following sections summarize the historic, continuing, and recent IRA response actions including the continuing operation and maintenance of the GWPTS, temporary expansion of the groundwater treatment capacity, and the quarterly groundwater monitoring.

4.1 Expansion of Groundwater Treatment Capacity Using Temporary Unit

As described in detail in IRA Status Report No. 27, for reporting period February 2019, the feasibility of expanding groundwater pumping and treatment was evaluated. The evaluation indicated that a short-term expansion of groundwater recovery via a new temporary well pumping to a temporary (rental) treatment unit was feasible. Later status reports and May 31, 2019 correspondence to MassDEP indicated the intention of the County to proceed with expanding treatment capacity as rapidly as feasible by procuring (via a rental contract) and installing a temporary treatment system. MassDEP concurred with adding additional temporary treatment capacity. The County, assisted by BETA, procured a temporary conventional treatment system housed in a shipping container through a rental contract with GWTT. The treatment system is described below. The temporary system was delivered to the FTA in late October 2019 and final steps to energize and start-up the system and divert groundwater to it were completed on November 11, 2019. The temporary system is designated as GWTS #2 for Site reporting purposes. Municipal water used to hydrate the GAC and test the system was initially pumped through the system on that date. Actual groundwater flow through the temporary system was estimated to begin on November 12, 2019. A standard start-up process with increased frequency of monitoring was executed.

Currently, groundwater from PRW-4 is conveyed through two 2-inch ID force mains to the treatment building on the FTA property. Prior to November 11, 2019, both force mains discharged through the top hatch of the equalization tank of the permanent treatment system, designated as GWTS #1 for reporting purposes. One force main continues to discharge to the GWTS #1 equalization tank. The second force main has been re-piped and is now connected via hose and hard piping to the temporary treatment system, GWTS #2. Hose connections will allow interchangeability between force mains and treatment systems.

The rental treatment system GWTS #2 is housed in a heated, weather-tight temporary structure, i.e., a former shipping container. The system is designed to treat PFAS-impacted groundwater at a target flow rate of approximately 30 gpm. Additional details regarding the installation and start-up of GWTS #2 were included in the December 2019 IRA Plan Modification Report.

4.2 Continuing Operation & Maintenance of GWPTS

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. After system startup in July 2015, monitoring samples were collected from the influent (PRW-4), midpoint, and effluent sample locations, biweekly and were submitted for the laboratory analysis of PFAS to aid in determining performance efficiency and monitor breakthrough of the PFAS. As previously noted, IRA and other assessment activities performed prior to the issuance of the NOR were described in the IRA Plan submitted to MassDEP in September 2016. The Cape Cod Commission submitted monthly IRA Status and RMR Reports between December 2016 and February 2018 documenting the performance of the GWPTS at the FTA.

On average, the GWPTS reportedly recovered and treated groundwater at approximately 50 gpm (high average - continuous) or approximately 2.2 million gallons monthly, removing approximately 0.015 pounds of PFOS a month. In mid-February 2018 the main transfer pump on the GWPTS failed and the system was temporarily shut down while procurement of a new pump, installation of the pump and related repairs were conducted. Due to the specialty nature of the pump and its variable frequency drive (VFD) controller and related details that delayed the replacement, the GWPTS was restarted on April 9, 2018. At that time oversight of the system had transitioned to Nover-Armstrong Associates, now BETA. From March 2018 to the present, BETA has prepared and submitted monthly IRA Status Reports and RMRs for the Disposal Site and GWPTS.

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.

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 the wastewater treatment system operator, GWTT, under contract with the County.

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 on a monthly basis; 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 the results for 23 PFAS compounds. The following sections detail the remedial monitoring reports for the February 2020 reporting period.

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. Subsequently, 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 MassDEP guidelines and regulatory actions.

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. From May 2019 through the current reporting period, tabulated treatment system analytical results included all six PFAS compounds of concern for informational purposes.

In December 2019, MassDEP published final MCP Method 1 risk standards for PFAS with an effective date of December 27, 2019. The final MCP PFAS risk standards for groundwater include the 6 PFAS compounds of concern listed above and a 0.020 µg/L[1] GW-1 numerical risk standard. Therefore, as of January 2020 the total PFAS concentrations reported and discussed for comparison purposes in all monitoring reports filed for the Site are the six PFAS included in the final MCP risk standards of December 27, 2019. Results are compared to the finalized MCP GW-1 risk standards for six PFAS compounds (0.020 µg/l).

[1] Concentrations of PFAS are typically presented in parts per trillion (ppt) or nanograms per liter (ng/L), however the MCP Method GW-1 numerical risk standards are in presented in parts per billion (ppb) or micrograms per liter (µg/L).

4.3 Current Operation & Maintenance of GWPT Systems

4.3.1 Remedial Monitoring Report – GWPTS #1

During the February 2020 reporting period, the primary treatment system (GWTS #1) and secondary system (GWTS #2) were in operation for all or portions of approximately 29 days. There were no scheduled shutdowns during this reporting period for GWTS #1, however two backwashes were conducted on the primary LGAC vessel of GWTS #1 on February 13 and February 28, 2020 and the system was shut down for an approximate total of four hours. On February 13, 2020, BETA collected performance samples from both GWTS #1 and GWTS #2 systems, which were both in operation at the time of sample collection.

GWTS # 1 System Monitoring Results

As noted, system samples were collected on February 13, 2020 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.

As noted in section 4.2, as of January 2020 the total PFAS concentrations reported and discussed in monitoring reports are based on the six PFAS included in the final MCP risk standards of December 27, 2019. Results are compared to the finalized MCP GW-1 risk standards for six PFAS compounds (0.020 µg/l). The total sum of the six PFAS concentrations in the Influent (PRW-4) sample was 3.659 µg/L, well above the GW-1 risk standards. Five of the six individually regulated PFAS compounds were detected at concentrations exceeding the MCP GW-1 risk standard (0.020 µg/l). Refer to the attached Table 2A, for a summary of the GWTS #1 PFAS analytical data. Recovery well PRW-4 is the source of the Influent groundwater. 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.

None of the six MA regulated compounds were detected in the Midpoint and Effluent samples; results documented were below the laboratory's method reporting limits (MDLs) and below the MCP Method 1 GW-1 standard.

Bureau Veritas reports the results for 23 PFAS compounds, including six (6) PFAS precursors. The 17 (additional) laboratory reported PFAS compounds (other than the six MA regulated compounds) were not detected above the MDLs in both the February 2020 Midpoint and Effluent samples. In brief, none of the 23 (laboratory reported) PFAS compounds were detected above the laboratory's reporting detection limits (RDLs) or MDLs in the February 2020 Midpoint and Effluent samples. Refer to the attached table, Table 2A, for a summary of the GWTS #1 PFAS analytical data. The complete laboratory report is attached in Appendix B.

GWTS #1 Operational Details

For the February 2020 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 0.35 million gallons of groundwater were treated during the February 2020 reporting period, at an average effluent flow rate of 8.4 gpm. Based on 0.35 million gallons treated and total influent concentration of 3.659 µg/L (February 13, 2020 sample results), approximately 0.004 kilograms of PFAS were estimated to have been removed from the plume area during this reporting period.

The estimated, instantaneous combined influent flow rates (for both systems) ranged from approximately 5.4 gpm to 48 gpm; typically, the estimated instantaneous influent flow rate was over 20 gpm. The O&M operator, GWTT, and BETA observed continued significant iron-oxide sediment accumulation (continuing from the January 2020 reporting period) in the equalization (EQ) tank and a significant drop (over previous reporting periods) in both influent instantaneous flow rates and effluent average flow rates up until February 24, 2020. On February 24, 2020, GWTT noticed a significant increase in the instantaneous influent flow rate (from 5.4 gpm on the previous site check up to 46.2 gpm) which simultaneously caused the pressure on the bag filters to increase. GWTT and BETA theorize that a significant amount of iron-oxide sediment had been accumulating in the force main piping (following the force main de-scaling on December 2, 2019) and was effectively restricting flow. However, it appears that the well pump at PRW-4 was able to apply enough pressure to force the sediment through the piping, thereby removing the blockage and allowing normal flow to the system.

GWTT additionally conducted two backwashes on the primary LGAC vessels during this reporting period to combat the large influx of iron-oxide sediments to the vessels. The backwash helps to remove/blow-off the iron-oxide sediment particles that have adsorbed to the carbon granules and as a result, the backwash helps to maintain flow rates through the vessel and restore the surface area on the carbon for PFAS removal through sorption, (overall maintaining the expected lifetime of the existing activated carbon).

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 discharges to GWTS #1. To note, because the 50% is an assumption, the observed total influent flow rate values are tabulated. Refer to the attached Table 3A for a summary of the GWPTS performance details.

4.3.2 Remedial Monitoring Report – GWPTS #2

GWTS # 2 Monitoring Results

As previously mentioned, BETA collected performance samples from GWTS #2 system on February 13, 2020. 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.

As previously mentioned, the tabulated treatment system analytical results from GWTS #2 have been reported and compared to all six regulated PFAS compounds and their respective MCP Method 1 GW-1 Standards. The total sum of the six PFAS concentrations in the Influent sample was 3.659 µg/L, well above the GW-1 risk standards. Five of the six individually regulated PFAS compounds were detected at concentrations exceeding the new MCP GW-1 risk standard (0.020 µg/l). Refer to the attached Table 2B, for a summary of the GWTS #2 PFAS analytical data.

No PFAS concentrations were reported above laboratory reporting detection limits (RDLs) or method detection limits (MDLs) in the February 2020 Midpoint and Effluent samples; RDLs were sufficiently low to allow comparison to the applicable MCP GW-1 risk standards. Bureau Veritas reports the results for 23 PFAS compounds, including six (6) PFAS precursors; additionally, the 17 PFAS compounds not tabulated in Table 2B were all below the RDLs and MDLs (for this February 2020 reporting period). Refer to the attached Table 2B, for a summary of the GWTS #2 PFAS analytical data. The complete laboratory report is included in Appendix B.

GWTS #2 Operational Details

Refer to the attached Table 3B for a summary of the GWPTS performance details.

For the February 2020 reporting period, BETA continued to observe the slow decrease in the total flow per period and average treatment flow rate of GWTS #2 since the December 2019 period. The instantaneous flow rate through the treatment system, estimated by timing a volume through the system as indicated by the flow totalizer, remain relatively steady in the range of 42 to 48 gpm, with one outlier estimate of 57 gpm. The potential causes of the decreasing total flow through GWTS #2 remain under evaluation. Potential causes include the configuration of the recovery well shutdown conditions, which must include the equalization tanks of GWTS #1 and #2.

In addition, as previously mentioned in the GWTS #1 Monitoring Results section, a significant decrease in the instantaneous estimated Influent flow rates (for both systems) was observed, probably as a result of iron-oxide sediment accumulation in the EQ holding tank and potential buildup of iron-oxide sediment in the force main piping reducing flow from PRW-4 to the system. However, as mentioned in section 4.3.1, the instantaneous influent flow rate spiked on February 24, 2020 apparently as a result of a the iron-oxide sediment blockage “blowing through” the system piping and restoring the influent flow rate through the force mains. As a result, GWTT had to change the bag filters twice on 02/24/2020 as they were significantly impacted with iron sediments and pressure differentials were rapidly increasing. Although, influent flow has been somewhat restored, significant iron-oxide sediment has continued to accumulate/settle at the bottom of the EQ tank and disruption of this accumulated sediment is causing sediments to be pumped into the LGAC vessels. As a result, the County planned to pump out the solids from both system’s EQ tanks during subsequent reporting periods.

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 0.21 million gallons of groundwater were estimated to be treated during the February 2020 reporting period, at an approximate average effluent flow rate of 4.9 gpm.

See earlier commentary on the flow rate through GWTS #2. Based on 0.21 million gallons treated, approximately 0.003 kilograms of PFAS were estimated to have been removed from the plume area during this reporting period.

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 discharge to GWTS #2. Refer to Table 2B for the total instantaneous influent flow rates, 50 % of which are estimated to be conveyed to GWTS #2. Refer to the attached Table 3B for a summary of the GWTS #2 performance details.

4.3.3 Remedial Monitoring Report Summary

During the February 2020 reporting period, the two treatment systems, GWTS #1 and GWTS #2, were in operation for all or portions of approximately 29 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 period of February 1 to February 29, 2020 both systems treated an approximate combined 0.56 million gallons of groundwater from the downgradient recovery well PRW-4 at an average, total (of the two systems) effluent flow rate of 13.3 gpm. Based on the approximate 0.56 million gallons treated and total influent concentration of 3.831 µg/L (February 13, 2020 sample results), approximately 0.007 kilograms of PFAS were estimated to have been removed from the plume area during this reporting period.

4.4 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 (a copy of the plan can be found in previous IRA Status report submittals, including IRA Status RMR No. 35 for the October 2019 reporting period). Additional monitoring points may be added to either the quarterly or annual sampling round, as warranted to meet specific objectives or provide additional coverage. BETA conducted quarterly groundwater assessments in April 2019, July 2019, and February 2020. The January 2019 event was selected as the 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. From October 28 -30, 2019, BETA conducted the larger annual groundwater sampling event based on the MassDEP approved sampling plan. In the future, the annual monitoring program will be held in October. The previous 2019 sampling events were detailed in the IRA Status Reports for the respective periods.

4.4.1 February 2020 Site-Wide Quarterly Groundwater Sampling and Analysis

On February 18 and 19, 2020, BETA conducted a quarterly groundwater monitoring event based on the MassDEP approved sampling plan. A total of thirteen (13) monitoring wells were sampled for laboratory analysis of total PFAS by EPA Method 537 Modified. All sampled wells and all wells located within the immediate vicinity of the FTA property were gauged prior to sampling. Refer to Figure 2 and Figure 3 for sampling locations.

Monitoring wells HSW-1, PFW-1, PFW-5, and OW-8a are located on the FTA property; HSW-1 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. Additionally, monitoring well PC-39 is located south (cross-gradient) of the FTA property.

The additional wells sampled during this reporting period are located (downgradient of the FTA) on the adjacent property that is owned by the Town of Barnstable and/or by Commonwealth Electric, depending on the exact location of the property line relative to the monitoring wells. These wells were chosen based on historic and relevant groundwater PFAS concentrations identified, and inferred upgradient and downgradient locations within the Disposal Site. The further downgradient monitoring wells, 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-16d, PC-28, PC-30, are located in the probable downgradient direction from the recovery well, PRW-4.

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

Refer to Table 4 for a summary of the PFAS analytical data for the monitoring wells within the Disposal Site Boundary, including the results of the most recent February 2020 sampling round. Copies of the laboratory reports/certificates of analysis are included in Appendix B. Individual concentrations of one or more of the (now regulated) six PFAS compounds and Total Concentrations of the six PFAS documented in the samples from the wells during the February 2020 sampling event were above the MassDEP ORS Guideline.

In summary, PFAS concentrations detected in groundwater across the Disposal Site during the February 2020 round of groundwater assessment are similar to historic ranges (including the 2019 sampling rounds).' Although the sum of the total PFAS concentrations (six PFAS compounds currently of concern according to 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 decrease, with exceptions discussed below, since PFAS assessment activities started at the Site in 2015, especially in the Hot Spot area.

In the former Hot Spot/Phase 1 cap area, PFAS groundwater concentrations have been observed to be generally falling from historic highs since the completion of the Phase I stormwater improvements in January 2019.

Figures 5A and Figure 5B depict these concentration trends observed in groundwater at monitoring wells HSW-1 and PFW-1, respectively. 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 generally decreased significantly through mid-2019 and have since remained relatively steady at elevated levels relative to the GW-1 risk standards.

The trend of total PFAS concentrations in groundwater at the Disposal Site has been downward overall since PFAS assessment activities started at the Site in 2015. BETA has also observed increases in PFAS concentrations with increased rainfall and higher water tables the winter and spring seasons.

BETA's review of the February 2020 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. Figure 6 depicts the PFAS concentration trend observed in groundwater monitoring well OW-8A, which is located on the northeastern portion of the FTA. The figures Figure 7A and Figure 7B depict the stable trend in PFAS concentrations documented at monitoring wells MW-12 and MW-22 respectively.

However, PFAS concentrations documented in wells located farther southeast and downgradient of the FTA, specifically PC-11, PC-28, and PC-30, have variable trends. During the February 2020 reporting period, concentration trends from PC-6A, PC-28, and PC-30 have documented a stable trend. However, groundwater concentration trends from PC-11 appear to be significantly decreasing (compared to historic concentrations). Refer to Figures 8A, 8B, 8C, and 8D that depict PFAS concentration trends in PC-11, PC-6A, PC-28, and PC-30 respectively.

4.4.2 October 2019 Site-Wide Groundwater Gauging and Elevation Survey

In late October, BETA collected new and updated elevation data from existing and viable wells throughout the Disposal Site. 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 February 19, 2020. To note, since the submission of the IRA Status report for the October 2019 reporting period, BETA re-collected elevation data from select wells located 400-500 feet east and southeast of the FTA on February 18, 2020 to correct the inaccurate elevation data points. Refer to Table 5 for a tabulated summary of the groundwater elevation data for selected monitoring points across the Disposal Site.

Groundwater flow is inferred to be to the south-southeasterly direction. Refer to Figure 9 for a depiction of the calculated groundwater flow from the February 2020 gauging event. The gauging results indicate moderate influence from the operating recovery well, PRW-4.

4.7 Completion of August 2019 IRA Plan Modification

In August 2019, BETA, on behalf of Barnstable County, submitted a public comment draft IRA Plan Modification in response to MassDEP's request for an IRA Plan Modification that includes the expansion of the groundwater recovery and treatment system and capping measures to prevent infiltration of precipitation through the soils at the Site. This IRA Plan Modification was prepared in accordance with the Massachusetts Contingency Plan, 310 CMR 40.0000 (MCP) in response to the Notice of Audit Findings/Compliance and Technical Assistance/Interim Deadline, dated November 21, 2018 issued by the Massachusetts Department of Environmental Protection (MassDEP) and the Request for Expedited Immediate Response Action Plan Modification/Interim Deadline-Enforcement Document Number 6694, (Request for IRA Plan Mod) dated May 1, 2019 also issued by the MassDEP, as amended by email correspondence.

Upon receipt of public comments ending on November 13, 2019, BETA incorporated public comments as appropriate and feasible and submitted the final IRA Plan Modification to MassDEP on behalf of Barnstable County on December 20, 2019. The final IRA Plan Modification, dated December 20, 2019, can be found on Barnstable County's FTA webpage and at MassDEP's Waste Site Database. The links to both locations are provided below.

https://www.barnstablecounty.org/bcfta-history/

https://eeaonline.eea.state.ma.us/portal#!/search/wastesite/results?RTN=4-0026179

The final IRA Plan Modification received presumptive approval on January 10, 2020.

5.0 IRA EVALUATIONS

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

5.1 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.

5.2 Identification of Critical Exposure Pathways (CEP)

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

5.3 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 drafted MassDEP MCL (MMCL) standard. Although no MMCLs for PFAS are currently available, it is anticipated that they will be equivalent to the recently finalized MCP GW-1 risk standards.

5.4 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. In addition, additional technologies to treat / remove PFAS from soil and groundwater at the FTA may be evaluated in the near future. The results of such evaluations would be reported in appropriate IRA submittals or MCP phase reports.

8.0 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 C. 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.

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TABLES

Table 1A - Summary of Flintrock Pond PFAS Surface Water Analytical Data
Barnstable County Fire & Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

SAMPLE ID	Pond S1	Pond D1	SW-201[4]	SW-301[4]	SW-401S[5]	SW-401D[5]	Overland Runoff[6]	Reagent Blank[7]
Maxxam ID	AMH820	AMH821	IIN736	JHR505	LEV377	LEV378	IIN747	IIN744
Sampling Date	6/18/2015	6/18/2015	11/16/2018	3/27/2019	10/28/2019	10/28/2019	11/16/2018	11/16/2018
Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
Per- and polyfluoroalkyl substances (PFAS)								
Perfluorooctane Sulfonate (PFOS)	2500	2400	400	270	560	330	(<6.0)	(<6.0)
Perfluoro-n-Octanoic Acid (PFOA)	140	160	44	26	32	30	(<3.3)	(<3.3)
Perfluoroheptanoic Acid (PFHpA)	180	170	62	37	47	46	(<7.4)	(<7.4)
Perfluorohexane Sulfonate (PFHxS)	550	560	110	63	74	74	(<5.6)	(<5.6)
Perfluorononanoic Acid (PFNA)	94	95	52	33	63	44	(<8.7)	(<8.7)
Perfluorodecanoic acid (PFDA)[8]	(<20)	(<20)	8.5	(<4.1)	10.0	5.9	(<6.1)	(<6.1)

Notes:

1. (<5.6) - Below Laboratory Detection Limit, shown in paretheses.
2. ng/L - nanograms per liter; parts per trillion (ppt).
3. NE - Not Established.
4. The surface water sample, "SW-201" and "SW-301," were collected from Flintrock Pond approximately 50 feet from the shoreline and about approximately 6-8 inches below the surface in windy conditions.
5. The surface water sample "SW-401S" and "SW-401D" were collected from Flintrock Pond approximately 100 feet from the shoreline and at approximately 6 inches and 12 inches below the surface respectively.
6. The sample, "Overland Runoff", was precipitation runoff observed and collected from the downward sloping driveway near the shed adjacent to the Pond's shoreline.
7. Reagent Blank sample is a quality control sample required by the PFAS analytical methods.
8. The MassDEP Office of Research and Standards (ORS) conducted research in 2018 (ORS, 2018a) concluding that the PFAS compounds of interest should extend to additional PFAS compounds that are closely related structurally or toxicologically. Therefore, based on the structural similarity and data indicating a long serum half-life, MassDEP is drafting an updated ORS Guideline to include a sixth PFAS compound, Perflurodecanoic acid (PFDA).
9. MassDEP and the USEPA do not have standards established for PFAS in surface water.

Table 1B - Summary of Flintrock Pond PFAS Analytical Data in Sediment
Barnstable County Fire Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

SAMPLE ID	SED-1	SED-101	SED-2	SED-201	SED-3	SED-301	SED-4	SED-401	SED-5	SED-501	SED-6
LAB SAMPLE ID	IIN737	JHR500	IIN738	JHR501	IIN739	JHR502	IIN740	JHR503	IIN741	JHR504	IIN742
SAMPLE DATE	11/16/2018	3/27/2019	11/16/2018	3/27/2019	11/16/2018	3/27/2019	11/16/2018	3/27/2019	11/16/2018	3/27/2019	11/16/2018
UNITS	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Per- and polyfluoroalkyl substances (PFAS)											
Perfluorooctanesulfonic acid (PFOS)	12,000	13,000	90,000	67,000	170,000	150,000	49,000	78,000	120,000	72,000	280,000
Perfluoro-n-Octanoic Acid (PFOA)	(<500)	(<320)	(<2500)	(<800)	(<5000)	(<1600)	870	(<320)	(<2500)	(<1600)	(<5000)
Perfluoroheptanoic Acid (PFHpA)	480	(<360)	(<1900)	(<900)	4,400	(<1800)	630	(<360)	(<1900)	(<1800)	5,100
Perfluorohexane Sulfonate (PFHxS)	730	760	2,800	2,400	7,200	4,800	7,600	6,200	2,900	3,000	10,000
Perfluorononanoic Acid (PFNA)	620	390	3,100	2,300	8,600	3,500	1,100	3,900	3,100	2,500	11,000
Perfluorodecanoic acid (PFDA) [6]	(<560)	(<620)	(<2800)	(<1600)	6,100	(<3100)	1,400	(<620)	(<2800)	(<3100)	6,300
Total Sum of 5 Selected PFAs	13,830	14,150	95,900	71,700	196,300	158,300	60,600	88,100	126,000	77,500	312,400

Notes: (Applicable to all pages within table)

1. (<500) - Below Laboratory Detection Limitl shown in parentheses.
2. ng/kg - nanograms per kilograms (parts per trillion-ppt).
3. Field Duplicate - Duplicate Sediment Sample Collected at SED-2 and SED-501 location.
4. Field Duplicate and Rinsate Blank samples were collected as quality control samples as required by the PFAS Analytical Methods.
5. NR - Not Reported. Sediment samples collected in 2015 were collected by The Cape Cod Commission and the prior to June 2018, documentation of additional PFAS analytes (other than PFOS and PFOA) was not required.
6. The MassDEP Office of Research and Standards (ORS) conducted research in 2018 (ORS, 2018a) concluding that the PFAS compounds of interest should extend to additional PFAS compounds that are closely related structurally or toxicologically. Therefore, based on the structural similarity and data indicating a long serum half-life, MassDEP is drafting an updated ORS Guideline to include a sixth PFAS compound, Perfluorodecanoic acid (PFDA).
   This sixth PFAS compound, PFDA, is presented herein this table, but is not incuded in the Total Concentration Sum of PFAS.
7. There is no official or draft MassDEP standards for contaminants in sediments.

Table 1B - Summary of Flintrock Pond PFAS Analytical Data in Sediment
Barnstable County Fire Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

SAMPLE ID	Pond 1S	Pond 1D	Pond 2S	Pond 2D	Pond 3	Pond South	Pond North	Pond Delta
LAB SAMPLE ID	--	--	--	--	--	--	--	--
SAMPLE DATE	6/18/2015	6/18/2015	6/18/2015	6/18/2015	6/18/2015	3/24/2015	3/24/2015	3/24/2015
UNITS	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Per- and polyfluoroalkyl substances (PI								
Perfluorooctanesulfonic acid (PFOS)	19,000	23,000	11,000	34,000	9,000	1,100,000	1,000,000	41,000
Perfluoro-n-Octanoic Acid (PFOA)	200	200	BRL (<100)	400	BRL (<100)	BRL (<50,000)	BRL (<50000)	BRL (<10000)
Perfluoroheptanoic Acid (PFHpA)	NR	NR	NR	NR	NR	NR	NR	NR
Perfluorohexane Sulfonate (PFHxS)	NR	NR	NR	NR	NR	NR	NR	NR
Perfluorononanoic Acid (PFNA)	NR	NR	NR	NR	NR	NR	NR	NR
Perfluorodecanoic acid (PFDA) [6]	NR	NR	NR	NR	NR	NR	NR	NR
Total Sum of 5 Selected PFAs	19,200	23,200	11,000	34,400	9,000	1,100,000	1,000,000	41,000

Notes: (Applicable to all pages within table)

1. (<500) - Below Laboratory Detection Limitl shown in parentheses.
2. ng/kg - nanograms per kilograms (parts per trillion-ppt).
3. Field Duplicate - Duplicate Sediment Sample Collected at SED-2 and SED-501 location.
4. Field Duplicate and Rinsate Blank samples were collected as quality control samples as required by the PFAS Analytical Methods.
5. NR - Not Reported. Sediment samples collected in 2015 were collected by The Cape Cod Commission and the prior to June 2018, documentation of additional PFAS analytes (other than PFOS and PFOA) was not required.
6. The MassDEP Office of Research and Standards (ORS) conducted research in 2018 (ORS, 2018a) concluding that the PFAS compounds of interest should extend to additional PFAS compounds that are closely related structurally or toxicologically. Therefore, based on the structural similarity and data indicating a long serum half-life, MassDEP is drafting an updated ORS Guideline to include a sixth PFAS compound, Perfluorodecanoic acid (PFDA).
   This sixth PFAS compound, PFDA, is presented herein this table, but is not incuded in the Total Concentration Sum of PFAS.
7. There is no official or draft MassDEP standards for contaminants in sediments.

Table 1B - Summary of Flintrock Pond PFAS Analytical Data in Sediment
Barnstable County Fire Rescue Training Academy
155 South Flint Rock Road, Barnstable, MA
RTN 4-26179

SAMPLE ID	Field Duplicate[4]		Rinsate Blank[4]	
LAB SAMPLE ID	IIN746	JHR507	JHR506	IIN743
SAMPLE DATE	11/16/2018	3/27/2019	3/27/2019	11/16/2018
UNITS	ng/kg	ng/kg	ng/kg	ng/L
Per- and polyfluoroalkyl substances (PI				
Perfluorooctanesulfonic acid (PFOS)	110,000	89,000	(<5.2)	(<6.0)
Perfluoro-n-Octanoic Acid (PFOA)	(<2500)	(<800)	(<7.4)	(<8.7)
Perfluoroheptanoic Acid (PFHpA)	(<1900)	(<900)	(<7.1)	(<7.4)
Perfluorohexane Sulfonate (PFHxS)	2,700	4,100	(<5.2)	(<5.6)
Perfluorononanoic Acid (PFNA)	4,100	3,400	(<4.9)	(<3.3)
Perfluorodecanoic acid (PFDA) [6]	(<2800)	(<1600)	(<4.1)	(<6.1)
Total Sum of 5 Selected PFAs	116,800	96,500	ND	ND

Notes: (Applicable to all pages within table)

1. (<500) - Below Laboratory Detection Limitl shown in parentheses.
2. ng/kg - nanograms per kilograms (parts per trillion-ppt).
3. Field Duplicate - Duplicate Sediment Sample Collected at SED-2 and SED-501 location.
4. Field Duplicate and Rinsate Blank samples were collected as quality control samples as required by the PFAS Analytical Methods.
5. NR - Not Reported. Sediment samples collected in 2015 were collected by The Cape Cod Commission and the prior to June 2018, documentation of additional PFAS analytes (other than PFOS and PFOA) was not required.
6. The MassDEP Office of Research and Standards (ORS) conducted research in 2018 (ORS, 2018a) concluding that the PFAS compounds of interest should extend to additional PFAS compounds that are closely related structurally or toxicologically. Therefore, based on the structural similarity and data indicating a long serum half-life, MassDEP is drafting an updated ORS Guideline to include a sixth PFAS compound, Perfluorodecanoic acid (PFDA).
   This sixth PFAS compound, PFDA, is presented herein this table, but is not incuded in the Total Concentration Sum of PFAS.
7. There is no official or draft MassDEP standards for contaminants in sediments.

Table 2A - 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)
MassDEP ORS Guidline[2]	70 ng/L						70 ng/L						70 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]
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]	650	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 09/29/18.																		
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 associated piping.																		
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)

Notes: 3831

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 2B - 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)

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 3A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - 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]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
4/9/2018	CE	No	75	NA	NA	NA	75	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	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	2	--	--	--	--	--	0.001	Yes	No	PRW-4 well pump is operating at high level, high level float is not triggering pump to shut off. CS turned off PRW-4 manually at 1243 and restarted at 14:32. Carbon vessels were backwashed individually from 1313 to 1427.
4/12/2018	CE	Yes	NA	NA	NA	NA	75	75	2.78	44.0	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	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	7	--	--	--	--	--	0.005	Yes	No	Pressure differential at 8 psi, no bags change. PRW-4 well high level float not triggering pump to shut off. Changed 3 bag filters (5 µm) and conducted system pressure checks.
4/19/2018	CE	Yes	83		NA	NA	75		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	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	14	--	--	--	--	--	0.009	Yes	No	High level float not triggering PRW-4 to shut down. Sean (B&B Electric) on site to inspect high float electrical issues. PRW-4 shut off at 13:40 to inspect control panel, 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	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	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	17	--	--	--	--	--	0.010	Yes	No	Pressure differential of 7 psi, no bag filter change, transfer pump is maintaining flow ahead of the PRW-4 well pump. While both the system transfer pump and PRW-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	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	21.00	--	--	--	--	--	0.012	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks.
Totals - April 2018										41.3	21.00						0.014			
5/1/2018	CS	Yes	83		NA	NA	75		3.83	32.0	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 ~
5/2/2018	CS	Yes	94	75	NA	NA	80	75	3.63	33.7	1.00	--	--	--	--	--	0.0006	Yes	No	Changed 3 bag filters (5 µm) and conducted system pressure checks. Conducted a backwash on both carbon vessels, PRW-4 well pump would not shut off, float 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	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	6.00	--	--	--	--	--	0.0034	Yes	No	Changed 3 bag filters (5 um) and conducted system pressure checks.
Totals - May 2018										33.1	8.00						0.004			
6/5/2018	CE/MM	No	--	--	NR	NR	NR	NR	--	--	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	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	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	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	7	--	--	--	--	--	0.004	Yes	No	No bag change, conducted system pressure checks.
6/13/2018	CE	Yes	58	54	NR	NR	NR	NR	3.46	35.4	8	--	--	--	--	--	0.005	Yes	No	Changed 3 bag filters.
6/13/2018	MM	Yes	--	--	NR	NR	NR	NR	--	--	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	NR	NR	NR	--	--	11	--	--	--	--	--	--	--	No	Changed 3 bag filters.
6/19/2018	CE	Yes	92	65	NR	NR	NR	NR	--	--	14	--	--	--	--	--	--	No	No	Changed 3 bag filters and repaired holding basket for bags. Recovery well was not running, went out to the well and checked power, turned power to well on/off and 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	15	--	--	--	--	--	0.008	Yes	No	No bag change, conducted system pressure checks.
6/21/2018	CE	Yes	79	60	NR	NR	NR	NR	--		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	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	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	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	24	--	--	--	--	--	0.014	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - June 2018										33.9	24						0.013			
7/2/2018	CE	Yes	83	69	NR	NR	NR	NR	3.95	31.0	2	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/5/2018	CE	No	--	--	NR	NR	NR	NR	--	--	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	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	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	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	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	15	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/18/2018	CE	No	--	--	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	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	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	--	--	--	--	--	--	--	--	--	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	21	--	--	--	--	--	0.009	Yes	No	Changed 3 bag filters, conducted system pressure checks.
7/25/2018	CE	Yes	84	72	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	Yes	No	Collected system pressure checks.
7/26/2018	CE	Yes	80	72	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	Yes	No	Collected system pressure checks.
7/27/2018	CE	Yes	88	72	NR	NR	NR	NR	4.8	25.5	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	28	--	--	--	--	--	0.011	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - July 2018										29.6	28						0.015			
8/2/2018	CE	Yes	89	70	NR	NR	NR	NR	5.17	23.7	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	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	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	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	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	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	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	27	--	--	--	--	--	0.011	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - August 2018										24.1	30						0.014			

Table 3A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - 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]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
9/4/2018	CE	Yes	89	67	NR	NR	NR	NR	5.87	20.9	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	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	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	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	18	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/21/2018	CE	No	74	70	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	No	No	Recovery well down.
9/24/2018	CE	Yes	94	70	NR	NR	NR	NR	8.03	15.3	23	--	--	--	--	--	0.010	Yes	No	Changed 3 bag filters, conducted system pressure checks.
9/28/2018	CE	Yes	--	--	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	--	--	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	28						0.010			
10/1/2018	CE	No	78	57	NR	NR	NR	NR	5.83	21.0	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	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	10	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
10/12/2018	CE	Yes	60	55	NR	NR	NR	NR	--	--	12	--	--	--	--	--	--	Yes	No	No bag change necessary.
10/15/2018	CE	Yes	70	60	NR	NR	NR	NR	6.9	17.8	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	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	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	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	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	31						0.011			
11/2/2018	CE	Yes	71	62	NR	NR	NR	NR	7.86	15.6	2	--	--	--	--	--	0.001	Yes	No	Changed 3 bag filters, conducted system pressure checks.
11/6/2018	CE	Yes	71	62	NR	NR	NR	NR	--	--	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	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	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	10	--	--	--	--	--	0.007	Yes	No	Conducted system pressure checks.
11/13/2018	CE	Yes	52	47	NR	NR	NR	NR	4.88	25.1	11	--	--	--	--	--	0.007	Yes	No	Conducted system pressure checks.
11/14/2018	CE	Yes	54	47	NR	NR	NR	NR	4.92	24.9	12	--	--	--	--	--	0.008	Yes	No	Conducted system pressure checks.
11/15/2018	CE	Yes	55	47	NR	NR	NR	NR	--	--	13	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
11/16/2018	CE	Yes	54	50	NR	NR	NR	NR	4.63	26.5	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	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	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	28	--	--	--	--	--	0.016	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - November 2018										23.0	28						0.012			
12/3/2018	CE	Yes	63	62	NR	NR	NR	NR	5.33	23.0	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	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	11	--	--	--	--	--	0.003	Yes	No	Changed 3 bag filters, conducted system pressure checks.
12/14/2018	CE	Yes	70	63	NR	NR	NR	NR	5.4	22.7	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	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	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	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	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	31	--	--	--	--	--	0.007	Yes	No	Changed 3 bag filters, conducted system pressure checks.
Totals - December 2018										19.5	31						0.008			
1/4/2019	RPT	Yes	72	72	NR	NR	NR	NR	6.5	18.8	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	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	10	--	--	--	--	--	0.003	Yes	No	Conducted system pressure checks.
1/11/2018	MDM	Yes	79	71	NR	NR	NR	NR	7.62	16.1	11	--	--	--	--	--	0.003	Yes	Yes	Change 3 bag filters, conducted system pressure checks.
1/14/2019	PCB	Yes	76	71	NR	NR	NR	NR	--	--	14	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
1/15/2019	PCB	Yes	80	71	NR	NR	NR	NR	--	--	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	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	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	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	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	30	--	--	--	--	--	0.007	Yes	No	Change 3 bag filters, conducted system pressure checks.
1/31/2019	PCB	Yes	83	71	NR	NR	NR	NR	--	--	31	--	--	--	--	--	--	Yes	No	Change 3 bag filters, conducted system pressure checks.
Totals - January 2019										14.5	31						0.008			
2/4/2019	RPT	Yes	--	--	NR	NR	NR	NR	--	--	--	--	--	--	--	--	--	--	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	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	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	12	--	--	--	--	--	--	Yes	No	Changed 3 bag filters, conducted system checks.
2/15/2019	MDM	Yes	--	--	NR	NR	NR	NR	7.5	16.3	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	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	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	26		132.7				0.011	Yes	No	
3/1/2019	ST	Yes	43	40	NR	NR	NR	NR	7.55	16.2	1	--	76.6	--	--	--	0.001	Yes	No	Conducted system pressure checks.
3/3/2019	ST	Yes	45	40	NR	NR	NR	NR	--	--	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	--	--	5	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
3/7/2019	PCB/ST	Yes	50	40	NR	NR	NR	NR	8.16	15.0	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	9	--	--	--	--	--	0.005	Yes	No	Changed bag filters.
3/11/2019	ST	Yes	58	50	NR	NR	NR	NR	7.92	15.5	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	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	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	--	--	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	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	--	--	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	--	--	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	25		63.2				0.022			

Table 3A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - 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)		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	6" Influent Tank Fill Rate (min)	Combined Instantaneous Estimated Influent Flow Rate (GPM)[2]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
4/1/2019	ST	Yes	--	--	40	28	40	39	2.25	54.4	1	--	--	--	--	--	0.002	Yes	No	Conducted system pressure checks and changed bag filters.
4/3/2019	ST	Yes	--	--	40	39	--	--	--	--	3	--	--	--	--	--	--	Yes	No	Conducted system pressure checks.
4/6/2019	ST	Yes	--	--	50	41	50	50	2.23	54.9	6	--	--	--	--	--	0.014	Yes	No	Conducted system pressure checks and changed bag filters.
4/9/2019	GWTT	Yes	--	--	40	50	--	--	1.6	76.6	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	--	--	10	--	--	--	--	--	--	Yes	No	Conducted system pressure checks and changed bag filters.
4/11/2019	ST	Yes	--	--	40	35	35	35	--	--	11	--	--	--	--	--	--	Yes	No	Conducted system pressure checks and changed bag filters.
4/12/2019	GWTT	Yes	--	--	50	40	44	46	3	40.8	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	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	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	23	--	33.4	--	--	--	0.029	Yes	No	Conducted system pressure checks and changed bag filters.
4/26/2019	GWTT	Yes	--	--	58	50	55	60	--	--	26	--	20.3	--	--	--	--	Yes	No	Conducted system pressure checks and changed bag filters, conducted general housekeeping duties.
4/30/2019	GWTT	No	--	--	--	--	--	--	--	--	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	29		24.2				0.058			
5/3/2019	GWTT	Yes	--	--	55	35	45	50	2.18	56.2	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	7	--	31.57	--	--	--	0.007	Yes	No	Conducted system pressure checks and changed bag filters.
5/10/2019	GWTT	No	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	System down as a result of failed VFD for transfer pump operation, changed bag filters.
5/17/2019	GWTT	No	--	--	55	38	--	--	--	--	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	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. Electrican 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	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	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	24	--	36.90	--	--	--	0.022	Yes	No	Conducted system pressure checks and changed bag filters, 3" butterfly valve on INF of LGACS #2 replaced. Installed a 3 inch flow totalizer and meter
Totals - May 2019										57.4	24		35.4				0.023			
6/4/2019	GWTT	Yes	--	--	57	48	57	62	2.46	49.8	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	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	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	--	--	--	--	--	--	--	--	11	--	--	--	--	--	--	No	No	System off for carbon change out.
6/14/2019	GWTT	No	--	--	--	--	25	28	2.3	53.3	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	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	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	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	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	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	27		62.4		NR[11]		0.068			
7/2/2019	GWTT	Yes	--	--	32	20	30	32	2.52	48.6	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	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	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
7/12/2019	GWTT	Yes	--	--	39	35	39	43	2.42	50.6	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	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	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	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	--	--	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	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	31		45.1		NR[11]		0.079			
8/2/2019	GWTT	Yes	--	--	15	5	18	9	2.68	50.6	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	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	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	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	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	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	--	--	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	--	--	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	--	--	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	31		NR[11]		252580	6.5	0.113			
9/3/2019	GWTT	Yes	--	--	18	7	10	14	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	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	10	--	NR	1203690	159500	27.7	0.008	Yes	No	
9/13/2019	GWTT	Yes	--	--	40	25	40	42	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	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	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	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	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]										NA[7]	30		NR[11]		601350	17.4	0.015			

Table 3A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - 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]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
10/1/2019	GWTT	Yes	--	--	50	28	18	19	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	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	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	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	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	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	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	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	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]										NA[7]	30		NR[11]		503480	11.7	0.008			
11/1/2019	GWTT	Yes	--	--	15	2	19	19	5.00	24.5	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	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	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	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	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	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	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	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	28	39	NR	2601976	115318	20.0	0.0141	Yes	No	Conducted system checks, changed bag filters.
Totals - November 2019[12]										30.1	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	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	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	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	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	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	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	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	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	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]										54.2	27		39.0		858169	22.1	0.006			
1/3/2020	GWTT	Yes	--	--	18	8	14	15	2.37	51.8	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	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	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	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	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	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	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	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	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]										33.2	30.9		38.8		812230	18.3	0.009			

Table 3A- Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - 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]		Instant. Effluent Flow Rate (GPM)[8]	Instantaneous Effluent Flow Rate (GPM)[2,9]	Totalizer (Gal)	Total Gallons Treated	Average Effluent Flow Rate (GPM)[10]				
2/4/2020	GWTT	Yes	--	--	28	22	26	30	8.00	15.3	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	--	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	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	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	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	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	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	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	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	29		41.6		350738	8.4	0.004			

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 Influent flow rate represents the combined flow within both force main pipes from recovery well PRW-4.
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.

Table 3B - Summary of Groundwater Pump and Treatment System Operating and Maintenance Data - System No. 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]	Total 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]			19										23.11		33	232250	8.49	0.0040			
12/2/2019	BETA	Yes	2		--	--	--	--	--	--	--	--	--	686500	--	37350.0	13.0	--	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	0.069	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	7.349	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	24.4	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	22.7	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	24.4	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	17.3	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	14.0	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	0.1	0.00003	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	19.3	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]			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	23.5	0.00101	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.
1/27/2020	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]			31										15.46		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]			29										11.44		47	206245	4.9	0.003			

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.
4. 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.

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	HSW-6/HS-2(a)										HSW-1/HS-1(a)										
SAMPLING DATE				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	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
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 (ng/L)	70	70	20	77,000	320,000	41,000	28,000	21,000	45,000	25,000	950	1,300	3,600	110,000	56,000	38,000	24,000	25,000	13,000	1,800	2,000	1,100	1,800	740
PFOA (ng/L)	70	70	20	--	--	--	660	--	320	160	15	94	79	--	--	1,000	350	1,300	320	840	100	64	46	36
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	BRL (<87)	26	46	--	--	--	--	--	--	43	65	43	33	22
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	26	140	310	--	--	--	--	--	--	1,700	300	170	150	66
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	15	66	100	--	--	--	--	--	--	510	67	52	43	32
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	--	--	--	--	30	--	--	--	--	--	--	--	55	19	13	9.1
TOTAL Σ6 PFAS	70	70	20	77,000	320,000	41,000	28,660	21,000	45,320	25,160	1,006	1,626	4,165	110,000	56,000	39,000	24,350	26,300	13,320	4,893	2,587	1,448	2,085	905

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	HS-1 [13]		HS-6 [13]	HS-2 [13]	HS-2S [13]		PFW-1												
SAMPLING DATE				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
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 (ng/L)	70	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
PFOA (ng/L)	70	70	20	460	1,800	450	370	BRL (<5.3)	8	360	800	--	--	--	--	470	1,500	160	300	560	130	220
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	--	--	--	3,900	330	360	210	570	230
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	--	--	--	7,400	960	1,500	4,800	910	1,000
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	--	--	--	610	140	290	500	150	200
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	110	160	120	200
TOTAL 6 PFAS	70	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

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PFW-2													PFW-3			PFW-4
SAMPLING DATE				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	4/1/2015	10/15/2015	4/18/2017	4/1/2015
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 (ng/L)	70	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	2,700	3,800	3,400	3,300
PFOA (ng/L)	70	70	20	5200	BRL (<800)	--	1,100	2,100	--	--	970	910	400	400	720	74	140	170	230	420
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	--	110	64	--	--	--	--
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	--	1,800	230	--	--	--	--
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	--	470	68	--	--	--	--
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	27	--	--	--	--
TOTAL Σ6 PFAS	70	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	2,536	2,840	3,970	3,630	3,720

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

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 was 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-exacavation activities.

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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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PFW-5							PFW-6				PRW-1	PRW-4 [3]						
SAMPLING DATE				3/31/2015	4/11/2017	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18/2020	4/1/2015	3/8/2016	4/18/2016	1/9/2019	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
PFAS (Method 537.2)																						
PFOS (ng/L)	70	70	20	2,700	2,100	1,100	1,900	1,600	2,400	1,000	3,400	2,400	850	1,500	1,600	760	5,900	9,000	7,600	6,300	9,500	5,400
PFOA (ng/L)	70	70	20	250	170	64	150	120	26	88	350	470	19	400	150	60	550	BRL (<2000)	260	BRL (<200)	210	99
PFNA (ng/L)	NE	70	20	--	--	BRL (<8.7)	25	16	BRL (<4.9)	11	--	--	--	140	--	--	--	--	--	--	--	--
PFHxS (ng/L)	NE	70	20	--	--	240	680	630	260	360	--	--	--	1,100	--	--	--	--	--	--	--	--
PFHpA (ng/L)	NE	70	20	--	--	30	82	54	22	56	--	--	--	220	--	--	--	--	--	--	--	--
PFDA (ng/L)	NE	NE	20	--	--	--	12	11	BRL (<4.1)	10	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL 6 PFAS	70	70	20	2,950	2,270	1,434	2,849	2,431	2,708	1,525	3,750	2,870	869	3,360	1,750	820	6,450	9,000	7,860	6,300	9,710	5,499

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.

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8. PFOS - Perfluorooctanesulfonate

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13. PFDA - Perfluorodecanoic Acid

14. NA - Concentration data not available

15. Monitoring well HS-1 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PRW-4 [3]							PC-0		PC-1											
SAMPLING DATE				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
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 (ng/L)	70	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
PFOA (ng/L)	70	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
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	140	62	150	140	75	70
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	850	380	650	430	380	450
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	200	200	180	230	150	240
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	--	--											78	67	19	20
TOTAL 6 PFAS	70	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

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PC-2		PC-3		PC-4		PC-6A								PC-7				
SAMPLING DATE				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	4/2/2015	6/17/2015	10/7/2015	3/8/2016	4/27/2017
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
PFAS (Method 537.2)																						
PFOS (ng/L)	70	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	17,000	500	700	1,700	2,900
PFOA (ng/L)	70	70	20	220	110	180	200	79	160	110	150	60	30	68	33	62	67	3,500	27	98	140	130
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	55	25	60	36	48	65	--	--	--	--	--
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	300	190	310	150	290	180	--	--	--	--	--
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	75	37	83	45	86	71	--	--	--	--	--
PFDA (ng/L)	NE	NE	20											10	BRL (<4.1)	7.4	5.9					
TOTAL 6 PFAS	70	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	20,500	527	798	1,840	3,030

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PC-8					PC-9							PC-10		PC-11									
SAMPLING DATE				6/17/2015	10/7/2015	3/8/2016	4/24/2017	2/6/2018	4/1/2015	10/7/2015	3/9/2016	3/30/2016	4/28/2017	1/10/2019	10/30/2019	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
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 (ng/L)	70	70	20	15,000	500	1,600	36,000	1,000	580	510	5,300	8,100	280	1,700	2,300	790	560	4,400	32,000	3,600	4,000	9,600	14,000	200,000	68,000	22,000	18,000
PFOA (ng/L)	70	70	20	2,800	370	97	--	71	30	40	1,200	1,600	31	64	100	50	67	550	430	250	180	250	410	640	BRL (<240)	150	290
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	53	90	--	--	--	--	--	--	230	190	1,700	540	320	140
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	360	420	--	--	--	--	--	--	1,500	1,500	2,400	1,200	800	1,300
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	81	120	--	--	--	--	--	--	200	310	210	BRL (<210)	160	210
PFDA (ng/L)	NE	NE	20		--	--	--	--	--	--	--	--	--	--	15	--	--	--	--	--	--	--	--	450	BRL (<260)	73	69
TOTAL 6 PFAS	70	70	20	17800	870	1697	36000	1071	610	550	6500	9700	311	2258	3,030	840	627	4950	32430	3850	4180	11,780	16,410	204,950	69,740	23,503	20,009

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PC-12			PC-13		PC-14			PC-15			PC-16d								
SAMPLING DATE				6/17/2015	5/12/2016	4/26/2017	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
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
PFAS (Method 537.2)																							
PFOS (ng/L)	70	70	20	1,300	1,700	1,600	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
PFOA (ng/L)	70	70	20	140	150	150	280	170	40	250	160	100	80	55	70	84	64	150	9.3	140	33	75	130
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	52	--	--	--	100	BRL (<8.7)	110	36	79	110
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	290	--	--	--	670	60	520	270	220	360
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	77	--	--	--	170	13	140	74	80	92
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	--	--	--	--	--	4.9	--	--	--	--	--	9	BRL (<4.1)	7	7.2
TOTAL 6 PFAS	70	70	20	1440	1850	1750	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

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PC-17			PC-18						PC-19				PC-20D	PC-21D	PC-22	
SAMPLING DATE				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	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 (ng/L)	70	70	20	140	230	140	1,200	900	580	890	1,500	1,500	3,300	1,600	2,000	1,900	3,200	230	1,200	1,400
PFOA (ng/L)	70	70	20	BRL	24	17	110	590	--	70	110	75	260	120	290	170	200	19	100	170
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	130	79	--	--	--	130	--	--	--	--
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	540	220	--	--	--	450	--	--	--	--
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	140	80	--	--	--	95	--	--	--	--
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	--	--	--	7.2	--	--	--	14	--	--	--	--
TOTAL Σ6 PFAS	70	70	20	140	254	157	1310	1490	580	960	2420	1,954	3560	1720	2290	2745	3,400	249	1300	1,570

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.

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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 was 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-exacavation activities.

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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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PC-23D	PC-24		PC-25	PC-26				PC-28							PC-29
SAMPLING DATE				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	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
PFAS (Method 537.2)																			
PFOS (ng/L)	70	70	20	1,000	420	320	2,300	1,000	1,900	1,200	380	400	770	38	18	82	270	270	1,400
PFOA (ng/L)	70	70	20	73	22	33	260	210	190	98	21	27	61	BRL (<3.3)	BRL (<7.4)	190	12	BRL (<7.4)	BRL (<4.6)
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	BRL(<8.7)	BRL (<4.9)	BRL (<4.9)	9	BRL (<4.9)	--
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	17	15	30	94	72	--
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	20	24	25	33	23	--
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	--	--	--	--	--	--	BRL (<4.1)	BRL (<4.1)	BRL (<4.1)	BRL (<(4.1)	--
TOTAL 6 PFAS	70	70	20	1073	442	353	2,560	1,210	2,090	1,298	401	427	831	75	57	327	418	365	1400

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.

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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.

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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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PC-30										PC-31		PC-32		PC-33		PC-34S	PC-34D	
SAMPLING DATE				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		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
PFAS (Method 537.2)																						
PFOS (ng/L)	70	70	20	980	2,500	1,900	1,600	2,200	1,200	4,300	960	1,200		1,200	12,000	1,200	960	2,700	2,100	1,300	1,400	1,500
PFOA (ng/L)	70	70	20	88	--	98	99	85	85	79	55	130		110	160	130	54	250	210	72	150	130
PFNA (ng/L)	NE	70	20	--	--	--	80	88	100	100	61	74		--	--	--	--	--	--	--	--	--
PFHxS (ng/L)	NE	70	20	--	--	--	510	390	340	300	220	210		--	--	--	--	--	--	--	--	--
PFHpA (ng/L)	NE	70	20	--	--	--	130	110	110	96	71	87		--	--	--	--	--	--	--	--	--
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	12	BRL (<4.1)	6	5.9		--	--	--	--	--	--	--	--	--
TOTAL 6 PFAS	70	70	20	1068	2500	1998	2,419	2,873	1,847	4,875	1,373	1,707		1310	12160	1330	1014	2950	2310	1372	1550	1630

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	PC-35S	PC-35D		PC-36S			PC-36D		PC-37	PC-38		PC-39		MW-1			MW-3S	
SAMPLING DATE				4/14/2016	4/14/2016	4/28/2017	4/14/2016	1/11/2019	10/29/2019	4/14/2016	4/24/2017	4/10/2017	4/24/2017	10/29/2019	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
PFAS (Method 537.2)																					
PFOS (ng/L)	70	70	20	1,700	2,000	1,700	35	64	1,200	3,100	2,500	45	BRL (<2.6)	BRL (<5.2)	1,200	820	3,900	4,400	2,600	4,900	1,900
PFOA (ng/L)	70	70	20	130	140	97	BRL (<5.3)	BRL (<3.3)	54	150	120	BRL (<20)	BRL (<4.6)	BRL (<7.4)	46	28	320	880	290	530	690
PFNA (ng/L)	NE	70	20	--	--	--	--	BRL (<8.7)	80	--	--	--	--	BRL (<4.9)	--	61	--	--	--	--	--
PFHxS (ng/L)	NE	70	20	--	--	--	--	38	120	--	--	--	--	6.1	--	100	--	--	--	--	--
PFHpA (ng/L)	NE	70	20	--	--	--	--	BRL (<7.4)	62	--	--	--	--	BRL (<7.1)	--	28	--	--	--	--	--
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	11	--	--	--	--	BRL (<4.1)	--	BRL (<4.1)	--	--	--	--	--
TOTAL 6 PFAS	70	70	20	1830	2140	1797	35	102	1,516	3250	2620	45	BRL	6.1	1,246	1,037	4,220	5,280	2,890	5,430	2,590

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [3,4]	MW-3D	SBV-3	MW-6		MW-7	MW-10		MW-12i	MW-12								MW-15	MW-15D	MW-19i
SAMPLING DATE				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	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
PFAS (Method 537.2)																						
PFOS (ng/L)	70	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	19	60	BRL
PFOA (ng/L)	70	70	20	10	350	510	140	580	670	440	36	400	470	280	650	920	250	380	580	27	60	BRL
PFNA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	56	64	92	87	80	78	--	--	--
PFHxS (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	1,200	1,500	1,700	880	1,300	1,200	--	--	--
PFHpA (ng/L)	NE	70	20	--	--	--	--	--	--	--	--	--	--	130	490	440	170	310	390	--	--	--
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	--	--	--	--	--	--	--	16	11	10	7.5	--	--	--
TOTAL 6 PFAS	70	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	46	120	BRL

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	MW-22								MW-28S	MW-30	MW-31	MW-32	MW-35i				MW-36D	MW-37	MW-37D	MW-99i		
SAMPLING DATE				6/3/2014	4/1/2015	6/26/2018	1/11/2019	4/23/2019	7/23/2019	10/29/2019	2/19/2020	4/1/2015	4/1/2015	8/18/2016	5/3/2017	8/20/2014	5/3/2017	1/10/2019	10/30/2019	4/6/2015	4/26/2017	4/2/2015	4/6/2015	4/26/2017	10/29/2019
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
PFAS (Method 537.2)																									
PFOS (ng/L)	70	70	20	4,900	600	320	350	320	410	510	460	2,100	1,400	3,200	240	60	42	BRL (<6)	BRL (<5.2)	140	77	60	730	240	630
PFOA (ng/L)	70	70	20	530	90	30	140	160	190	150	230	90	130	170	36	BRL	14	BRL (<3.3)	BRL (<7.4)	<20	77	90	70	18	50
PFNA (ng/L)	NE	70	20	--	--	9	BRL (<8.7)	81	8	8	5.0	--	--	--	--	--	--	BRL (<8.7)	BRL (<4.9)	--	--	--	--	--	58
PFHxS (ng/L)	NE	70	20	--	--	130	680	600	520	690	540	--	--	--	--	--	--	BRL (<5.6)	6.0	--	--	--	--	--	340
PFHpA (ng/L)	NE	70	20	--	--	13	69	49	33	61	38	--	--	--	--	--	--	BRL (<7.4)	BRL (<7.1)	--	--	--	--	--	46
PFDA (ng/L)	NE	NE	20	--	--	--	--	BRL (<4.1)	BRL (<4.1)	BRL (<4.1)	BRL (<4.1)	--	--	--	--	--	--	--	BRL (<4.1)	--	--	--	--	--	5.5
TOTAL Σ6 PFAS	70	70	20	5,430	690	502	1,239	1,210	1,161	1,419	1,273	2,190	1,530	3,370	276	60	56	BRL	6.0	140	154	150	800	258	1,130

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

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 was 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-exacavation activities.

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

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] Health Advisory	MassDEP ORS Guideline	Method 1 GW-1 Standards [4]	OW-8A										FS-1SA	FS-1	RW-1		HW-1D [14]			HW-2S	OW-2A	OW-2S	OW-2D
SAMPLING DATE				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	6/16/2016	4/11/2017	4/1/2015	4/11/2017	5/3/2017	1/10/2019	10/28/2019	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
PFAS (Method 537.2)																								
PFOS (ng/L)	70	70	20	2,700	8,600	1,700	770	2,800	990	880	780	220	650	1,700	1,700	2,300	1,000	25	BRL (<6)	BRL (<5.2)	15	1,300	2,400	6
PFOA (ng/L)	70	70	20	430	1,000	2,000	120	65	420	66	55	130	62	550	730	240	58	8	BRL (<3.3)	BRL (<7.4)	8.2	150	250	BRL (<5.3)
PFNA (ng/L)	NE	70	20	--	--	--	--	310	150	120	78	10	110	--	--	--	--	--	BRL (<8.7)	BRL (<4.9)	--	--	--	--
PFHxS (ng/L)	NE	70	20	--	--	--	--	250	890	140	100	750	190	--	--	--	--	--	BRL (<5.6)	BRL (<5.2)	--	--	--	--
PFHpA (ng/L)	NE	70	20	--	--	--	--	43	210	40	26	190	35	--	--	--	--	--	BRL (<7.4)	BRL (<7.1)	--	--	--	--
PFDA (ng/L)	NE	NE	20	--	--	--	--	--	--	15	18	14	17	--	--	--	--	--	--	BRL (<4.1)	--	--	--	--
TOTAL 6 PFAS	70	70	20	3,130	9,600	3,700	890	3,468	2,660	1,261	1,057	1,314	1,064	2,250	2,430	2,540	1,058	33	BRL	BRL	23.2	1,450	2,650	6

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

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8. PFOS - Perfluorooctanesulfonate

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10. PFNA - Perfluorononanoic Acid

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13. PFDA - Perfluorodecanoic Acid

14. NA - Concentration data not available

15. Monitoring well HS-1 was 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-exacavation activities.

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

Table 5 - Groundwater Elevation and Gauging Data 2018-2019
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)						Groundwater Elevation (Feet)					
			Date						Date					
			6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18-19/2020	6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18-19/2020
FS-1sa2 (surveyed in 2018)	Academy	41.839	--	12.45	10.96	11.78	--	11.56	--	29.389	30.879	30.059	--	30.279
FS-1sA	Academy	41.769	--	--	--	--	--	--	--	--	--	--	--	--
FS-1sC	Academy	41.915	--	--	--	--	--	--	--	--	--	--	--	--
HSW-1/HS-1(a)	Academy	40.012	--	9.62	8.78	8.02	11.67	9.45	--	30.392	31.232	31.992	28.342	30.562
HSW-6/HS-2(a)	Academy	39.305	9.37	10.39	8.02	8.02	10.76	8.74	29.935	28.915	31.285	31.285	28.545	30.565
OW-2D	Academy	37.36	--	7.91	6.39	6.39	8.76	7.00	--	29.45	30.97	30.97	28.6	30.36
OW-2S	Academy	37.532	--	8.33	6.22	7.93	9.59	7.65	--	29.202	31.312	29.602	27.942	29.882
OW-4	Not Located	NS	--	--	--	--	--	--	--	--	--	--	--	--
OW-8A	Academy	42.471	12.33	12.21	11.75	12.59	14.37	12.4	30.141	30.261	30.721	29.881	28.101	30.071
OW-8i	Academy	42.579	--	--	--	--	--	--	--	--	--	--	--	--
PFW-1	Academy	41.83	11.67	12.53	11.02	11.83	13.78	11.65	30.16	29.3	30.81	30	28.05	30.18
PFW-2	Academy	40.019	--	10.44	8.95	9.72	11.53	9.6	--	29.579	31.069	30.299	28.489	30.419
PFW-3	Academy	37.832	--	8.2	6.67	7.5	9.29	7.32	--	29.632	31.162	30.332	28.542	30.512
PFW-4	Academy	39.344	--	9.78	8.21	9.07	10.98	8.84	--	29.564	31.134	30.274	28.364	30.504
PFW-5	Academy	42.017	--	12.38	11.29	11.79	13.56	11.55	--	29.637	30.727	30.227	28.457	30.467
PFW-6	Academy	40.577	--	11.23	9.75	10.59	--	10.4	--	29.347	30.827	29.987	--	30.177
MW-1	Adjacent Academy	42.584	--	--	12.06	12.54	14.46	12.35	--	--	20.79	30.044	28.124	30.234
MW-2	Adjacent Academy	42.72	--	--	--	--	14.79	12.7	--	--	--	--	27.93	30.02
MW-3D	Adjacent Academy	43.654	--	--	--	--	--	--	--	--	--	--	--	--
MW-3i	Adjacent Academy	43.823	--	13.8	12.31	13.14	15.04	--	--	29.24	30.73	29.9	28.783	--
MW-3S	Adjacent Academy -SE	43.535	--	13.64	12.17	12.99	14.89	12.8	--	29.22	30.75	29.93	28.645	30.735
MW-6	Adjacent Academy -SE	41.432	--	--	--	--	13.58	11.4	--	--	--	--	27.852	30.032
MW-7	Adjacent Academy -SE	43.126	--	--	12.8	13.6	15.59	13.42	--	--	30.326	27.536	27.536	29.706
MW-8	Adjacent Academy -SE	48.721	--	--	13.46	14.28	16.22	--	--	--	35.261	34.441	32.501	--
MW-8C	Adjacent Academy -SE	43.992	--	--	--	--	--	14.1	--	--	--	--	--	--
MW-9D	Adjacent Academy -SE	45.079	--	--	14.21	--	17.08	14.9	--	--	30.869	--	27.999	30.179
MW-9S	Adjacent Academy -SE	44.629	--	--	--	--	--	--	--	--	--	--	--	--
MW-10	Adjacent Academy	44.212	--	14.85	13.43	14.26	16.23	14.06	--	29.362	30.782	29.952	27.982	30.152
MW-11	Adjacent Academy/Dest	NS	--	--	--	--	15.5	--	--	--	--	--	--	--
MW-12s	DG -E	43.421	14.62	14.76	13.3	14.29	16.1	13.94	28.801	28.661	30.121	29.131	27.321	29.481
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	NA	--	--	--	--	--	--	--	--	--	--	--	--
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	29.16	28.4	29.96	29.06	27.11	29.33
MW-23	DG-NE	49.491	--	--	--	--	--		--	--	--	--	--	--
MW-27	DG-NE	41.909	--	--	--	--	--	--	--	--	--	--	--	--
MW-28S	DG- NE	41.413	--	--	--	--	12.95	10.9	--	--	--	--	28.463	30.513
MW-28D	DG- NE	41.175	--	--	--	--	--	--	--	--	--	--	--	--
MW-32	DG- NE	41.984	--	--	--	--	--	--	--	--	--	--	--	--
MW-33	DG- NE	52.612	--	--	--	--	--	--	--	--	--	--	--	--
MW-35i	DG- NE	52.265	--	27.32	--	--	29.08	--	--	24.945	--	--	23.185	--
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	28.43	27.76	29.21	28.35	26.23	28.57
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	59.467	31.05	31.52	30.13	31	33.2	30.89	28.417	27.947	29.337	28.467	26.267	28.577
PC-7	DG- Far east	57.612	--	--	--	--	--	--	--	--	--	--	--	--
PC-8	DG- Far east	56.881	--	--	--	--	--	--	--	--	--	--	--	--
PC-9	DG- Far east /fair conditi	43.278	--	17.3	--	--	19.1	--	--	25.978	--	--	24.178	--
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	28.265	27.815	29.165	26.165	27.25	27.7
PC-12	DG- Far east	54.676	--	--	--	--	--	--	--	--	--	--	--	--
PC-13	DG- Far east	49.386	--	--	--	--	--	--	--	--	--	--	--	--
PC-14	DG- Far east	48.022	--	--	--	--	--	--	--	--	--	--	--	--
PC-15	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	26.746	26.526	27.876	26.926	24.876	27.126
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	--	--	26.672	--	--	24.942	--
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	NA	--	--	--	--	--	--	--	--	--	--	--	--
PC-26	DG- Far east	58.338	--	--	--	--	--	--	--	--	--	--	--	--
PC-28	DG- Far east	40.895	--	15.85	13.59	13.53	16.7	14.65	--	25.045	27.305	27.365	24.195	26.245
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	27.484	27.154	27.534	27.534	25.374	27.634
PC-31	DG- Far east	59.337	--	--	--	--	--	--	--	--	--	--	--	--
PC-32	DG- Far east	56.901	--	--	--	--	--	--	--	--	--	--	--	--
PC-33	DG- Far east	55.463	--	--	--	--	--	--	--	--	--	--	--	--
PC-34S	Adjacent Academy -SE	37.512	--	--	--	--	9.32	7.05	--	--	--	--	28.192	30.462
PC-34D	Adjacent Academy -SE	38.278	--	--	--	--	9.84	7.79	--	--	--	--	28.438	30.488
PC-35S	Adjacent to Academy-S	37.544	--	--	6.42	7.26	9.26	7.2	--	--	31.124	30.284	28.284	30.344
PC-35D	Adjacent to Academy-S	38.201	--	--	--	--	9.62	7.55	--	--	--	--	28.581	30.651
PC-36S	Adjacent to Academy-S	46.163	--	16.7	--	--	18.15	--	--	29.463	--	--	28.013	--
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	--	29.7	31.3	30.4	28.792	30.682
PC-38	Adjacent to Academy-S	58.266	--	--	--	--	32.28	--	--	--	--	--	25.986	--
PC-39	Adjacent to Academy-S	55.511	--	--	--	--	--	25.89	--	--	--	--	--	29.621
HW-1D	Mary Dunn Pond (DG)	30.15	--	4.22	--	--	6.07	--	--	25.9	--	--	24.08	--
HW-1S	Mary Dunn Pond (DG)	33.541	--	--	--	--	--	--	--	--	--	--	--	--
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	--	--	--	--	--	--	--	--	--	--	--	--

Table 5 - Groundwater Elevation and Gauging Data 2018-2019
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)						Groundwater Elevation (Feet)					
			Date						Date					
			6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18-19/2020	6/26/2018	1/9/2019	4/23/2019	7/22/2019	10/28/2019	2/18-19/2020
TW80-9	Piezometer- West of FP [2]	36.594	--	--	--	--	--	--	--	--	--	--	--	--
WH-2D	Mary Dunn Pond (DG)	33.263	--	--	--	--	--	--	--	--	--	--	--	--
WH-2S	Mary Dunn Pond (DG)	33.17	--	--	--	--	--	--	--	--	--	--	--	--
WS-101		36.529	--	--	--	--	--	--	--	--	--	--	--	--
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.

FIGURES

0 0.1 0.2 0.4 0.6

Miles

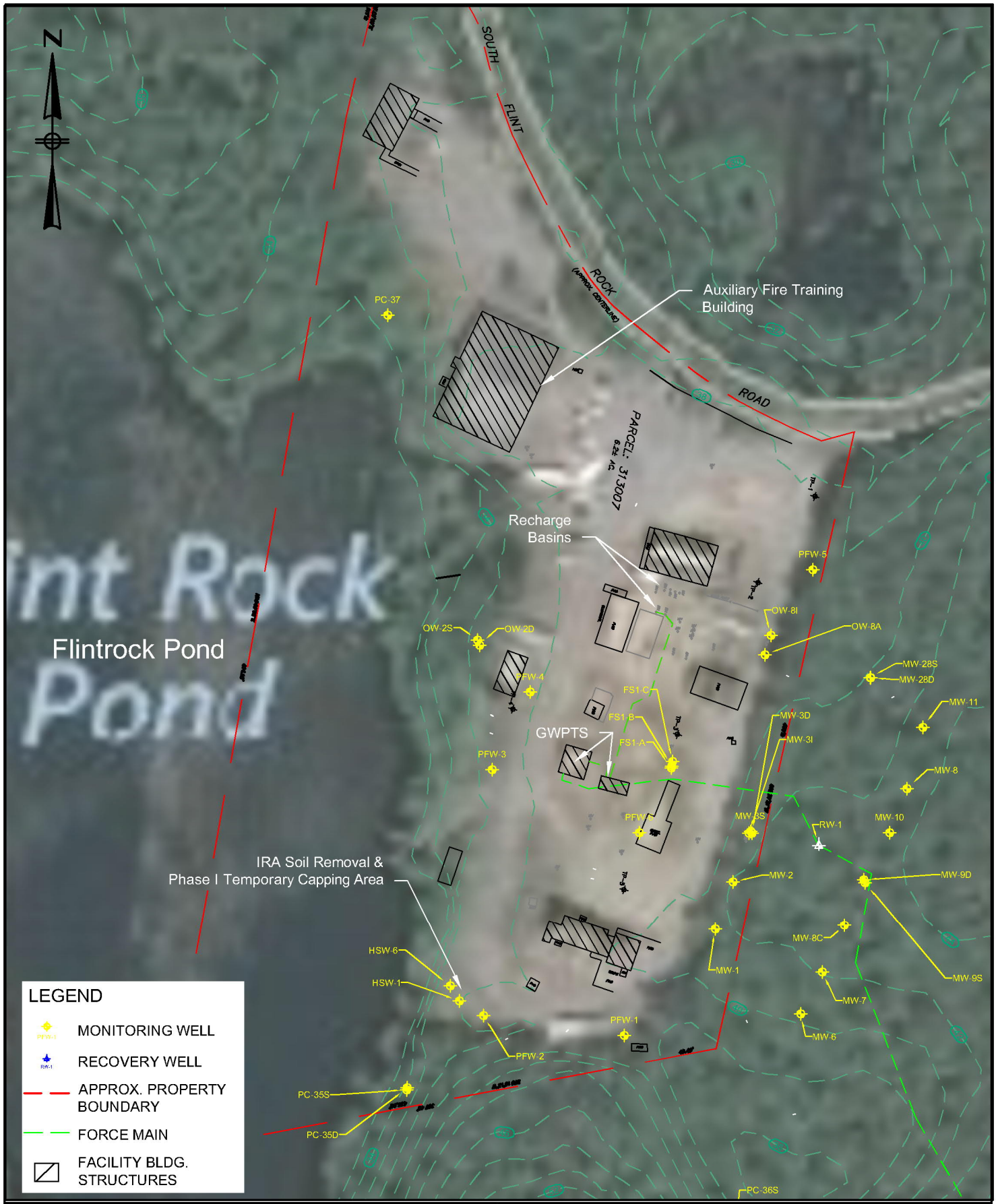
N

BETA

Figure 1
Site Location
Barnstable County Fire & Rescue Training Academy

155 South Flint Rock Road
Hyannis, Massachusetts

RTN 4-26179 April 2018



BETA

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Figure 2- Site Plan FTA Facility

Barnstable County Fire & Rescue Training Academy

155 S. Flint Rock Road, Barnstable, MA

Scale = 1':100'

K:\6206 Barnstable County\MCP LSP Base Services fmrly 2018-219 services\DrawingFiles\XRefs\GW Contour\6206_EX_BASE_MM_2.dwgg Plot Date: 02/11/2020

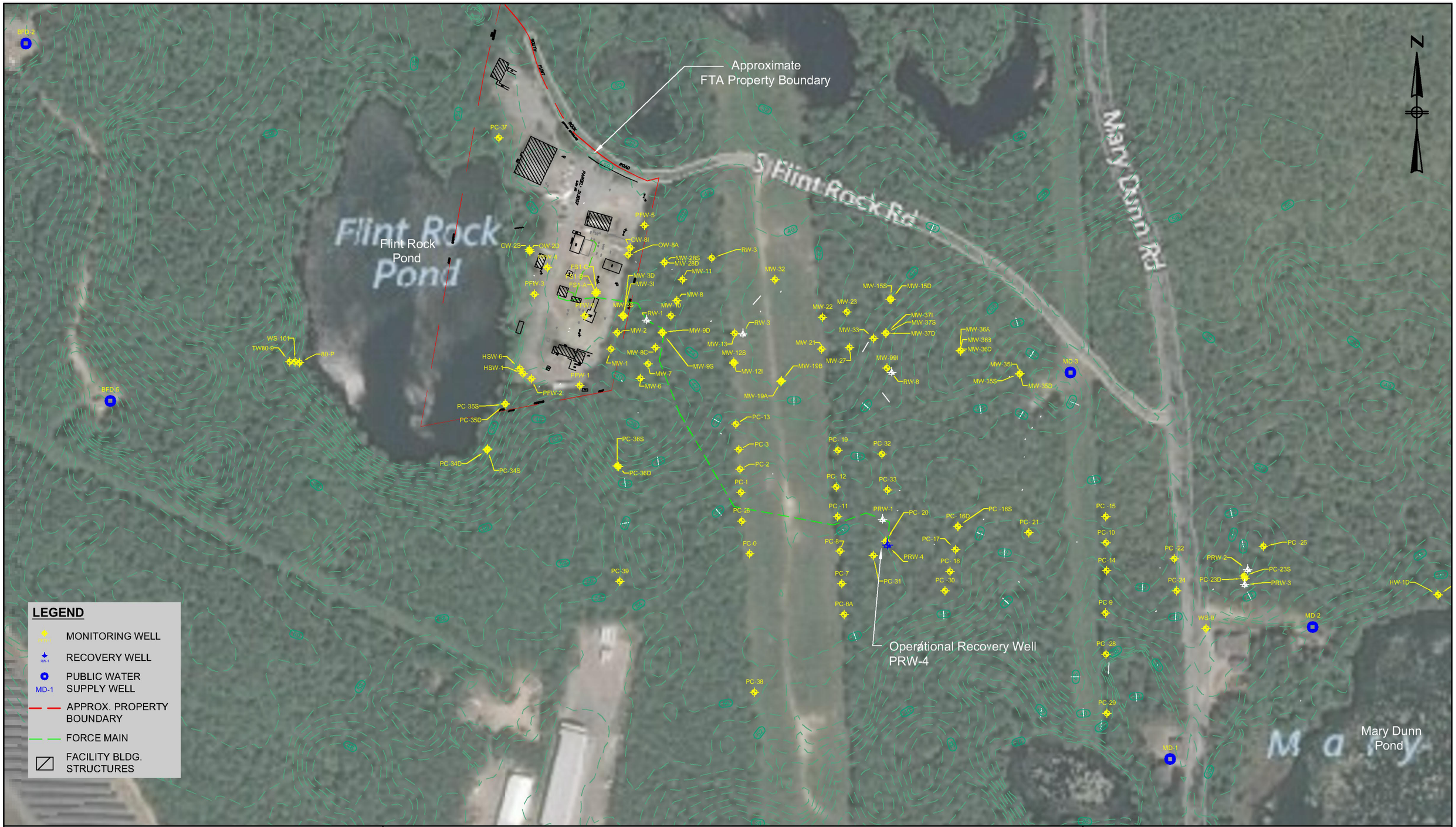


FIGURE 3 - SITE PLAN

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

Plot Date: 04/20/2020

www.BETA-Inc.com

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_2.DWG

MassDEP - Bureau of Waste Site Cleanup

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

Site Information:
BARNSTABLE COUNTY FIRE TRAINING ACADEMY
155 SOUTH FLINT ROCK ROAD HYANNIS, MA
4-000026175

NAD83 UTM Meters:
4614847mN , 393002mE (Zone: 19)
April 18, 2018

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: http://www.mass.gov/mgis/.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Figure 3

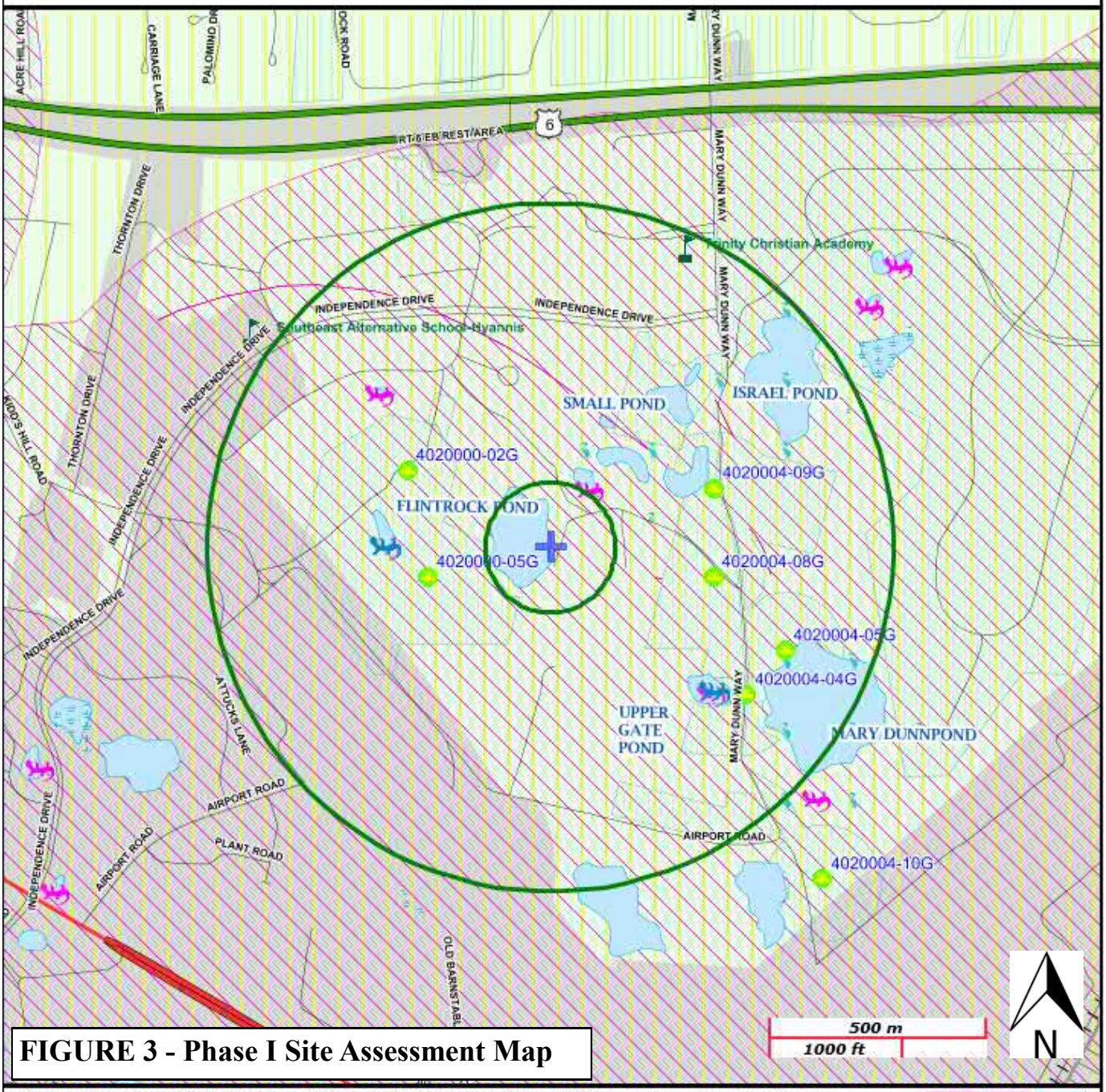
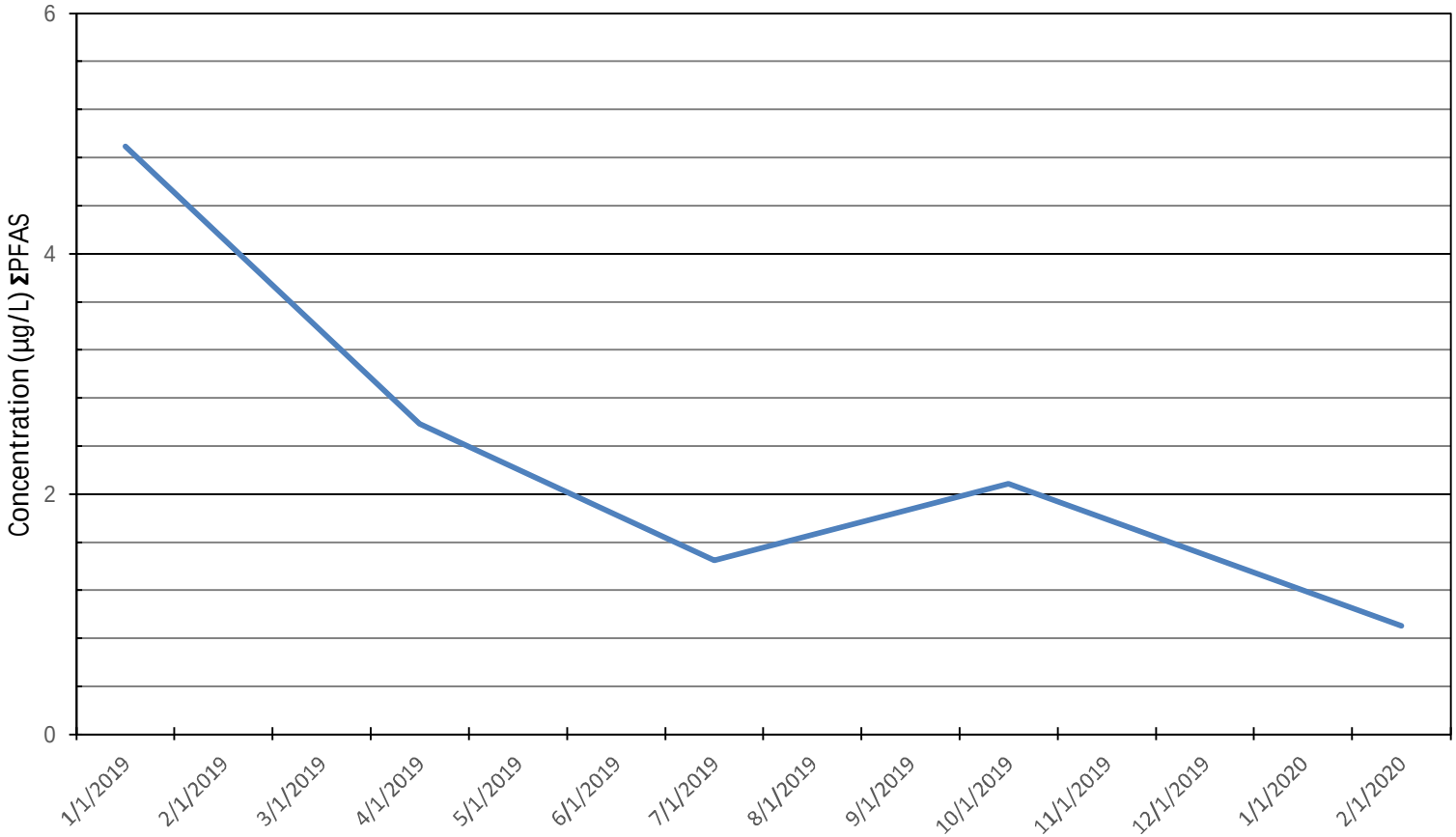


FIGURE 3 - Phase I Site Assessment Map

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

BETA

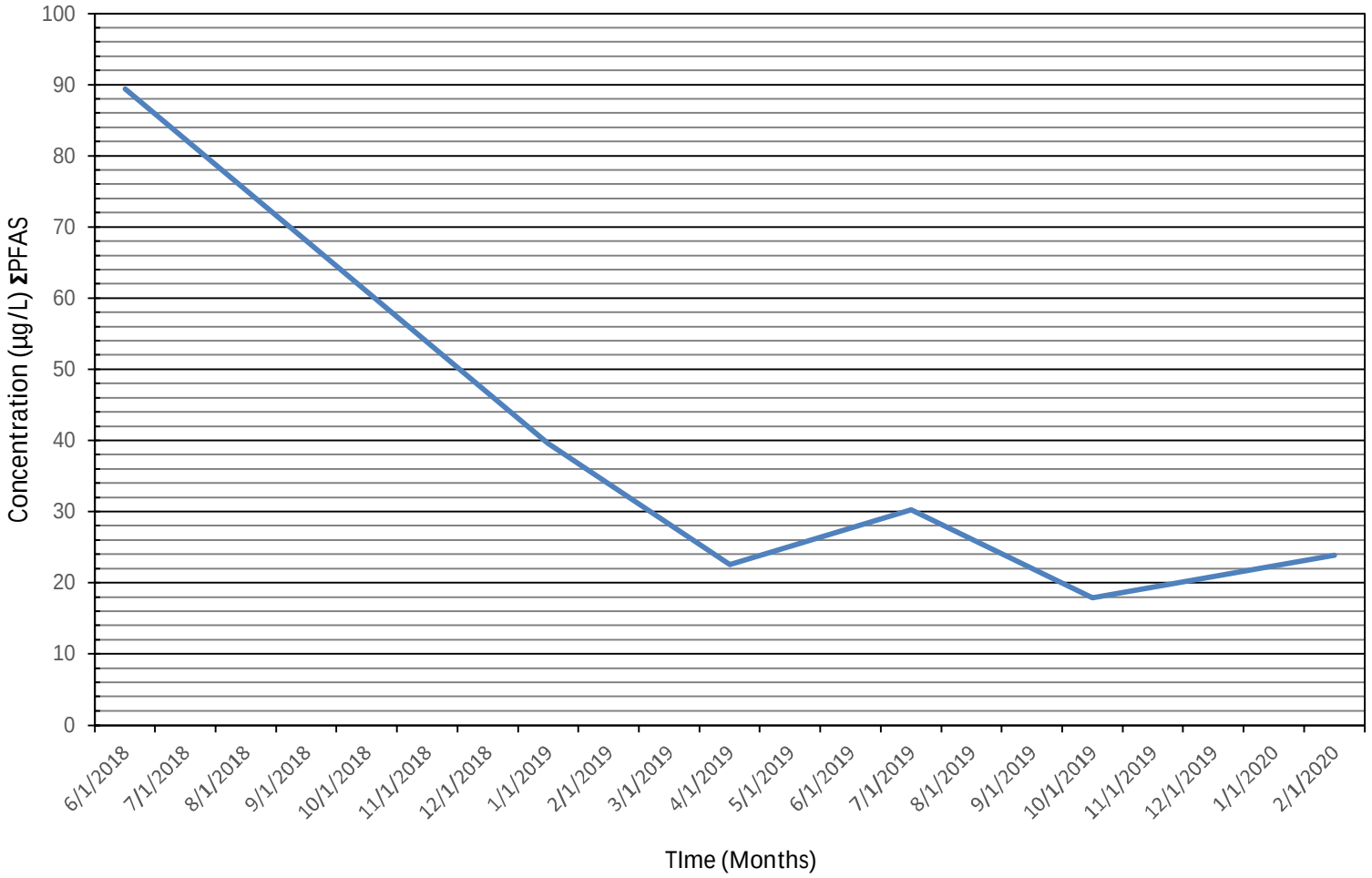
Figure 5A - ΣPFAS Concentrations in HSW-1 from January 2019-February 2020



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) .
3. HSW-1 was not sampled in June 2018.

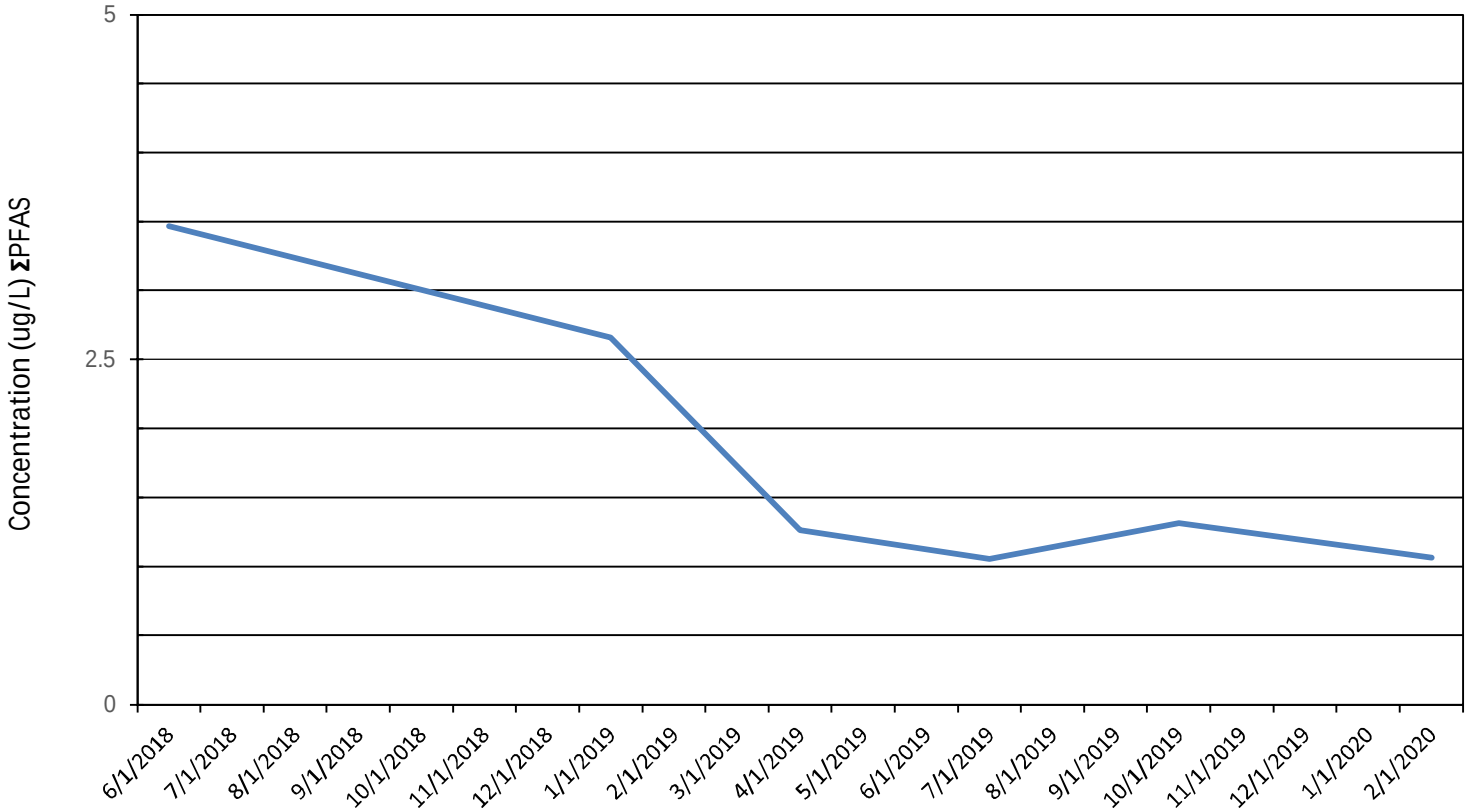
Figure 5B - ΣPFAS Concentrations in PFW-1 from June 2018-February 2020



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).

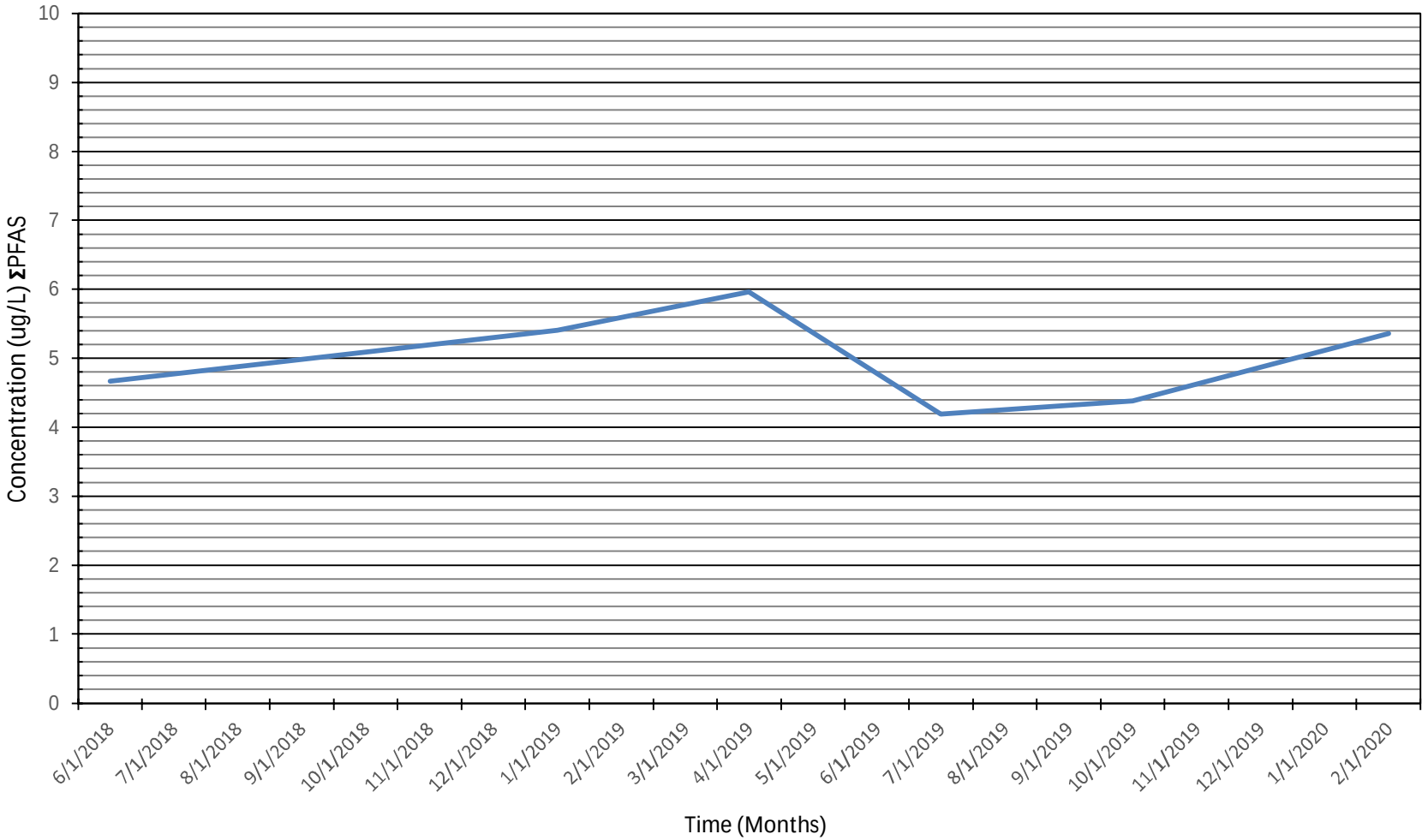
Figure 6 - ΣPFAS Concentrations in OW-8A from January 2019-February 2020



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) .

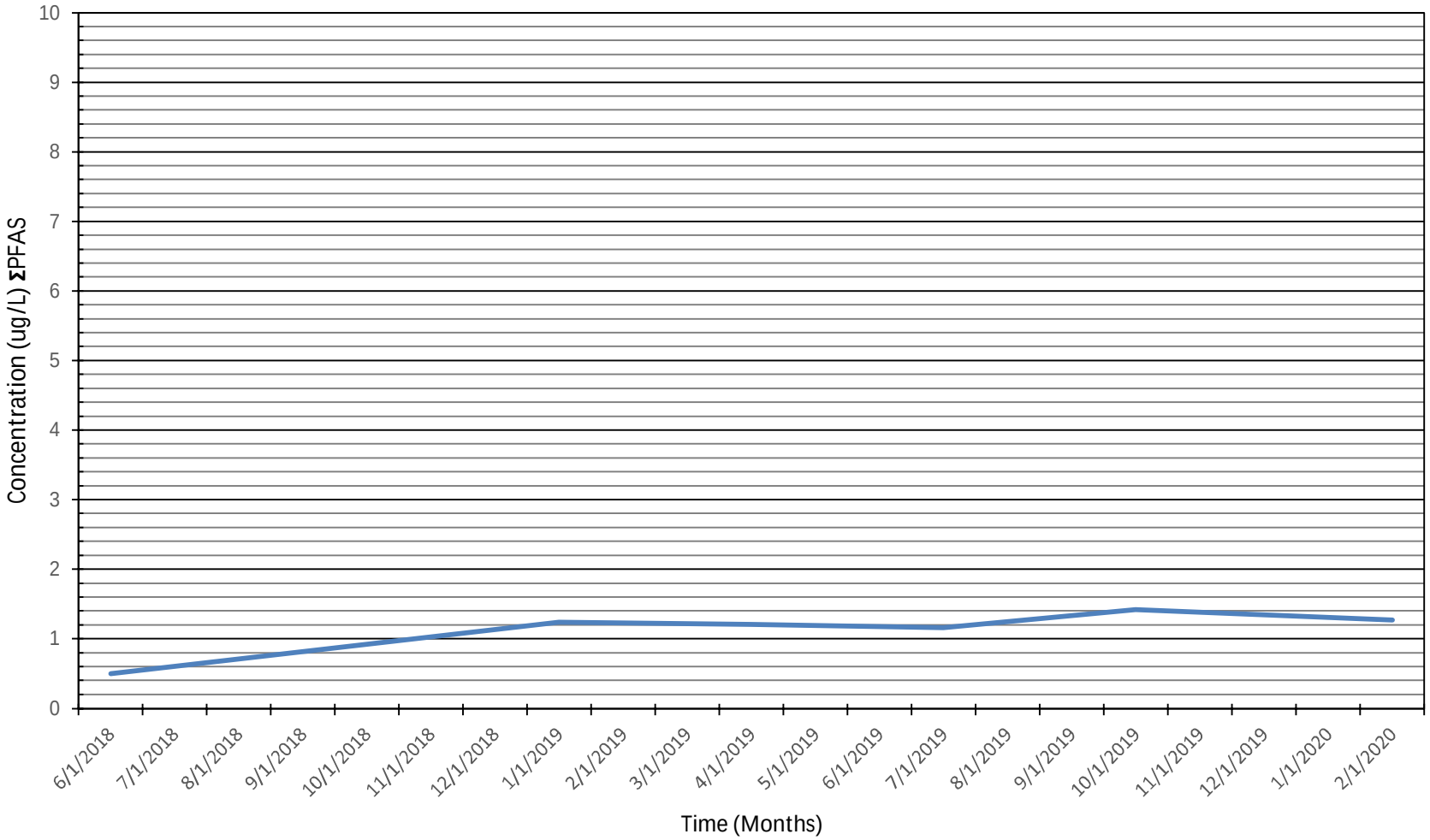
Figure 7A - ΣPFAS Concentrations in MW-12 from June 2018 - February 2020



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).

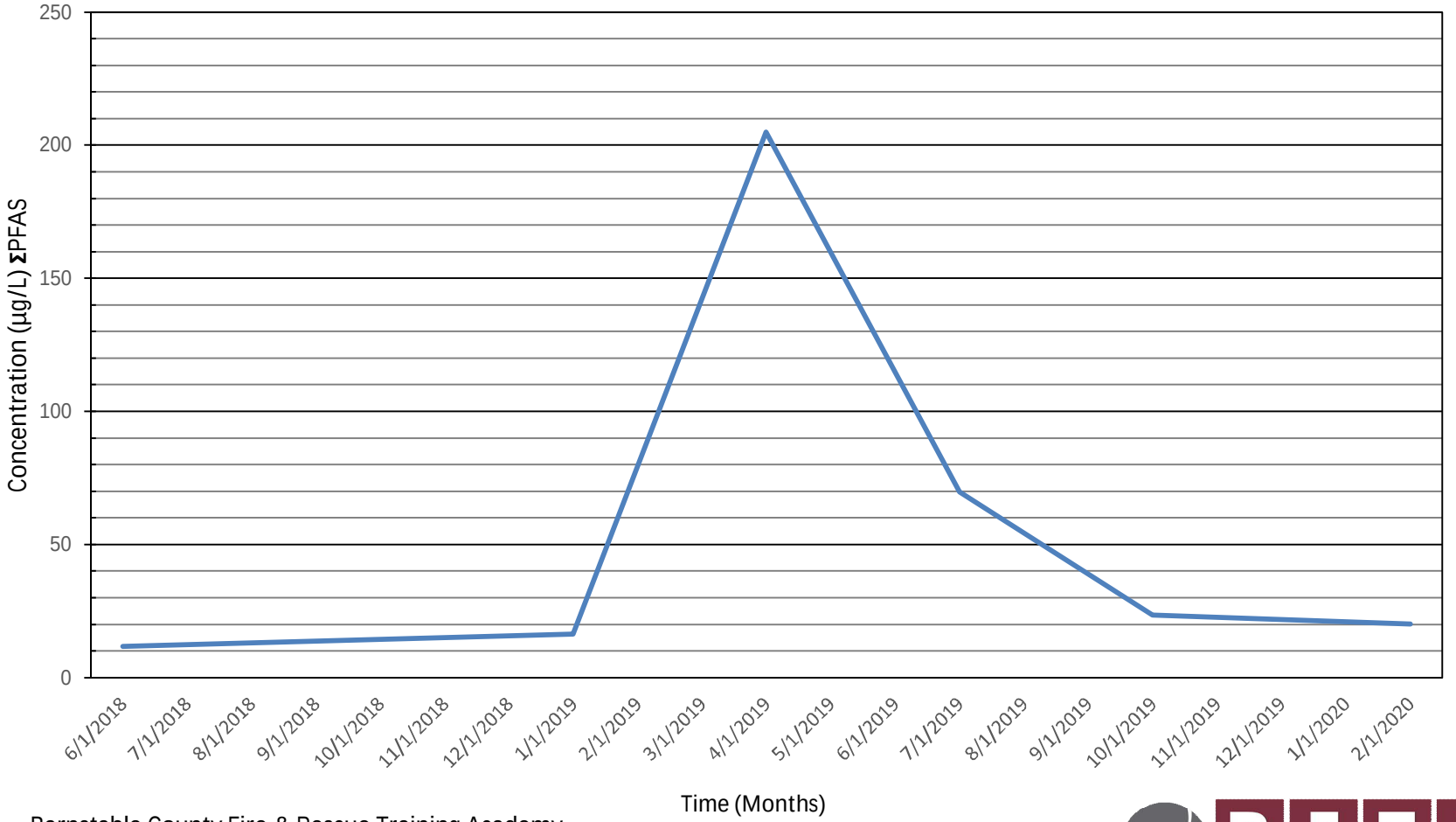
Figure 7B - ΣPFAS Concentrations in MW-22 from June 2018-February 2020



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).

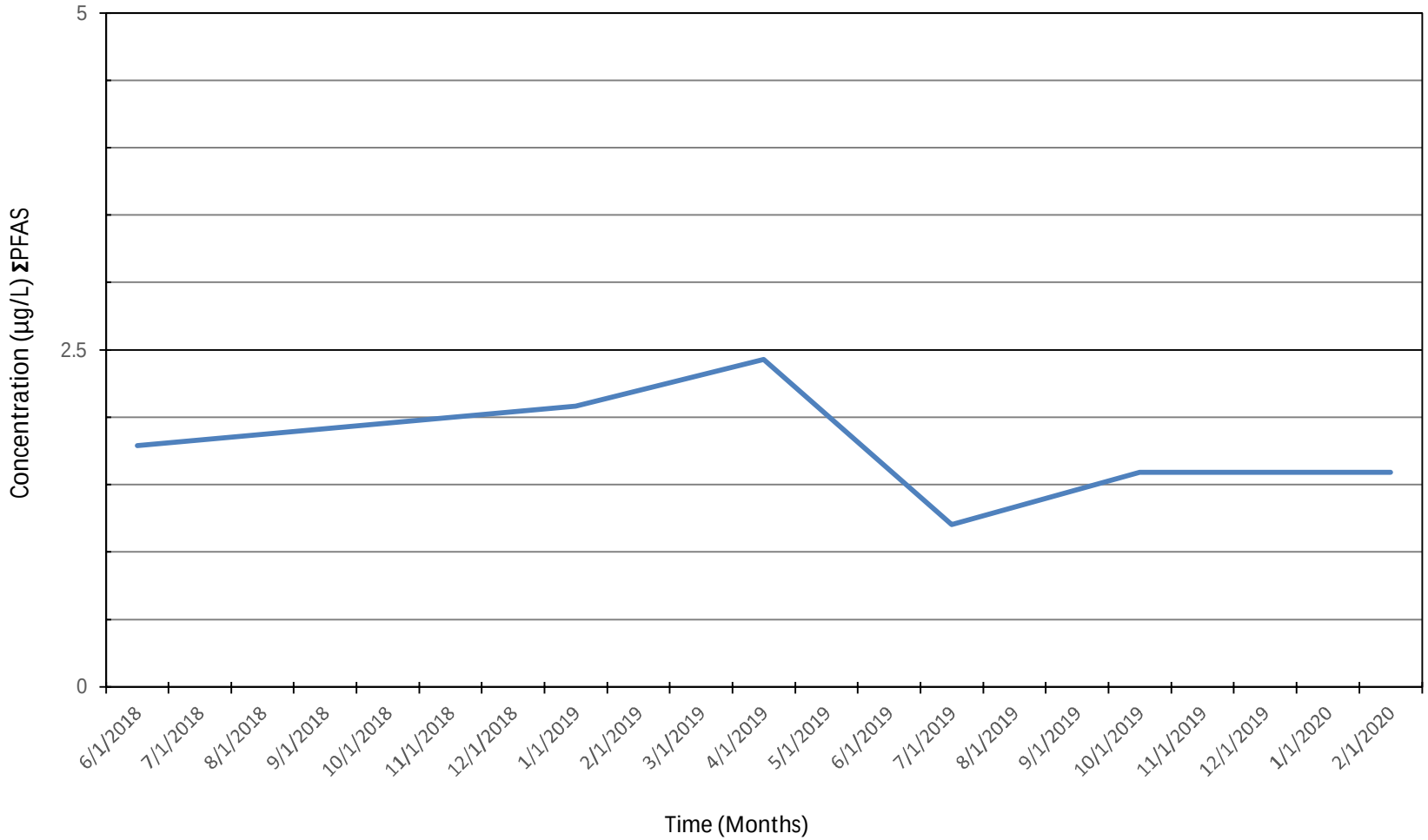
Figure 8A - ΣPFAS Concentrations in PC-11 from June 2018-February 2020



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).

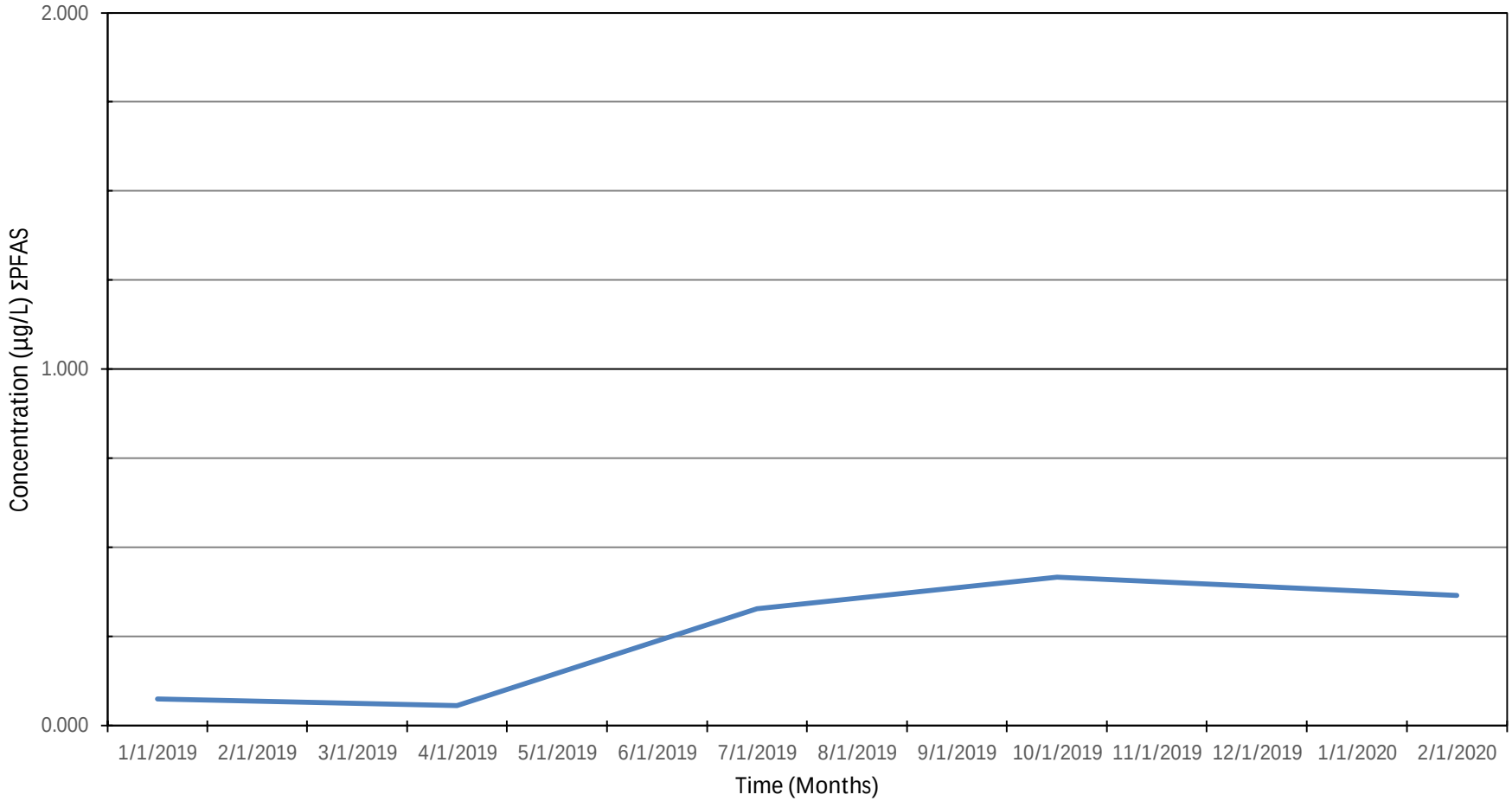
Figure 8B - ΣPFAS Concentrations in PC-6A from June 2018-February 2020



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).

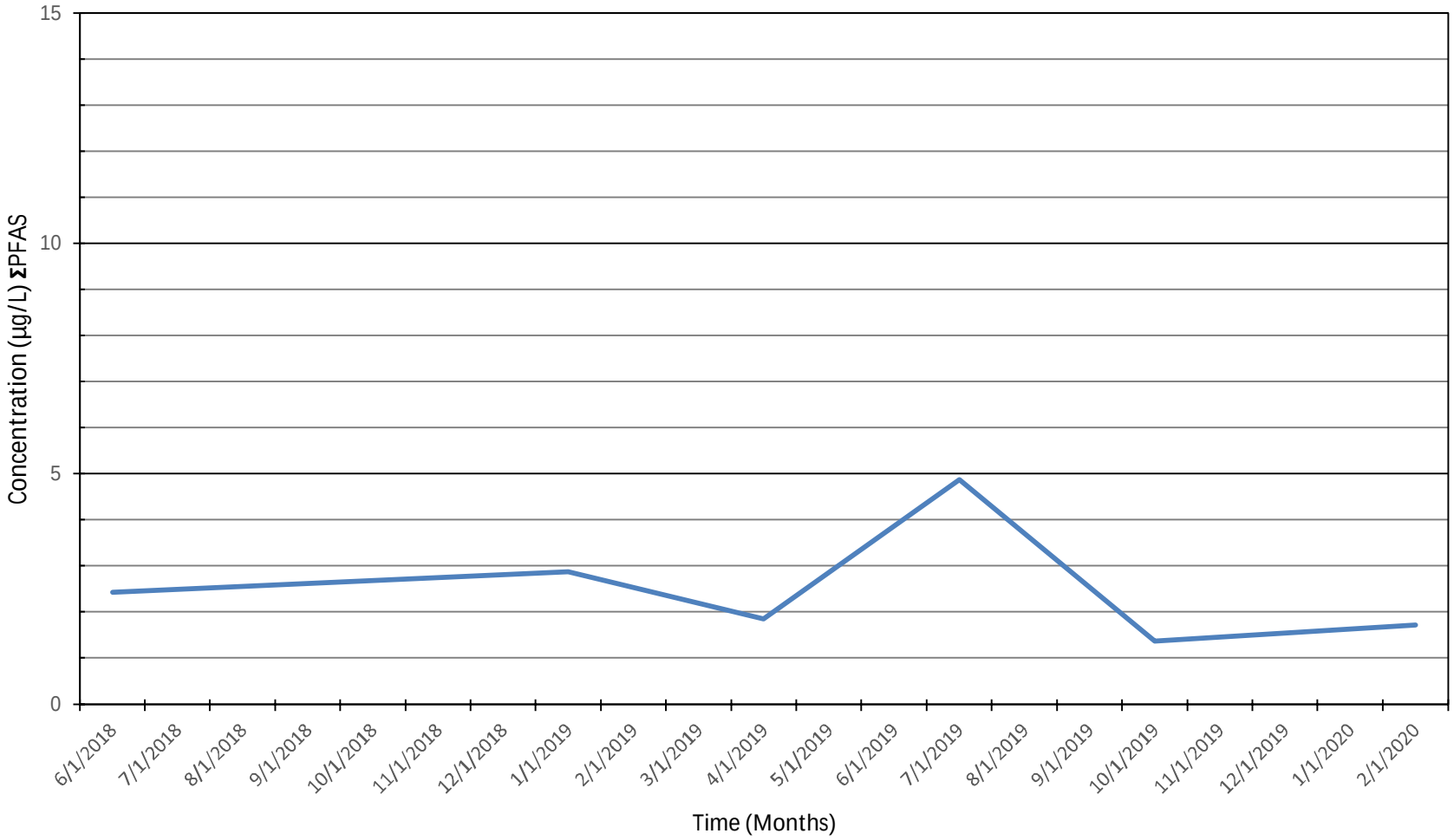
Figure 8C - ΣPFAS Concentrations in PC-28 from January 2019-February 2020



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

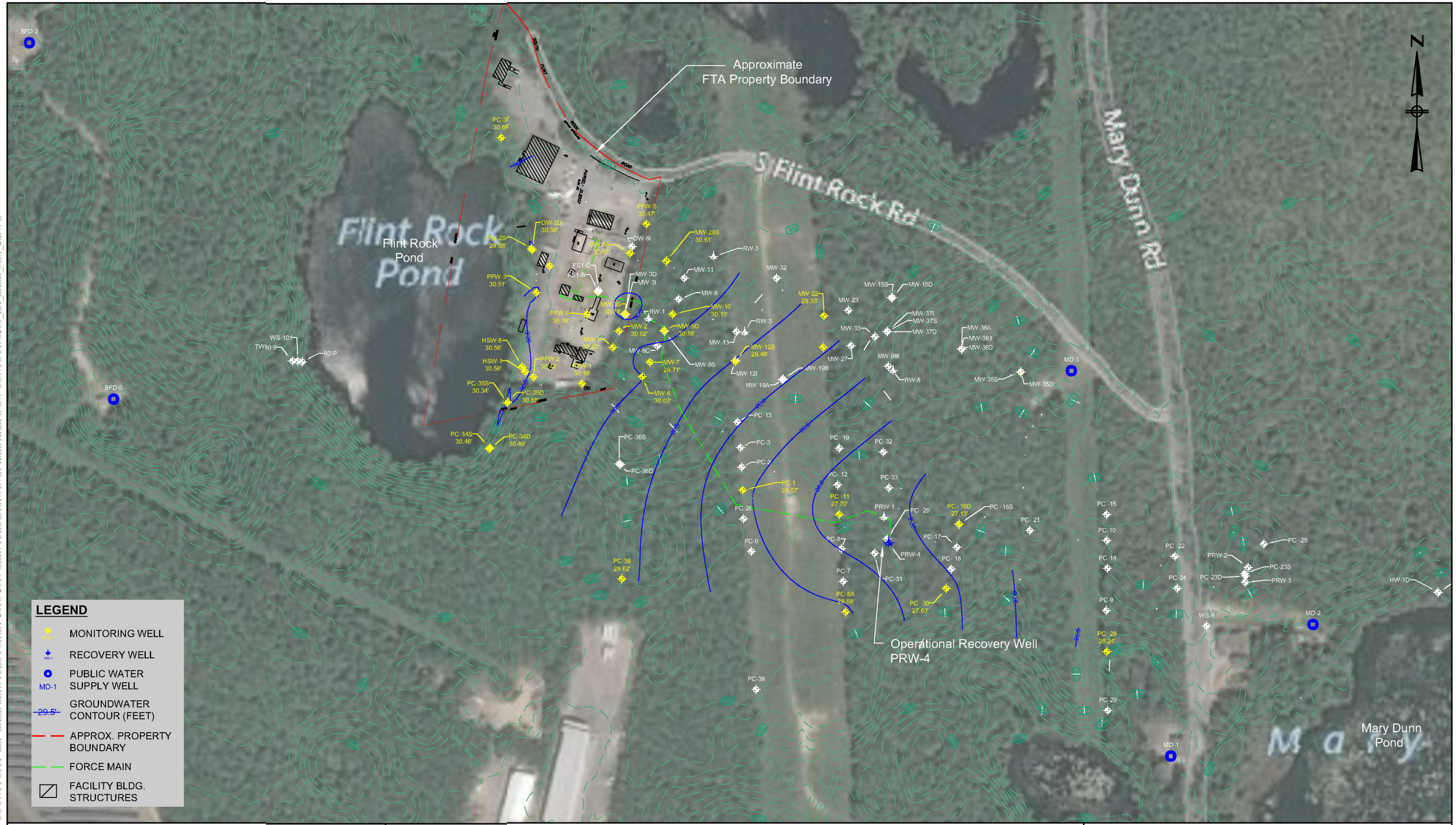
Notes:
1. Concentrations depicted represent the sum of the the five (5) PFAS compounds, PFOS, PFOA, PFHpA, PFHxS, and PFNA from June 2018 to April 2019. Concentrations depicted from April 2019 to October 2019 represent the sum of the six (6) PFAS compounds PFOS, PFOA, PFHpA, PFHxS, PFNA, and PFDA.
2.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

Figure 8D - ΣPFAS Concentrations in PC-30 from June 2018-February 2020



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).



BETA
www.BETA-Inc.com

FIGURE 10 - GROUNDWATER CONTOUR FLOW MAP - February 2020

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

Plot Date: 04/20/2020

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_2.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): 9/26/2016

☐ 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: ROGER P 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: JACK 4. Last Name: YUNITS

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: JYUNITS@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.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC 105

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

Release Tracking Number
4 - 26179

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: 2/1/2020 (mm/dd/yyyy) To: 2/29/2020 (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: 11/18/2016 (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: TJ MCGOFF 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: 29 b. GW Recovered (gals): 350738

c. NAPL Recovered (gals): d. GW Discharged (gals): 350738

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	02/13/2020	PFAS	3.659			☑	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: 2/1/2020 (mm/dd/yyyy) To: 2/29/2020 (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: 11/18/2016 (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: TJ MCGOFF 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: 29 b. GW Recovered (gals): 206245

c. NAPL Recovered (gals): d. GW Discharged (gals): 206245

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	02/13/2020	PFAS	3.659			☑	0.020	UG/L	YES

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

APPENDIX B

Laboratory Reports/Certificates of Analysis

Site#: 6206
Site Location: BCFTA
Your C.O.C. #: 709782-06-01

Attention: Steven Tebo

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

Report Date: 2020/03/03
Report #: R6095744
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C047360
Received: 2020/02/21, 13:05

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
PFAS in water by SPE/LCMS (1)	5	2020/02/27	2020/03/01	CAM SOP-00894	EPA 537 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs 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 BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs 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.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs 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 BV Labs, unless otherwise agreed in writing. BV Labs 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 BV Labs, 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

Site#: 6206
Site Location: BCFTA
Your C.O.C. #: 709782-06-01

Attention: Steven Tebo

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

Report Date: 2020/03/03
Report #: R6095744
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C047360
Received: 2020/02/21, 13:05

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Patricia Legette, Project Manager
Email: Patricia.Legette@bvlabs.com
Phone# (905)817-5799

==========

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 #: C047360
Report Date: 2020/03/03

Barnstable County
Site Location: BCFTA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK879			MBK880			
Sampling Date		2020/02/13 09:15			2020/02/13 09:00			
COC Number		709782-06-01			709782-06-01			
	UNITS	INFLUENT (PRW-4)	RDL	MDL	MIDPOINT SYSTEM #1	RDL	MDL	QC Batch
Perfluorinated Compounds								
Perfluorobutanoic acid (PFBA)	ug/L	0.046	0.020	0.0070	<0.0070	0.020	0.0070	6609614
Perfluoropentanoic acid (PFPeA)	ug/L	0.18	0.020	0.0041	<0.0041	0.020	0.0041	6609614
Perfluorohexanoic acid (PFHxA)	ug/L	0.20	0.020	0.0064	<0.0064	0.020	0.0064	6609614
Perfluoroheptanoic acid (PFHpA)	ug/L	0.092	0.020	0.0071	<0.0071	0.020	0.0071	6609614
Perfluorooctanoic acid (PFOA)	ug/L	0.074	0.020	0.0074	<0.0074	0.020	0.0074	6609614
Perfluorononanoic acid (PFNA)	ug/L	0.066	0.020	0.0049	<0.0049	0.020	0.0049	6609614
Perfluorodecanoic acid (PFDA)	ug/L	0.017	0.020	0.0041	<0.0041	0.020	0.0041	6609614
Perfluoroundecanoic acid (PFUnA)	ug/L	0.058	0.020	0.0043	<0.0043	0.020	0.0043	6609614
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0068	0.020	0.0068	<0.0068	0.020	0.0068	6609614
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0069	0.020	0.0069	<0.0069	0.020	0.0069	6609614
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0067	0.020	0.0067	<0.0067	0.020	0.0067	6609614
Perfluorobutanesulfonic acid (PFBS)	ug/L	0.020	0.020	0.0051	<0.0051	0.020	0.0051	6609614
Perfluorohexanesulfonic acid(PFHxS)	ug/L	0.31	0.020	0.0052	<0.0052	0.020	0.0052	6609614
Perfluoroheptanesulfonic acid PFHpS	ug/L	0.015	0.020	0.0033	<0.0033	0.020	0.0033	6609614
Perfluorooctanesulfonic acid (PFOS)	ug/L	3.1	0.20	0.052	<0.0052	0.020	0.0052	6609614
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0072	0.020	0.0072	<0.0072	0.020	0.0072	6609614
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0071	0.020	0.0066	<0.0066	0.020	0.0066	6609614
EtFOSA	ug/L	<0.0090	0.020	0.0090	<0.0090	0.020	0.0090	6609614
MeFOSA	ug/L	<0.0035	0.020	0.0035	<0.0035	0.020	0.0035	6609614
EtFOSE	ug/L	<0.0094	0.020	0.0094	<0.0094	0.020	0.0094	6609614
MeFOSE	ug/L	<0.0066	0.020	0.0066	<0.0066	0.020	0.0066	6609614
6:2 Fluorotelomer sulfonic acid	ug/L	0.32	0.020	0.0059	<0.0059	0.020	0.0059	6609614
8:2 Fluorotelomer sulfonic acid	ug/L	0.35	0.020	0.0059	<0.0059	0.020	0.0059	6609614
Surrogate Recovery (%)								
13C2-6:2-Fluorotelomersulfonic Acid	%	98	N/A	N/A	96	N/A	N/A	6609614
13C2-8:2-Fluorotelomersulfonic Acid	%	89	N/A	N/A	88	N/A	N/A	6609614
13C2-Perfluorodecanoic acid	%	98	N/A	N/A	88	N/A	N/A	6609614
13C2-Perfluorododecanoic acid	%	86	N/A	N/A	77	N/A	N/A	6609614
13C2-Perfluorohexanoic acid	%	107	N/A	N/A	101	N/A	N/A	6609614
13C2-perfluorotetradecanoic acid	%	84	N/A	N/A	72	N/A	N/A	6609614
13C2-Perfluoroundecanoic acid	%	91	N/A	N/A	82	N/A	N/A	6609614
13C3-Perfluorobutanesulfonic acid	%	107	N/A	N/A	98	N/A	N/A	6609614

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

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BV Labs Job #: C047360
Report Date: 2020/03/03

Barnstable County
Site Location: BCFTA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK879			MBK880			
Sampling Date		2020/02/13 09:15			2020/02/13 09:00			
COC Number		709782-06-01			709782-06-01			
	UNITS	INFLUENT (PRW-4)	RDL	MDL	MIDPOINT SYSTEM #1	RDL	MDL	QC Batch
13C4-Perfluorobutanoic acid	%	107	N/A	N/A	100	N/A	N/A	6609614
13C4-Perfluoroheptanoic acid	%	107	N/A	N/A	99	N/A	N/A	6609614
13C4-Perfluorooctanesulfonic acid	%	100	N/A	N/A	94	N/A	N/A	6609614
13C4-Perfluorooctanoic acid	%	104	N/A	N/A	96	N/A	N/A	6609614
13C5-Perfluorononanoic acid	%	104	N/A	N/A	96	N/A	N/A	6609614
13C5-Perfluoropentanoic acid	%	107	N/A	N/A	99	N/A	N/A	6609614
13C8-Perfluorooctane Sulfonamide	%	91	N/A	N/A	86	N/A	N/A	6609614
18O2-Perfluorohexanesulfonic acid	%	100	N/A	N/A	95	N/A	N/A	6609614
D3-MeFOSA	%	70	N/A	N/A	68	N/A	N/A	6609614
D5-EtFOSA	%	69	N/A	N/A	63	N/A	N/A	6609614
D7-MeFOSE	%	84	N/A	N/A	80	N/A	N/A	6609614
D9-EtFOSE	%	79	N/A	N/A	77	N/A	N/A	6609614

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

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BV Labs Job #: C047360
Report Date: 2020/03/03

Barnstable County
Site Location: BCFTA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK881	MBK882	MBK883			
Sampling Date		2020/02/13 09:30	2020/02/13 10:00	2020/02/13 10:15			
COC Number		709782-06-01	709782-06-01	709782-06-01			
	UNITS	EFFLUENT (SYSTEM #1)	MIDPOINT (SYSTEM #2)	EFFLUENT (SYSTEM #2)	RDL	MDL	QC Batch
Perfluorinated Compounds							
Perfluorobutanoic acid (PFBA)	ug/L	<0.0070	<0.0070	<0.0070	0.020	0.0070	6609614
Perfluoropentanoic acid (PFPeA)	ug/L	<0.0041	<0.0041	<0.0041	0.020	0.0041	6609614
Perfluorohexanoic acid (PFHxA)	ug/L	<0.0064	<0.0064	<0.0064	0.020	0.0064	6609614
Perfluoroheptanoic acid (PFHpA)	ug/L	<0.0071	<0.0071	<0.0071	0.020	0.0071	6609614
Perfluorooctanoic acid (PFOA)	ug/L	<0.0074	<0.0074	<0.0074	0.020	0.0074	6609614
Perfluorononanoic acid (PFNA)	ug/L	<0.0049	<0.0049	<0.0049	0.020	0.0049	6609614
Perfluorodecanoic acid (PFDA)	ug/L	<0.0041	<0.0041	<0.0041	0.020	0.0041	6609614
Perfluoroundecanoic acid (PFUnA)	ug/L	<0.0043	<0.0043	<0.0043	0.020	0.0043	6609614
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0068	<0.0068	<0.0068	0.020	0.0068	6609614
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0069	<0.0069	<0.0069	0.020	0.0069	6609614
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0067	<0.0067	<0.0067	0.020	0.0067	6609614
Perfluorobutanesulfonic acid (PFBS)	ug/L	<0.0051	<0.0051	<0.0051	0.020	0.0051	6609614
Perfluorohexanesulfonic acid(PFHxS)	ug/L	<0.0052	<0.0052	<0.0052	0.020	0.0052	6609614
Perfluoroheptanesulfonic acid PFHpS	ug/L	<0.0033	<0.0033	<0.0033	0.020	0.0033	6609614
Perfluorooctanesulfonic acid (PFOS)	ug/L	<0.0052	<0.0052	<0.0052	0.020	0.0052	6609614
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0072	<0.0072	<0.0072	0.020	0.0072	6609614
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.0066	<0.0066	<0.0066	0.020	0.0066	6609614
EtFOSA	ug/L	<0.0090	<0.0090	<0.0090	0.020	0.0090	6609614
MeFOSA	ug/L	<0.0035	<0.0035	<0.0035	0.020	0.0035	6609614
EtFOSE	ug/L	<0.0094	<0.0094	<0.0094	0.020	0.0094	6609614
MeFOSE	ug/L	<0.0066	<0.0066	<0.0066	0.020	0.0066	6609614
6:2 Fluorotelomer sulfonic acid	ug/L	<0.0059	<0.0059	<0.0059	0.020	0.0059	6609614
8:2 Fluorotelomer sulfonic acid	ug/L	<0.0059	<0.0059	<0.0059	0.020	0.0059	6609614
Surrogate Recovery (%)							
13C2-6:2-Fluorotelomersulfonic Acid	%	101	96	103	N/A	N/A	6609614
13C2-8:2-Fluorotelomersulfonic Acid	%	85	88	90	N/A	N/A	6609614
13C2-Perfluorodecanoic acid	%	84	88	94	N/A	N/A	6609614
13C2-Perfluorododecanoic acid	%	73	82	88	N/A	N/A	6609614
13C2-Perfluorohexanoic acid	%	105	98	107	N/A	N/A	6609614
13C2-perfluorotetradecanoic acid	%	64	76	75	N/A	N/A	6609614
13C2-Perfluoroundecanoic acid	%	75	83	88	N/A	N/A	6609614
13C3-Perfluorobutanesulfonic acid	%	102	98	105	N/A	N/A	6609614

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

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BV Labs Job #: C047360
Report Date: 2020/03/03

Barnstable County
Site Location: BCFTA
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK881	MBK882	MBK883			
Sampling Date		2020/02/13 09:30	2020/02/13 10:00	2020/02/13 10:15			
COC Number		709782-06-01	709782-06-01	709782-06-01			
	UNITS	EFFLUENT (SYSTEM #1)	MIDPOINT (SYSTEM #2)	EFFLUENT (SYSTEM #2)	RDL	MDL	QC Batch
13C4-Perfluorobutanoic acid	%	105	98	106	N/A	N/A	6609614
13C4-Perfluoroheptanoic acid	%	102	96	105	N/A	N/A	6609614
13C4-Perfluorooctanesulfonic acid	%	93	91	93	N/A	N/A	6609614
13C4-Perfluorooctanoic acid	%	99	93	102	N/A	N/A	6609614
13C5-Perfluorononanoic acid	%	97	93	103	N/A	N/A	6609614
13C5-Perfluoropentanoic acid	%	103	97	106	N/A	N/A	6609614
13C8-Perfluorooctane Sulfonamide	%	92	84	95	N/A	N/A	6609614
18O2-Perfluorohexanesulfonic acid	%	98	91	99	N/A	N/A	6609614
D3-MeFOSA	%	69	72	75	N/A	N/A	6609614
D5-EtFOSA	%	67	67	76	N/A	N/A	6609614
D7-MeFOSE	%	82	77	89	N/A	N/A	6609614
D9-EtFOSE	%	81	76	86	N/A	N/A	6609614

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

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 #: C047360
Report Date: 2020/03/03

Barnstable County
Site Location: BCFTA
Sampler Initials: MM

TEST SUMMARY

BV Labs ID: MBK879
Sample ID: INFLUENT (PRW-4)
Matrix: Water

Collected: 2020/02/13
Shipped:
Received: 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6609614	2020/02/27	2020/03/01	Adnan Khan

BV Labs ID: MBK880
Sample ID: MIDPOINT SYSTEM #1
Matrix: Water

Collected: 2020/02/13
Shipped:
Received: 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6609614	2020/02/27	2020/03/01	Adnan Khan

BV Labs ID: MBK881
Sample ID: EFFLUENT (SYSTEM #1)
Matrix: Water

Collected: 2020/02/13
Shipped:
Received: 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6609614	2020/02/27	2020/03/01	Adnan Khan

BV Labs ID: MBK882
Sample ID: MIDPOINT (SYSTEM #2)
Matrix: Water

Collected: 2020/02/13
Shipped:
Received: 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6609614	2020/02/27	2020/03/01	Adnan Khan

BV Labs ID: MBK883
Sample ID: EFFLUENT (SYSTEM #2)
Matrix: Water

Collected: 2020/02/13
Shipped:
Received: 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6609614	2020/02/27	2020/03/01	Adnan Khan

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GENERAL COMMENTS

Results relate only to the items tested.

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BV Labs Job #: C047360
Report Date: 2020/03/03

Barnstable County
Site Location: BCFTA
Sampler Initials: MM

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
6609614	AKH	Spiked Blank	13C2-6:2-Fluorotelomersulfonic Acid	2020/03/01		90	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/03/01		88	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/03/01		90	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/03/01		84	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/03/01		91	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/03/01		80	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/03/01		88	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/03/01		93	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/03/01		95	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/03/01		92	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/03/01		92	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/03/01		91	%	50 - 150
			13C5-Perfluorononanoic acid	2020/03/01		93	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/03/01		95	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/03/01		85	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2020/03/01		89	%	50 - 150
			D3-MeFOSA	2020/03/01		61	%	50 - 150
			D5-EtFOSA	2020/03/01		60	%	50 - 150
			D7-MeFOSE	2020/03/01		78	%	50 - 150
			D9-EtFOSE	2020/03/01		77	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/03/01		96	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2020/03/01		98	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2020/03/01		101	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2020/03/01		102	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2020/03/01		106	%	70 - 130
			Perfluorononanoic acid (PFNA)	2020/03/01		101	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2020/03/01		99	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2020/03/01		101	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2020/03/01		102	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2020/03/01		103	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/01		101	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2020/03/01		96	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/01		102	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2020/03/01		100	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2020/03/01		102	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2020/03/01		97	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/01		97	%	70 - 130
			EtFOSA	2020/03/01		104	%	70 - 130
			MeFOSA	2020/03/01		104	%	70 - 130
			EtFOSE	2020/03/01		103	%	70 - 130
			MeFOSE	2020/03/01		105	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2020/03/01		103	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2020/03/01		106	%	70 - 130
6609614	AKH	Spiked Blank DUP	13C2-6:2-Fluorotelomersulfonic Acid	2020/03/01		98	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/03/01		91	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/03/01		95	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/03/01		93	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/03/01		99	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/03/01		86	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/03/01		94	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/03/01		99	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/03/01		101	%	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-Perfluoroheptanoic acid	2020/03/01		98	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/03/01		98	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/03/01		97	%	50 - 150
			13C5-Perfluorononanoic acid	2020/03/01		99	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/03/01		100	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/03/01		90	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2020/03/01		97	%	50 - 150
			D3-MeFOSA	2020/03/01		72	%	50 - 150
			D5-EtFOSA	2020/03/01		69	%	50 - 150
			D7-MeFOSE	2020/03/01		85	%	50 - 150
			D9-EtFOSE	2020/03/01		86	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/03/01		98	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2020/03/01		102	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2020/03/01		103	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2020/03/01		105	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2020/03/01		108	%	70 - 130
			Perfluorononanoic acid (PFNA)	2020/03/01		106	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2020/03/01		105	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2020/03/01		103	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2020/03/01		104	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2020/03/01		111	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/01		107	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2020/03/01		99	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/01		102	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2020/03/01		103	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2020/03/01		103	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2020/03/01		100	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/01		103	%	70 - 130
			EtFOSA	2020/03/01		110	%	70 - 130
			MeFOSA	2020/03/01		105	%	70 - 130
			EtFOSE	2020/03/01		102	%	70 - 130
			MeFOSE	2020/03/01		106	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2020/03/01		106	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2020/03/01		112	%	70 - 130
6609614	AKH	RPD	Perfluorobutanoic acid (PFBA)	2020/03/01	2.6		%	30
			Perfluoropentanoic acid (PFPeA)	2020/03/01	3.8		%	30
			Perfluorohexanoic acid (PFHxA)	2020/03/01	2.2		%	30
			Perfluoroheptanoic acid (PFHpA)	2020/03/01	2.8		%	30
			Perfluorooctanoic acid (PFOA)	2020/03/01	2.1		%	30
			Perfluorononanoic acid (PFNA)	2020/03/01	4.3		%	30
			Perfluorodecanoic acid (PFDA)	2020/03/01	6.0		%	30
			Perfluoroundecanoic acid (PFUnA)	2020/03/01	2.0		%	30
			Perfluorododecanoic acid (PFDoA)	2020/03/01	1.4		%	30
			Perfluorotridecanoic acid (PFTRDA)	2020/03/01	7.5		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/01	5.3		%	30
			Perfluorobutanesulfonic acid (PFBS)	2020/03/01	3.5		%	30
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/01	0.74		%	30
			Perfluoroheptanesulfonic acid PFHpS	2020/03/01	2.8		%	30
			Perfluorooctanesulfonic acid (PFOS)	2020/03/01	0.52		%	30
			Perfluorodecanesulfonic acid (PFDS)	2020/03/01	3.0		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/01	6.2		%	30
			EtFOSA	2020/03/01	5.3		%	30

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			MeFOSA	2020/03/01	0.35		%	30
			EtFOSE	2020/03/01	0.71		%	30
			MeFOSE	2020/03/01	1.3		%	30
			6:2 Fluorotelomer sulfonic acid	2020/03/01	2.8		%	30
			8:2 Fluorotelomer sulfonic acid	2020/03/01	4.9		%	30
6609614	AKH	Method Blank	13C2-6:2-Fluorotelomersulfonic Acid	2020/03/01		98	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/03/01		92	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/03/01		95	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/03/01		90	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/03/01		103	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/03/01		86	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/03/01		92	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/03/01		103	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/03/01		103	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/03/01		101	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/03/01		100	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/03/01		99	%	50 - 150
			13C5-Perfluorononanoic acid	2020/03/01		99	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/03/01		101	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/03/01		89	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2020/03/01		99	%	50 - 150
			D3-MeFOSA	2020/03/01		69	%	50 - 150
			D5-EtFOSA	2020/03/01		68	%	50 - 150
			D7-MeFOSE	2020/03/01		88	%	50 - 150
			D9-EtFOSE	2020/03/01		82	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/03/01	<0.0070		ug/L	
			Perfluoropentanoic acid (PFPeA)	2020/03/01	<0.0041		ug/L	
			Perfluorohexanoic acid (PFHxA)	2020/03/01	<0.0064		ug/L	
			Perfluoroheptanoic acid (PFHpA)	2020/03/01	<0.0071		ug/L	
			Perfluorooctanoic acid (PFOA)	2020/03/01	<0.0074		ug/L	
			Perfluorononanoic acid (PFNA)	2020/03/01	<0.0049		ug/L	
			Perfluorodecanoic acid (PFDA)	2020/03/01	<0.0041		ug/L	
			Perfluoroundecanoic acid (PFUnA)	2020/03/01	<0.0043		ug/L	
			Perfluorododecanoic acid (PFDoA)	2020/03/01	<0.0068		ug/L	
			Perfluorotridecanoic acid (PFTRDA)	2020/03/01	<0.0069		ug/L	
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/01	<0.0067		ug/L	
			Perfluorobutanesulfonic acid (PFBS)	2020/03/01	<0.0051		ug/L	
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/01	<0.0052		ug/L	
			Perfluoroheptanesulfonic acid PFHpS	2020/03/01	<0.0033		ug/L	
			Perfluorooctanesulfonic acid (PFOS)	2020/03/01	<0.0052		ug/L	
			Perfluorodecanesulfonic acid (PFDS)	2020/03/01	<0.0072		ug/L	
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/01	<0.0066		ug/L	
			EtFOSA	2020/03/01	<0.0090		ug/L	
			MeFOSA	2020/03/01	<0.0035		ug/L	
			EtFOSE	2020/03/01	<0.0094		ug/L	
			MeFOSE	2020/03/01	<0.0066		ug/L	
			6:2 Fluorotelomer sulfonic acid	2020/03/01	<0.0059		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			8:2 Fluorotelomer sulfonic acid	2020/03/01	<0.0059		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.

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BV Labs Job #: C047360
Report Date: 2020/03/03

Barnstable County
Site Location: BCFTA
Sampler Initials: MM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

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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Maxxam
A Bureau Veritas Group Company

Maxxam Analytics International Corporation o/a Maxxam Analytics
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free 800-563-6266 Fax:(905) 817-5777 www.maxxam.ca

21-Feb-20 13:05
Patricia Legette
C047360
YHA ENV-890

Page 1 of

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		For Lab Use Only:
Company Name:	#29803 Barnstable County	Company Name:	BETA Group	Quotation #:	B57344	Bottle Order #: 709782
Attention:	Accounts Payable	Attention:	Steven Tebo / Roger Thibault	P.O. #:		
Address:	3195 Main Street PO Box 427 Barnstable MA 02630	Address:	701 George Washington Hwy Lincoln, RI 02865	Project:	#6206	
Tel:	(508) 362-3828 Ext: 1234 Fax:	Tel:	(508) 375-6603 Fax:	Project Name:	BCFTA	Project Manager: Patricia Legette
Email:	eoconnell@barnstablecounty.org, stebo@barnstableco	Email:	stebo@barnstablecounty.org, rthibault@noverarmstrong	Site #:		
				Sampled By:	Mykel Mendes / ~~Chris Dix~~	C#709782-06-01

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

Regulation 153 (2011)
☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ___

Other Regulations
☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality ___
☐ PWQO
☐ Other ___

Special Instructions
* new Massachusetts GW-1 std. 0.020 ug/L

Include Criteria on Certificate of Analysis (Y/N)? ___

Field Filtered (please circle): Metals / Hg / Cr VI

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)
USEPA 537 m

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	# of Bottles	Comments
1		INFLUENT (PW-4)	2020/02/13	0915	GW	2	
2		MIDPOINT SYSTEM #1		0900	GW	2	
3		EFFLUENT (SYSTEM #1)		0930		2	
4		MIDPOINT (SYSTEM #2)		1000		2	
5		EFFLUENT (SYSTEM #2)	2020/02/13	1015	GW	2	
6							
7							
8							
9							
10							

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Mykel Mendes / Mykel Mendes	20/02/20	1100	~~Chris~~ TRUSHNA PATEL	2020/02/21	13:05	

Laboratory Use Only
Time Sensitive
Temperature (°C) on Recei: 3.2 | 3.8 | 4.0
Custody Seal: Present ✓ Intact ✓ — Yes ✓ — No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

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

White: Maxxa Yellow: Client

Your Project #: BARNSTABLE COUNTY
Site#: BCFRTA
Your C.O.C. #: 747591-02-01, 747591-01-01

Attention: Steven Tebo

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

Report Date: 2020/03/09
Report #: R6102750
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C047342
Received: 2020/02/21, 13:05

Sample Matrix: Water
Samples Received: 15

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
PFAS in water by SPE/LCMS (1)	5	2020/03/03	2020/03/03	CAM SOP-00894	EPA 537 m
PFAS in water by SPE/LCMS (1)	2	2020/03/03	2020/03/04	CAM SOP-00894	EPA 537 m
PFAS in water by SPE/LCMS (1)	8	2020/03/04	2020/03/06	CAM SOP-00894	EPA 537 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs 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 BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs 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.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs 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 BV Labs, unless otherwise agreed in writing. BV Labs 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 BV Labs, 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.

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Your Project #: BARNSTABLE COUNTY
Site#: BCFRTA
Your C.O.C. #: 747591-02-01, 747591-01-01

Attention: Steven Tebo

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

Report Date: 2020/03/09
Report #: R6102750
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C047342
Received: 2020/02/21, 13:05

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Patricia Legette, Project Manager
Email: Patricia.Legette@bvlabs.com
Phone# (905)817-5799

==========

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.

BV Labs Job #: C047342
Report Date: 2020/03/09

Barnstable County
Client Project #: BARNSTABLE COUNTY
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK805			MBK806			MBK807			
Sampling Date		2020/02/18 12:05			2020/02/18 12:05			2020/02/18 13:10			
COC Number		747591-02-01			747591-02-01			747591-02-01			
	UNITS	HSW-1	RDL	MDL	PFW-1	RDL	MDL	OW-8A	RDL	MDL	QC Batch
Perfluorinated Compounds											
Perfluorobutanoic acid (PFBA)	ug/L	0.036	0.020	0.0070	0.067	0.10	0.035	0.0082	0.020	0.0070	6615866
Perfluoropentanoic acid (PFPeA)	ug/L	0.11	0.020	0.0041	0.29	0.10	0.021	0.036	0.020	0.0041	6615866
Perfluorohexanoic acid (PFHxA)	ug/L	0.12	0.020	0.0064	0.31	0.10	0.032	0.034	0.020	0.0064	6615866
Perfluoroheptanoic acid (PFHpA)	ug/L	0.032	0.020	0.0071	0.20	0.10	0.036	0.035	0.020	0.0071	6615866
Perfluorooctanoic acid (PFOA)	ug/L	0.036	0.020	0.0074	0.22	0.10	0.037	0.062	0.020	0.0074	6615866
Perfluorononanoic acid (PFNA)	ug/L	0.022	0.020	0.0049	0.23	0.10	0.025	0.11	0.020	0.0049	6615866
Perfluorodecanoic acid (PFDA)	ug/L	0.0091	0.020	0.0041	0.20	0.10	0.021	0.017	0.020	0.0041	6615866
Perfluoroundecanoic acid (PFUnA)	ug/L	0.12	0.020	0.0043	0.12	0.10	0.022	0.061	0.020	0.0043	6615866
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0068	0.020	0.0068	<0.034	0.10	0.034	<0.0068	0.020	0.0068	6615866
Perfluorotridecanoic acid (PFTRDA)	ug/L	0.013	0.020	0.0069	<0.035	0.10	0.035	<0.0069	0.020	0.0069	6615866
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0067	0.020	0.0067	<0.034	0.10	0.034	<0.0067	0.020	0.0067	6615866
Perfluorobutanesulfonic acid (PFBS)	ug/L	<0.0051	0.020	0.0051	<0.026	0.10	0.026	<0.0051	0.020	0.0051	6615866
Perfluorohexanesulfonic acid(PFHxS)	ug/L	0.066	0.020	0.0052	1.0	0.10	0.026	0.19	0.020	0.0052	6615866
Perfluoroheptanesulfonic acid PFHpS	ug/L	<0.0033	0.020	0.0033	0.064	0.10	0.017	0.0055	0.020	0.0033	6615866
Perfluorooctanesulfonic acid (PFOS)	ug/L	0.74	0.020	0.0052	22	1.0	0.26	0.65	0.020	0.0052	6615866
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0072	0.020	0.0072	<0.036	0.10	0.036	<0.0072	0.020	0.0072	6615866
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0075	0.020	0.0066	<0.033	0.10	0.033	<0.0066	0.020	0.0066	6615866
EtFOSA	ug/L	<0.0090	0.020	0.0090	<0.045	0.10	0.045	<0.0090	0.020	0.0090	6615866
MeFOSA	ug/L	<0.0035	0.020	0.0035	<0.018	0.10	0.018	<0.0035	0.020	0.0035	6615866
EtFOSE	ug/L	<0.0094	0.020	0.0094	<0.047	0.10	0.047	<0.0094	0.020	0.0094	6615866
MeFOSE	ug/L	<0.0066	0.020	0.0066	<0.033	0.10	0.033	<0.0066	0.020	0.0066	6615866
6:2 Fluorotelomer sulfonic acid	ug/L	0.13	0.020	0.0059	0.71	0.10	0.030	0.0061	0.020	0.0059	6615866
8:2 Fluorotelomer sulfonic acid	ug/L	0.18	0.020	0.0059	3.8	0.10	0.030	0.038	0.020	0.0059	6615866
Surrogate Recovery (%)											
13C2-6:2-Fluorotelomersulfonic Acid	%	99	N/A	N/A	92	N/A	N/A	95	N/A	N/A	6615866
13C2-8:2-Fluorotelomersulfonic Acid	%	95	N/A	N/A	90	N/A	N/A	99	N/A	N/A	6615866
13C2-Perfluorodecanoic acid	%	90	N/A	N/A	94	N/A	N/A	97	N/A	N/A	6615866
13C2-Perfluorododecanoic acid	%	84	N/A	N/A	88	N/A	N/A	91	N/A	N/A	6615866
13C2-Perfluorohexanoic acid	%	100	N/A	N/A	96	N/A	N/A	101	N/A	N/A	6615866
13C2-perfluorotetradecanoic acid	%	76	N/A	N/A	91	N/A	N/A	92	N/A	N/A	6615866
13C2-Perfluoroundecanoic acid	%	88	N/A	N/A	93	N/A	N/A	97	N/A	N/A	6615866
13C3-Perfluorobutanesulfonic acid	%	98	N/A	N/A	95	N/A	N/A	99	N/A	N/A	6615866
13C4-Perfluorobutanoic acid	%	99	N/A	N/A	96	N/A	N/A	100	N/A	N/A	6615866
13C4-Perfluoroheptanoic acid	%	102	N/A	N/A	98	N/A	N/A	100	N/A	N/A	6615866

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

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PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK805			MBK806			MBK807			
Sampling Date		2020/02/18 12:05			2020/02/18 12:05			2020/02/18 13:10			
COC Number		747591-02-01			747591-02-01			747591-02-01			
	UNITS	HSW-1	RDL	MDL	PFW-1	RDL	MDL	OW-8A	RDL	MDL	QC Batch
13C4-Perfluorooctanesulfonic acid	%	92	N/A	N/A	100	N/A	N/A	97	N/A	N/A	6615866
13C4-Perfluorooctanoic acid	%	98	N/A	N/A	96	N/A	N/A	101	N/A	N/A	6615866
13C5-Perfluorononanoic acid	%	98	N/A	N/A	97	N/A	N/A	102	N/A	N/A	6615866
13C5-Perfluoropentanoic acid	%	99	N/A	N/A	93	N/A	N/A	100	N/A	N/A	6615866
13C8-Perfluorooctane Sulfonamide	%	86	N/A	N/A	82	N/A	N/A	91	N/A	N/A	6615866
18O2-Perfluorohexanesulfonic acid	%	99	N/A	N/A	97	N/A	N/A	98	N/A	N/A	6615866
D3-MeFOSA	%	71	N/A	N/A	46 (1)	N/A	N/A	68	N/A	N/A	6615866
D5-EtFOSA	%	73	N/A	N/A	44 (2)	N/A	N/A	68	N/A	N/A	6615866
D7-MeFOSE	%	79	N/A	N/A	74	N/A	N/A	81	N/A	N/A	6615866
D9-EtFOSE	%	80	N/A	N/A	76	N/A	N/A	85	N/A	N/A	6615866

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 (N-Methylperfluorooctane sulfonamide - 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 (N-Ethylperfluorooctane sulfonamide - EtFOSA).

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BV Labs Job #: C047342
Report Date: 2020/03/09

Barnstable County
Client Project #: BARNSTABLE COUNTY
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK808			MBK809			MBK810			
Sampling Date		2020/02/18 13:10			2020/02/18 08:00			2020/02/19 10:30			
COC Number		747591-02-01			747591-02-01			747591-02-01			
	UNITS	PFW-5	RDL	MDL	DUPLICATE 1	RDL	MDL	PC-39	RDL	MDL	QC Batch
Perfluorinated Compounds											
Perfluorobutanoic acid (PFBA)	ug/L	0.017	0.020	0.0070	0.068	0.10	0.035	<0.0070	0.020	0.0070	6615866
Perfluoropentanoic acid (PFPeA)	ug/L	0.073	0.020	0.0041	0.30	0.10	0.021	0.027	0.020	0.0041	6615866
Perfluorohexanoic acid (PFHxA)	ug/L	0.089	0.020	0.0064	0.31	0.10	0.032	0.044	0.020	0.0064	6615866
Perfluoroheptanoic acid (PFHpA)	ug/L	0.056	0.020	0.0071	0.20	0.10	0.036	0.028	0.020	0.0071	6615866
Perfluorooctanoic acid (PFOA)	ug/L	0.088	0.020	0.0074	0.23	0.10	0.037	0.028	0.020	0.0074	6615866
Perfluorononanoic acid (PFNA)	ug/L	0.011	0.020	0.0049	0.23	0.10	0.025	0.061	0.020	0.0049	6615866
Perfluorodecanoic acid (PFDA)	ug/L	0.010	0.020	0.0041	0.21	0.10	0.021	<0.0041	0.020	0.0041	6615866
Perfluoroundecanoic acid (PFUnA)	ug/L	0.034	0.020	0.0043	0.12	0.10	0.022	0.013	0.020	0.0043	6615866
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0068	0.020	0.0068	<0.034	0.10	0.034	<0.0068	0.020	0.0068	6615866
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0069	0.020	0.0069	<0.035	0.10	0.035	<0.0069	0.020	0.0069	6615866
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0067	0.020	0.0067	<0.034	0.10	0.034	<0.0067	0.020	0.0067	6615866
Perfluorobutanesulfonic acid (PFBS)	ug/L	0.0097	0.020	0.0051	<0.026	0.10	0.026	<0.0051	0.020	0.0051	6615866
Perfluorohexanesulfonic acid(PFHxS)	ug/L	0.36	0.020	0.0052	1.1	0.10	0.026	0.10	0.020	0.0052	6615866
Perfluoroheptanesulfonic acid PFHpS	ug/L	<0.0033	0.020	0.0033	0.066	0.10	0.017	<0.0033	0.020	0.0033	6615866
Perfluorooctanesulfonic acid (PFOS)	ug/L	1.0	0.020	0.0052	23	1.0	0.026	0.82	0.020	0.0052	6615866
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0072	0.020	0.0072	<0.036	0.10	0.036	<0.0072	0.020	0.0072	6615866
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.074	0.020	0.0066	<0.033	0.10	0.033	<0.0066	0.020	0.0066	6615866
EtFOSA	ug/L	<0.0090	0.020	0.0090	<0.045	0.10	0.045	<0.0090	0.020	0.0090	6615866
MeFOSA	ug/L	<0.0035	0.020	0.0035	<0.018	0.10	0.018	<0.0035	0.020	0.0035	6615866
EtFOSE	ug/L	<0.0094	0.020	0.0094	<0.047	0.10	0.047	<0.0094	0.020	0.0094	6615866
MeFOSE	ug/L	<0.0066	0.020	0.0066	<0.033	0.10	0.033	<0.0066	0.020	0.0066	6615866
6:2 Fluorotelomer sulfonic acid	ug/L	0.15	0.020	0.0059	0.71	0.10	0.030	<0.0059	0.020	0.0059	6615866
8:2 Fluorotelomer sulfonic acid	ug/L	0.14	0.020	0.0059	3.8	0.10	0.030	<0.0059	0.020	0.0059	6615866
Surrogate Recovery (%)											
13C2-6:2-Fluorotelomersulfonic Acid	%	92	N/A	N/A	93	N/A	N/A	97	N/A	N/A	6615866
13C2-8:2-Fluorotelomersulfonic Acid	%	92	N/A	N/A	92	N/A	N/A	98	N/A	N/A	6615866
13C2-Perfluorodecanoic acid	%	88	N/A	N/A	91	N/A	N/A	92	N/A	N/A	6615866
13C2-Perfluorododecanoic acid	%	77	N/A	N/A	89	N/A	N/A	83	N/A	N/A	6615866
13C2-Perfluorohexanoic acid	%	96	N/A	N/A	97	N/A	N/A	98	N/A	N/A	6615866
13C2-perfluorotetradecanoic acid	%	75	N/A	N/A	89	N/A	N/A	89	N/A	N/A	6615866
13C2-Perfluoroundecanoic acid	%	84	N/A	N/A	92	N/A	N/A	89	N/A	N/A	6615866
13C3-Perfluorobutanesulfonic acid	%	96	N/A	N/A	98	N/A	N/A	96	N/A	N/A	6615866
13C4-Perfluorobutanoic acid	%	97	N/A	N/A	96	N/A	N/A	96	N/A	N/A	6615866
13C4-Perfluoroheptanoic acid	%	97	N/A	N/A	96	N/A	N/A	97	N/A	N/A	6615866

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

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PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK808			MBK809			MBK810			
Sampling Date		2020/02/18 13:10			2020/02/18 08:00			2020/02/19 10:30			
COC Number		747591-02-01			747591-02-01			747591-02-01			
	UNITS	PFW-5	RDL	MDL	DUPLICATE 1	RDL	MDL	PC-39	RDL	MDL	QC Batch
13C4-Perfluorooctanesulfonic acid	%	90	N/A	N/A	98	N/A	N/A	96	N/A	N/A	6615866
13C4-Perfluorooctanoic acid	%	94	N/A	N/A	95	N/A	N/A	96	N/A	N/A	6615866
13C5-Perfluorononanoic acid	%	94	N/A	N/A	96	N/A	N/A	97	N/A	N/A	6615866
13C5-Perfluoropentanoic acid	%	96	N/A	N/A	94	N/A	N/A	97	N/A	N/A	6615866
13C8-Perfluorooctane Sulfonamide	%	80	N/A	N/A	83	N/A	N/A	87	N/A	N/A	6615866
18O2-Perfluorohexanesulfonic acid	%	93	N/A	N/A	97	N/A	N/A	96	N/A	N/A	6615866
D3-MeFOSA	%	61	N/A	N/A	47 (1)	N/A	N/A	69	N/A	N/A	6615866
D5-EtFOSA	%	60	N/A	N/A	49 (2)	N/A	N/A	71	N/A	N/A	6615866
D7-MeFOSE	%	70	N/A	N/A	72	N/A	N/A	88	N/A	N/A	6615866
D9-EtFOSE	%	72	N/A	N/A	77	N/A	N/A	86	N/A	N/A	6615866

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 (N-Methylperfluorooctane sulfonamide - 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 (N-Ethylperfluorooctane sulfonamide - EtFOSA).

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PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK811		MBK812			MBK813			
Sampling Date		2020/02/19 11:30		2020/02/19 11:35			2020/02/19 12:20			
COC Number		747591-02-01		747591-02-01			747591-02-01			
	UNITS	PC-16D	QC Batch	PC-30	RDL	MDL	PC-11	RDL	MDL	QC Batch
Perfluorinated Compounds										
Perfluorobutanoic acid (PFBA)	ug/L	0.052	6615866	0.051	0.020	0.0070	0.11	0.040	0.014	6617916
Perfluoropentanoic acid (PFPeA)	ug/L	0.16	6615866	0.15	0.020	0.0041	0.45	0.040	0.0082	6617916
Perfluorohexanoic acid (PFHxA)	ug/L	0.16	6615866	0.15	0.020	0.0064	0.61	0.040	0.013	6617916
Perfluoroheptanoic acid (PFHpA)	ug/L	0.092	6615866	0.087	0.020	0.0071	0.21	0.040	0.014	6617916
Perfluorooctanoic acid (PFOA)	ug/L	0.13	6615866	0.074	0.020	0.0074	0.29	0.040	0.015	6617916
Perfluorononanoic acid (PFNA)	ug/L	0.11	6615866	0.074	0.020	0.0049	0.14	0.040	0.0098	6617916
Perfluorodecanoic acid (PFDA)	ug/L	0.0072	6615866	0.0059	0.020	0.0041	0.069	0.040	0.0082	6617916
Perfluoroundecanoic acid (PFUnA)	ug/L	0.015	6615866	0.024	0.020	0.0043	0.12	0.040	0.0086	6617916
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0068	6615866	<0.0068	0.020	0.0068	<0.014	0.040	0.014	6617916
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0069	6615866	<0.0069	0.020	0.0069	<0.014	0.040	0.014	6617916
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0067	6615866	<0.0067	0.020	0.0067	<0.013	0.040	0.013	6617916
Perfluorobutanesulfonic acid (PFBS)	ug/L	0.017	6615866	0.0083	0.020	0.0051	0.044	0.040	0.010	6617916
Perfluorohexanesulfonic acid(PFHxS)	ug/L	0.36	6615866	0.21	0.020	0.0052	1.3	0.040	0.010	6617916
Perfluoroheptanesulfonic acid PFHpS	ug/L	0.026	6615866	0.0072	0.020	0.0033	0.028	0.040	0.0066	6617916
Perfluorooctanesulfonic acid (PFOS)	ug/L	1.6	6615866	1.2	0.20	0.052	18	0.40	0.10	6617916
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0072	6615866	<0.0072	0.020	0.0072	<0.014	0.040	0.014	6617916
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.0066	6615866	<0.0066	0.020	0.0066	<0.013	0.040	0.013	6617916
EtFOSA	ug/L	<0.0090	6615866	<0.0090	0.020	0.0090	<0.018	0.040	0.018	6617916
MeFOSA	ug/L	<0.0035	6615866	<0.0035	0.020	0.0035	<0.0070	0.040	0.0070	6617916
EtFOSE	ug/L	<0.0094	6615866	<0.0094	0.020	0.0094	<0.019	0.040	0.019	6617916
MeFOSE	ug/L	<0.0066	6615866	<0.0066	0.020	0.0066	<0.013	0.040	0.013	6617916
6:2 Fluorotelomer sulfonic acid	ug/L	0.12	6615866	0.022	0.020	0.0059	1.4	0.040	0.012	6617916
8:2 Fluorotelomer sulfonic acid	ug/L	0.022	6615866	<0.0059	0.020	0.0059	1.6	0.040	0.012	6617916
Surrogate Recovery (%)										
13C2-6:2-Fluorotelomersulfonic Acid	%	93	6615866	111	N/A	N/A	98	N/A	N/A	6617916
13C2-8:2-Fluorotelomersulfonic Acid	%	92	6615866	111	N/A	N/A	105	N/A	N/A	6617916
13C2-Perfluorodecanoic acid	%	88	6615866	105	N/A	N/A	104	N/A	N/A	6617916
13C2-Perfluorododecanoic acid	%	78	6615866	85	N/A	N/A	91	N/A	N/A	6617916
13C2-Perfluorohexanoic acid	%	96	6615866	117	N/A	N/A	115	N/A	N/A	6617916
13C2-perfluorotetradecanoic acid	%	54	6615866	78	N/A	N/A	89	N/A	N/A	6617916
13C2-Perfluoroundecanoic acid	%	84	6615866	95	N/A	N/A	96	N/A	N/A	6617916
13C3-Perfluorobutanesulfonic acid	%	94	6615866	103	N/A	N/A	105	N/A	N/A	6617916
13C4-Perfluorobutanoic acid	%	93	6615866	108	N/A	N/A	109	N/A	N/A	6617916
13C4-Perfluoroheptanoic acid	%	95	6615866	115	N/A	N/A	114	N/A	N/A	6617916

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

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BV Labs Job #: C047342
Report Date: 2020/03/09

Barnstable County
Client Project #: BARNSTABLE COUNTY
Sampler Initials: MM

PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK811		MBK812			MBK813			
Sampling Date		2020/02/19 11:30		2020/02/19 11:35			2020/02/19 12:20			
COC Number		747591-02-01		747591-02-01			747591-02-01			
	UNITS	PC-16D	QC Batch	PC-30	RDL	MDL	PC-11	RDL	MDL	QC Batch
13C4-Perfluorooctanesulfonic acid	%	93	6615866	109	N/A	N/A	96	N/A	N/A	6617916
13C4-Perfluorooctanoic acid	%	95	6615866	112	N/A	N/A	112	N/A	N/A	6617916
13C5-Perfluorononanoic acid	%	94	6615866	109	N/A	N/A	110	N/A	N/A	6617916
13C5-Perfluoropentanoic acid	%	94	6615866	110	N/A	N/A	111	N/A	N/A	6617916
13C8-Perfluorooctane Sulfonamide	%	83	6615866	89	N/A	N/A	86	N/A	N/A	6617916
18O2-Perfluorohexanesulfonic acid	%	94	6615866	103	N/A	N/A	102	N/A	N/A	6617916
D3-MeFOSA	%	65	6615866	60	N/A	N/A	64	N/A	N/A	6617916
D5-EtFOSA	%	66	6615866	55	N/A	N/A	63	N/A	N/A	6617916
D7-MeFOSE	%	78	6615866	70	N/A	N/A	74	N/A	N/A	6617916
D9-EtFOSE	%	78	6615866	68	N/A	N/A	74	N/A	N/A	6617916

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

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PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK814		MBK815			MBK816			
Sampling Date		2020/02/19 12:20		2020/02/19 13:30			2020/02/19 15:20			
COC Number		747591-02-01		747591-01-01			747591-01-01			
	UNITS	PC-6A	MDL	PC-1	RDL	MDL	PC-28	RDL	MDL	QC Batch
Perfluorinated Compounds										
Perfluorobutanoic acid (PFBA)	ug/L	0.041	0.0070	0.093	0.020	0.0070	<0.0070	0.020	0.0070	6617916
Perfluoropentanoic acid (PFPeA)	ug/L	0.12	0.0041	0.33	0.020	0.0041	0.021	0.020	0.0041	6617916
Perfluorohexanoic acid (PFHxA)	ug/L	0.12	0.0064	0.26	0.020	0.0064	0.024	0.020	0.0064	6617916
Perfluoroheptanoic acid (PFHpA)	ug/L	0.071	0.0071	0.24	0.020	0.0071	0.023	0.020	0.0071	6617916
Perfluorooctanoic acid (PFOA)	ug/L	0.067	0.0074	0.18	0.020	0.0074	<0.0074	0.020	0.0074	6617916
Perfluorononanoic acid (PFNA)	ug/L	0.065	0.0049	0.070	0.020	0.0049	<0.0049	0.020	0.0049	6617916
Perfluorodecanoic acid (PFDA)	ug/L	0.0059	0.0041	0.020	0.020	0.0041	<0.0041	0.020	0.0041	6617916
Perfluoroundecanoic acid (PFUnA)	ug/L	0.055	0.0043	0.27	0.020	0.0043	<0.0043	0.020	0.0043	6617916
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0068	0.0068	<0.0068	0.020	0.0068	<0.0068	0.020	0.0068	6617916
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0069	0.0069	<0.0069	0.020	0.0069	<0.0069	0.020	0.0069	6617916
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0067	0.0067	<0.0067	0.020	0.0067	<0.0067	0.020	0.0067	6617916
Perfluorobutanesulfonic acid (PFBS)	ug/L	<0.0051	0.0051	0.012	0.020	0.0051	<0.0051	0.020	0.0051	6617916
Perfluorohexanesulfonic acid(PFHxS)	ug/L	0.18	0.0052	0.45	0.020	0.0052	0.072	0.020	0.0052	6617916
Perfluoroheptanesulfonic acid PFHpS	ug/L	0.0052	0.0033	0.0056	0.020	0.0033	<0.0033	0.020	0.0033	6617916
Perfluorooctanesulfonic acid (PFOS)	ug/L	1.6	0.0052	1.7	0.20	0.052	0.27	0.020	0.0052	6617916
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0072	0.0072	<0.0072	0.020	0.0072	<0.0072	0.020	0.0072	6617916
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.0066	0.0066	<0.0066	0.020	0.0066	<0.0066	0.020	0.0066	6617916
EtFOSA	ug/L	<0.0090	0.0090	<0.0090	0.020	0.0090	<0.0090	0.020	0.0090	6617916
MeFOSA	ug/L	<0.0035	0.0035	<0.0035	0.020	0.0035	<0.0035	0.020	0.0035	6617916
EtFOSE	ug/L	<0.0094	0.0094	<0.0094	0.020	0.0094	<0.0094	0.020	0.0094	6617916
MeFOSE	ug/L	<0.0066	0.0066	<0.0066	0.020	0.0066	<0.0066	0.020	0.0066	6617916
6:2 Fluorotelomer sulfonic acid	ug/L	0.0072	0.0059	0.48	0.020	0.0059	0.0063	0.020	0.0059	6617916
8:2 Fluorotelomer sulfonic acid	ug/L	<0.0059	0.0059	0.49	0.020	0.0059	<0.0059	0.020	0.0059	6617916
Surrogate Recovery (%)										
13C2-6:2-Fluorotelomersulfonic Acid	%	113	N/A	100	N/A	N/A	109	N/A	N/A	6617916
13C2-8:2-Fluorotelomersulfonic Acid	%	116	N/A	107	N/A	N/A	101	N/A	N/A	6617916
13C2-Perfluorodecanoic acid	%	109	N/A	73	N/A	N/A	99	N/A	N/A	6617916
13C2-Perfluorododecanoic acid	%	95	N/A	78	N/A	N/A	89	N/A	N/A	6617916
13C2-Perfluorohexanoic acid	%	125	N/A	103	N/A	N/A	119	N/A	N/A	6617916
13C2-perfluorotetradecanoic acid	%	84	N/A	59	N/A	N/A	60	N/A	N/A	6617916
13C2-Perfluoroundecanoic acid	%	100	N/A	78	N/A	N/A	92	N/A	N/A	6617916
13C3-Perfluorobutanesulfonic acid	%	110	N/A	99	N/A	N/A	103	N/A	N/A	6617916
13C4-Perfluorobutanoic acid	%	117	N/A	102	N/A	N/A	107	N/A	N/A	6617916
13C4-Perfluoroheptanoic acid	%	122	N/A	100	N/A	N/A	117	N/A	N/A	6617916

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

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PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK814		MBK815			MBK816			
Sampling Date		2020/02/19 12:20		2020/02/19 13:30			2020/02/19 15:20			
COC Number		747591-02-01		747591-01-01			747591-01-01			
	UNITS	PC-6A	MDL	PC-1	RDL	MDL	PC-28	RDL	MDL	QC Batch
13C4-Perfluorooctanesulfonic acid	%	107	N/A	99	N/A	N/A	95	N/A	N/A	6617916
13C4-Perfluorooctanoic acid	%	117	N/A	98	N/A	N/A	111	N/A	N/A	6617916
13C5-Perfluorononanoic acid	%	115	N/A	88	N/A	N/A	108	N/A	N/A	6617916
13C5-Perfluoropentanoic acid	%	118	N/A	99	N/A	N/A	113	N/A	N/A	6617916
13C8-Perfluorooctane Sulfonamide	%	94	N/A	80	N/A	N/A	90	N/A	N/A	6617916
18O2-Perfluorohexanesulfonic acid	%	109	N/A	99	N/A	N/A	105	N/A	N/A	6617916
D3-MeFOSA	%	67	N/A	62	N/A	N/A	59	N/A	N/A	6617916
D5-EtFOSA	%	65	N/A	59	N/A	N/A	57	N/A	N/A	6617916
D7-MeFOSE	%	75	N/A	76	N/A	N/A	73	N/A	N/A	6617916
D9-EtFOSE	%	78	N/A	71	N/A	N/A	70	N/A	N/A	6617916

RDL = Reportable Detection Limit
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N/A = Not Applicable

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PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK817			MBK818	MBK819			
Sampling Date		2020/02/19 14:10			2020/02/19 13:25	2020/02/19 15:30			
COC Number		747591-01-01			747591-01-01	747591-01-01			
	UNITS	MW-12	RDL	MDL	MW-22	RINSATE BLANK	RDL	MDL	QC Batch
Perfluorinated Compounds									
Perfluorobutanoic acid (PFBA)	ug/L	0.19	0.020	0.0070	0.010	<0.0070	0.020	0.0070	6617916
Perfluoropentanoic acid (PFPeA)	ug/L	0.72	0.020	0.0041	0.050	<0.0041	0.020	0.0041	6617916
Perfluorohexanoic acid (PFHxA)	ug/L	0.55	0.020	0.0064	0.084	<0.0064	0.020	0.0064	6617916
Perfluoroheptanoic acid (PFHpA)	ug/L	0.39	0.020	0.0071	0.038	<0.0071	0.020	0.0071	6617916
Perfluorooctanoic acid (PFOA)	ug/L	0.58	0.020	0.0074	0.23	<0.0074	0.020	0.0074	6617916
Perfluorononanoic acid (PFNA)	ug/L	0.078	0.020	0.0049	0.0050	<0.0049	0.020	0.0049	6617916
Perfluorodecanoic acid (PFDA)	ug/L	0.0075	0.020	0.0041	<0.0041	<0.0041	0.020	0.0041	6617916
Perfluoroundecanoic acid (PFUnA)	ug/L	0.0052	0.020	0.0043	<0.0043	<0.0043	0.020	0.0043	6617916
Perfluorododecanoic acid (PFDoA)	ug/L	<0.0068	0.020	0.0068	<0.0068	<0.0068	0.020	0.0068	6617916
Perfluorotridecanoic acid (PFTRDA)	ug/L	<0.0069	0.020	0.0069	<0.0069	<0.0069	0.020	0.0069	6617916
Perfluorotetradecanoic acid(PFTEDA)	ug/L	<0.0067	0.020	0.0067	<0.0067	<0.0067	0.020	0.0067	6617916
Perfluorobutanesulfonic acid (PFBS)	ug/L	0.013	0.020	0.0051	<0.0051	<0.0051	0.020	0.0051	6617916
Perfluorohexanesulfonic acid(PFHxS)	ug/L	1.2	0.020	0.0052	0.54	<0.0052	0.020	0.0052	6617916
Perfluoroheptanesulfonic acid PFHpS	ug/L	0.036	0.020	0.0033	0.0036	<0.0033	0.020	0.0033	6617916
Perfluorooctanesulfonic acid (PFOS)	ug/L	3.1	0.20	0.052	0.46	<0.0052	0.020	0.0052	6617916
Perfluorodecanesulfonic acid (PFDS)	ug/L	<0.0072	0.020	0.0072	<0.0072	<0.0072	0.020	0.0072	6617916
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.098	0.020	0.0066	<0.0066	<0.0066	0.020	0.0066	6617916
EtFOSA	ug/L	<0.0090	0.020	0.0090	<0.0090	<0.0090	0.020	0.0090	6617916
MeFOSA	ug/L	<0.0035	0.020	0.0035	<0.0035	<0.0035	0.020	0.0035	6617916
EtFOSE	ug/L	<0.0094	0.020	0.0094	<0.0094	<0.0094	0.020	0.0094	6617916
MeFOSE	ug/L	<0.0066	0.020	0.0066	<0.0066	<0.0066	0.020	0.0066	6617916
6:2 Fluorotelomer sulfonic acid	ug/L	0.87	0.020	0.0059	<0.0059	<0.0059	0.020	0.0059	6617916
8:2 Fluorotelomer sulfonic acid	ug/L	0.020	0.020	0.0059	<0.0059	<0.0059	0.020	0.0059	6617916
Surrogate Recovery (%)									
13C2-6:2-Fluorotelomersulfonic Acid	%	101	N/A	N/A	106	132	N/A	N/A	6617916
13C2-8:2-Fluorotelomersulfonic Acid	%	116	N/A	N/A	105	127	N/A	N/A	6617916
13C2-Perfluorodecanoic acid	%	120	N/A	N/A	103	123	N/A	N/A	6617916
13C2-Perfluorododecanoic acid	%	102	N/A	N/A	91	108	N/A	N/A	6617916
13C2-Perfluorohexanoic acid	%	131	N/A	N/A	123	144	N/A	N/A	6617916
13C2-perfluorotetradecanoic acid	%	95	N/A	N/A	81	97	N/A	N/A	6617916
13C2-Perfluoroundecanoic acid	%	112	N/A	N/A	96	118	N/A	N/A	6617916
13C3-Perfluorobutanesulfonic acid	%	117	N/A	N/A	106	125	N/A	N/A	6617916
13C4-Perfluorobutanoic acid	%	121	N/A	N/A	114	139	N/A	N/A	6617916
13C4-Perfluoroheptanoic acid	%	129	N/A	N/A	119	141	N/A	N/A	6617916

RDL = Reportable Detection Limit
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N/A = Not Applicable

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PERFLUOROALKYL SUBSTANCES (WATER)

BV Labs ID		MBK817			MBK818	MBK819			
Sampling Date		2020/02/19 14:10			2020/02/19 13:25	2020/02/19 15:30			
COC Number		747591-01-01			747591-01-01	747591-01-01			
	UNITS	MW-12	RDL	MDL	MW-22	RINSATE BLANK	RDL	MDL	QC Batch
13C4-Perfluorooctanesulfonic acid	%	113	N/A	N/A	97	116	N/A	N/A	6617916
13C4-Perfluorooctanoic acid	%	124	N/A	N/A	113	136	N/A	N/A	6617916
13C5-Perfluorononanoic acid	%	122	N/A	N/A	106	129	N/A	N/A	6617916
13C5-Perfluoropentanoic acid	%	127	N/A	N/A	118	141	N/A	N/A	6617916
13C8-Perfluorooctane Sulfonamide	%	102	N/A	N/A	91	106	N/A	N/A	6617916
18O2-Perfluorohexanesulfonic acid	%	114	N/A	N/A	107	124	N/A	N/A	6617916
D3-MeFOSA	%	64	N/A	N/A	68	80	N/A	N/A	6617916
D5-EtFOSA	%	62	N/A	N/A	66	75	N/A	N/A	6617916
D7-MeFOSE	%	81	N/A	N/A	73	84	N/A	N/A	6617916
D9-EtFOSE	%	80	N/A	N/A	76	86	N/A	N/A	6617916

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

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TEST SUMMARY

BV Labs ID: MBK805 **Collected:** 2020/02/18
Sample ID: HSW-1 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6615866	2020/03/03	2020/03/03	Adnan Khan

BV Labs ID: MBK806 **Collected:** 2020/02/18
Sample ID: PFW-1 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6615866	2020/03/03	2020/03/04	Adnan Khan

BV Labs ID: MBK807 **Collected:** 2020/02/18
Sample ID: OW-8A **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6615866	2020/03/03	2020/03/03	Adnan Khan

BV Labs ID: MBK808 **Collected:** 2020/02/18
Sample ID: PFW-5 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6615866	2020/03/03	2020/03/03	Adnan Khan

BV Labs ID: MBK809 **Collected:** 2020/02/18
Sample ID: DUPLICATE 1 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6615866	2020/03/03	2020/03/04	Adnan Khan

BV Labs ID: MBK810 **Collected:** 2020/02/19
Sample ID: PC-39 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6615866	2020/03/03	2020/03/03	Adnan Khan

BV Labs ID: MBK811 **Collected:** 2020/02/19
Sample ID: PC-16D **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6615866	2020/03/03	2020/03/03	Adnan Khan

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TEST SUMMARY

BV Labs ID: MBK812 **Collected:** 2020/02/19
Sample ID: PC-30 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6617916	2020/03/04	2020/03/06	Patrick Yu Peng Li

BV Labs ID: MBK813 **Collected:** 2020/02/19
Sample ID: PC-11 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6617916	2020/03/04	2020/03/06	Patrick Yu Peng Li

BV Labs ID: MBK814 **Collected:** 2020/02/19
Sample ID: PC-6A **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6617916	2020/03/04	2020/03/06	Patrick Yu Peng Li

BV Labs ID: MBK815 **Collected:** 2020/02/19
Sample ID: PC-1 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6617916	2020/03/04	2020/03/06	Patrick Yu Peng Li

BV Labs ID: MBK816 **Collected:** 2020/02/19
Sample ID: PC-28 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6617916	2020/03/04	2020/03/06	Patrick Yu Peng Li

BV Labs ID: MBK817 **Collected:** 2020/02/19
Sample ID: MW-12 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6617916	2020/03/04	2020/03/06	Patrick Yu Peng Li

BV Labs ID: MBK818 **Collected:** 2020/02/19
Sample ID: MW-22 **Shipped:**
Matrix: Water **Received:** 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6617916	2020/03/04	2020/03/06	Patrick Yu Peng Li

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BV Labs Job #: C047342
Report Date: 2020/03/09

Barnstable County
Client Project #: BARNSTABLE COUNTY
Sampler Initials: MM

TEST SUMMARY

BV Labs ID: MBK819
Sample ID: RINSATE BLANK
Matrix: Water

Collected: 2020/02/19
Shipped:
Received: 2020/02/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFAS in water by SPE/LCMS	LCMS	6617916	2020/03/04	2020/03/06	Patrick Yu Peng Li

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GENERAL COMMENTS

Sample MBK806 [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 MBK809 [DUPLICATE 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 MBK811 [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 MBK812 [PC-30] : 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 MBK813 [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 MBK814 [PC-6A] : 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 MBK815 [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 MBK817 [MW-12] : 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.

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
6615866	AKH	Spiked Blank	13C2-6:2-Fluorotelomersulfonic Acid	2020/03/03		96	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/03/03		103	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/03/03		99	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/03/03		90	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/03/03		101	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/03/03		82	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/03/03		99	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/03/03		102	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/03/03		103	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/03/03		101	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/03/03		103	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/03/03		102	%	50 - 150
			13C5-Perfluorononanoic acid	2020/03/03		103	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/03/03		102	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/03/03		86	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2020/03/03		104	%	50 - 150
			D3-MeFOSA	2020/03/03		58	%	50 - 150
			D5-EtFOSA	2020/03/03		57	%	50 - 150
			D7-MeFOSE	2020/03/03		75	%	50 - 150
			D9-EtFOSE	2020/03/03		77	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/03/03		97	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2020/03/03		101	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2020/03/03		104	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2020/03/03		103	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2020/03/03		108	%	70 - 130
			Perfluorononanoic acid (PFNA)	2020/03/03		102	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2020/03/03		101	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2020/03/03		103	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2020/03/03		101	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2020/03/03		107	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/03		105	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2020/03/03		96	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/03		102	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2020/03/03		102	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2020/03/03		101	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2020/03/03		99	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/03		102	%	70 - 130
			EtFOSA	2020/03/03		110	%	70 - 130
			MeFOSA	2020/03/03		106	%	70 - 130
			EtFOSE	2020/03/03		106	%	70 - 130
			MeFOSE	2020/03/03		105	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2020/03/03		111	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2020/03/03		106	%	70 - 130
6615866	AKH	Spiked Blank DUP	13C2-6:2-Fluorotelomersulfonic Acid	2020/03/03		99	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/03/03		100	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/03/03		98	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/03/03		87	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/03/03		103	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/03/03		85	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/03/03		94	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/03/03		102	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/03/03		105	%	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-Perfluoroheptanoic acid	2020/03/03		105	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/03/03		98	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/03/03		103	%	50 - 150
			13C5-Perfluorononanoic acid	2020/03/03		103	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/03/03		103	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/03/03		85	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2020/03/03		103	%	50 - 150
			D3-MeFOSA	2020/03/03		67	%	50 - 150
			D5-EtFOSA	2020/03/03		70	%	50 - 150
			D7-MeFOSE	2020/03/03		78	%	50 - 150
			D9-EtFOSE	2020/03/03		79	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/03/03		96	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2020/03/03		100	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2020/03/03		103	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2020/03/03		100	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2020/03/03		105	%	70 - 130
			Perfluorononanoic acid (PFNA)	2020/03/03		101	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2020/03/03		100	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2020/03/03		103	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2020/03/03		102	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2020/03/03		106	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/03		104	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2020/03/03		96	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/03		100	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2020/03/03		99	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2020/03/03		105	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2020/03/03		91	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/03		101	%	70 - 130
			EtFOSA	2020/03/03		103	%	70 - 130
			MeFOSA	2020/03/03		103	%	70 - 130
			EtFOSE	2020/03/03		106	%	70 - 130
			MeFOSE	2020/03/03		105	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2020/03/03		105	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2020/03/03		106	%	70 - 130
6615866	AKH	RPD	Perfluorobutanoic acid (PFBA)	2020/03/03	1.2		%	30
			Perfluoropentanoic acid (PFPeA)	2020/03/03	0.28		%	30
			Perfluorohexanoic acid (PFHxA)	2020/03/03	1.2		%	30
			Perfluoroheptanoic acid (PFHpA)	2020/03/03	3.1		%	30
			Perfluorooctanoic acid (PFOA)	2020/03/03	2.9		%	30
			Perfluorononanoic acid (PFNA)	2020/03/03	1.7		%	30
			Perfluorodecanoic acid (PFDA)	2020/03/03	1.1		%	30
			Perfluoroundecanoic acid (PFUnA)	2020/03/03	0.52		%	30
			Perfluorododecanoic acid (PFDoA)	2020/03/03	1.8		%	30
			Perfluorotridecanoic acid (PFTRDA)	2020/03/03	1.6		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/03	0.89		%	30
			Perfluorobutanesulfonic acid (PFBS)	2020/03/03	0.20		%	30
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/03	1.8		%	30
			Perfluoroheptanesulfonic acid PFHpS	2020/03/03	3.2		%	30
			Perfluorooctanesulfonic acid (PFOS)	2020/03/03	3.8		%	30
			Perfluorodecanesulfonic acid (PFDS)	2020/03/03	7.8		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/03	0.38		%	30
			EtFOSA	2020/03/03	6.6		%	30

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			MeFOSA	2020/03/03	2.4		%	30
			EtFOSE	2020/03/03	0.49		%	30
			MeFOSE	2020/03/03	0.061		%	30
			6:2 Fluorotelomer sulfonic acid	2020/03/03	5.8		%	30
			8:2 Fluorotelomer sulfonic acid	2020/03/03	0.25		%	30
6615866	AKH	Method Blank	13C2-6:2-Fluorotelomersulfonic Acid	2020/03/03		108	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/03/03		106	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/03/03		98	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/03/03		86	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/03/03		109	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/03/03		83	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/03/03		93	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/03/03		106	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/03/03		109	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/03/03		109	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/03/03		104	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/03/03		106	%	50 - 150
			13C5-Perfluorononanoic acid	2020/03/03		107	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/03/03		108	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/03/03		90	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2020/03/03		108	%	50 - 150
			D3-MeFOSA	2020/03/03		65	%	50 - 150
			D5-EtFOSA	2020/03/03		64	%	50 - 150
			D7-MeFOSE	2020/03/03		80	%	50 - 150
			D9-EtFOSE	2020/03/03		79	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/03/03	<0.0070		ug/L	
			Perfluoropentanoic acid (PFPeA)	2020/03/03	<0.0041		ug/L	
			Perfluorohexanoic acid (PFHxA)	2020/03/03	<0.0064		ug/L	
			Perfluoroheptanoic acid (PFHpA)	2020/03/03	<0.0071		ug/L	
			Perfluorooctanoic acid (PFOA)	2020/03/03	<0.0074		ug/L	
			Perfluorononanoic acid (PFNA)	2020/03/03	<0.0049		ug/L	
			Perfluorodecanoic acid (PFDA)	2020/03/03	<0.0041		ug/L	
			Perfluoroundecanoic acid (PFUnA)	2020/03/03	<0.0043		ug/L	
			Perfluorododecanoic acid (PFDoA)	2020/03/03	<0.0068		ug/L	
			Perfluorotridecanoic acid (PFTRDA)	2020/03/03	<0.0069		ug/L	
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/03	<0.0067		ug/L	
			Perfluorobutanesulfonic acid (PFBS)	2020/03/03	<0.0051		ug/L	
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/03	<0.0052		ug/L	
			Perfluoroheptanesulfonic acid PFHpS	2020/03/03	<0.0033		ug/L	
			Perfluorooctanesulfonic acid (PFOS)	2020/03/03	<0.0052		ug/L	
			Perfluorodecanesulfonic acid (PFDS)	2020/03/03	<0.0072		ug/L	
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/03	<0.0066		ug/L	
			EtFOSA	2020/03/03	<0.0090		ug/L	
			MeFOSA	2020/03/03	<0.0035		ug/L	
			EtFOSE	2020/03/03	<0.0094		ug/L	
			MeFOSE	2020/03/03	<0.0066		ug/L	
			6:2 Fluorotelomer sulfonic acid	2020/03/03	<0.0059		ug/L	
			8:2 Fluorotelomer sulfonic acid	2020/03/03	<0.0059		ug/L	
6617916	YPL	Spiked Blank	13C2-6:2-Fluorotelomersulfonic Acid	2020/03/06		103	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/03/06		103	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/03/06		103	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/03/06		94	%	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-Perfluorohexanoic acid	2020/03/06		106	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/03/06		89	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/03/06		98	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/03/06		99	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/03/06		103	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/03/06		108	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/03/06		99	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/03/06		109	%	50 - 150
			13C5-Perfluorononanoic acid	2020/03/06		107	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/03/06		105	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/03/06		92	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2020/03/06		102	%	50 - 150
			D3-MeFOSA	2020/03/06		73	%	50 - 150
			D5-EtFOSA	2020/03/06		69	%	50 - 150
			D7-MeFOSE	2020/03/06		78	%	50 - 150
			D9-EtFOSE	2020/03/06		80	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/03/06		102	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2020/03/06		108	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2020/03/06		109	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2020/03/06		107	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2020/03/06		111	%	70 - 130
			Perfluorononanoic acid (PFNA)	2020/03/06		107	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2020/03/06		107	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2020/03/06		107	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2020/03/06		109	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2020/03/06		111	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/06		109	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2020/03/06		105	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/06		107	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2020/03/06		103	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2020/03/06		114	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2020/03/06		101	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/06		106	%	70 - 130
			EtFOSA	2020/03/06		111	%	70 - 130
			MeFOSA	2020/03/06		107	%	70 - 130
			EtFOSE	2020/03/06		114	%	70 - 130
			MeFOSE	2020/03/06		117	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2020/03/06		112	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2020/03/06		111	%	70 - 130
6617916	YPL	Spiked Blank DUP	13C2-6:2-Fluorotelomersulfonic Acid	2020/03/06		104	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/03/06		105	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/03/06		103	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/03/06		96	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/03/06		109	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/03/06		90	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/03/06		101	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/03/06		102	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/03/06		106	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/03/06		111	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/03/06		106	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/03/06		110	%	50 - 150
			13C5-Perfluorononanoic acid	2020/03/06		107	%	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
			13C5-Perfluoropentanoic acid	2020/03/06		108	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/03/06		91	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2020/03/06		105	%	50 - 150
			D3-MeFOSA	2020/03/06		77	%	50 - 150
			D5-EtFOSA	2020/03/06		73	%	50 - 150
			D7-MeFOSE	2020/03/06		82	%	50 - 150
			D9-EtFOSE	2020/03/06		83	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/03/06		98	%	70 - 130
			Perfluoropentanoic acid (PFPeA)	2020/03/06		107	%	70 - 130
			Perfluorohexanoic acid (PFHxA)	2020/03/06		108	%	70 - 130
			Perfluoroheptanoic acid (PFHpA)	2020/03/06		105	%	70 - 130
			Perfluorooctanoic acid (PFOA)	2020/03/06		110	%	70 - 130
			Perfluorononanoic acid (PFNA)	2020/03/06		106	%	70 - 130
			Perfluorodecanoic acid (PFDA)	2020/03/06		106	%	70 - 130
			Perfluoroundecanoic acid (PFUnA)	2020/03/06		104	%	70 - 130
			Perfluorododecanoic acid (PFDoA)	2020/03/06		106	%	70 - 130
			Perfluorotridecanoic acid (PFTRDA)	2020/03/06		109	%	70 - 130
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/06		108	%	70 - 130
			Perfluorobutanesulfonic acid (PFBS)	2020/03/06		101	%	70 - 130
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/06		103	%	70 - 130
			Perfluoroheptanesulfonic acid PFHpS	2020/03/06		100	%	70 - 130
			Perfluorooctanesulfonic acid (PFOS)	2020/03/06		105	%	70 - 130
			Perfluorodecanesulfonic acid (PFDS)	2020/03/06		99	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/06		104	%	70 - 130
			EtFOSA	2020/03/06		107	%	70 - 130
			MeFOSA	2020/03/06		104	%	70 - 130
			EtFOSE	2020/03/06		106	%	70 - 130
			MeFOSE	2020/03/06		112	%	70 - 130
			6:2 Fluorotelomer sulfonic acid	2020/03/06		111	%	70 - 130
			8:2 Fluorotelomer sulfonic acid	2020/03/06		110	%	70 - 130
6617916	YPL	RPD	Perfluorobutanoic acid (PFBA)	2020/03/06	3.8		%	30
			Perfluoropentanoic acid (PFPeA)	2020/03/06	1.5		%	30
			Perfluorohexanoic acid (PFHxA)	2020/03/06	1.5		%	30
			Perfluoroheptanoic acid (PFHpA)	2020/03/06	2.0		%	30
			Perfluorooctanoic acid (PFOA)	2020/03/06	0.58		%	30
			Perfluorononanoic acid (PFNA)	2020/03/06	0.33		%	30
			Perfluorodecanoic acid (PFDA)	2020/03/06	0.98		%	30
			Perfluoroundecanoic acid (PFUnA)	2020/03/06	3.3		%	30
			Perfluorododecanoic acid (PFDoA)	2020/03/06	2.3		%	30
			Perfluorotridecanoic acid (PFTRDA)	2020/03/06	1.7		%	30
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/06	0.68		%	30
			Perfluorobutanesulfonic acid (PFBS)	2020/03/06	4.1		%	30
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/06	3.8		%	30
			Perfluoroheptanesulfonic acid PFHpS	2020/03/06	2.9		%	30
			Perfluorooctanesulfonic acid (PFOS)	2020/03/06	8.5		%	30
			Perfluorodecanesulfonic acid (PFDS)	2020/03/06	2.0		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/06	1.6		%	30
			EtFOSA	2020/03/06	3.4		%	30
			MeFOSA	2020/03/06	2.6		%	30
			EtFOSE	2020/03/06	6.6		%	30
			MeFOSE	2020/03/06	4.7		%	30
			6:2 Fluorotelomer sulfonic acid	2020/03/06	1.1		%	30

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			8:2 Fluorotelomer sulfonic acid	2020/03/06	1.1		%	30
6617916	YPL	Method Blank	13C2-6:2-Fluorotelomersulfonic Acid	2020/03/06		123	%	50 - 150
			13C2-8:2-Fluorotelomersulfonic Acid	2020/03/06		118	%	50 - 150
			13C2-Perfluorodecanoic acid	2020/03/06		111	%	50 - 150
			13C2-Perfluorododecanoic acid	2020/03/06		99	%	50 - 150
			13C2-Perfluorohexanoic acid	2020/03/06		122	%	50 - 150
			13C2-perfluorotetradecanoic acid	2020/03/06		94	%	50 - 150
			13C2-Perfluoroundecanoic acid	2020/03/06		106	%	50 - 150
			13C3-Perfluorobutanesulfonic acid	2020/03/06		111	%	50 - 150
			13C4-Perfluorobutanoic acid	2020/03/06		113	%	50 - 150
			13C4-Perfluoroheptanoic acid	2020/03/06		121	%	50 - 150
			13C4-Perfluorooctanesulfonic acid	2020/03/06		107	%	50 - 150
			13C4-Perfluorooctanoic acid	2020/03/06		117	%	50 - 150
			13C5-Perfluorononanoic acid	2020/03/06		114	%	50 - 150
			13C5-Perfluoropentanoic acid	2020/03/06		115	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2020/03/06		97	%	50 - 150
			18O2-Perfluorohexanesulfonic acid	2020/03/06		111	%	50 - 150
			D3-MeFOSA	2020/03/06		61	%	50 - 150
			D5-EtFOSA	2020/03/06		60	%	50 - 150
			D7-MeFOSE	2020/03/06		82	%	50 - 150
			D9-EtFOSE	2020/03/06		79	%	50 - 150
			Perfluorobutanoic acid (PFBA)	2020/03/06	<0.0070		ug/L	
			Perfluoropentanoic acid (PFPeA)	2020/03/06	<0.0041		ug/L	
			Perfluorohexanoic acid (PFHxA)	2020/03/06	<0.0064		ug/L	
			Perfluoroheptanoic acid (PFHpA)	2020/03/06	<0.0071		ug/L	
			Perfluorooctanoic acid (PFOA)	2020/03/06	<0.0074		ug/L	
			Perfluorononanoic acid (PFNA)	2020/03/06	<0.0049		ug/L	
			Perfluorodecanoic acid (PFDA)	2020/03/06	<0.0041		ug/L	
			Perfluoroundecanoic acid (PFUnA)	2020/03/06	<0.0043		ug/L	
			Perfluorododecanoic acid (PFDoA)	2020/03/06	<0.0068		ug/L	
			Perfluorotridecanoic acid (PFTRDA)	2020/03/06	<0.0069		ug/L	
			Perfluorotetradecanoic acid(PFTEDA)	2020/03/06	<0.0067		ug/L	
			Perfluorobutanesulfonic acid (PFBS)	2020/03/06	<0.0051		ug/L	
			Perfluorohexanesulfonic acid(PFHxS)	2020/03/06	<0.0052		ug/L	
			Perfluoroheptanesulfonic acid PFHpS	2020/03/06	<0.0033		ug/L	
			Perfluorooctanesulfonic acid (PFOS)	2020/03/06	<0.0052		ug/L	
			Perfluorodecanesulfonic acid (PFDS)	2020/03/06	<0.0072		ug/L	
			Perfluorooctane Sulfonamide (PFOSA)	2020/03/06	<0.0066		ug/L	
			EtFOSA	2020/03/06	<0.0090		ug/L	
			MeFOSA	2020/03/06	<0.0035		ug/L	
			EtFOSE	2020/03/06	<0.0094		ug/L	
			MeFOSE	2020/03/06	<0.0066		ug/L	
			6:2 Fluorotelomer sulfonic acid	2020/03/06	<0.0059		ug/L	
			8:2 Fluorotelomer sulfonic acid	2020/03/06	<0.0059		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.

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

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

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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21-Feb-20 13:05
Patricia Legette
C047342
YHA ENV-890

Page 1 of 2

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:	
Company Name:	#29803 Barnstable County	Company Name:	BETA	Quotation #:	B57344
Attention:	Accounts Payable	Attention:	Steven Tebo / Roger Thibault	P.O. #:	
Address:	3195 Main Street PO Box 427 Barnstable MA 02630	Address:	701 George Washington Hwy Lincoln, RI 02865	Project:	BARNSTABLE COUNTY
Tel:	(508) 362-3828 Ext: 1234 Fax:	Tel:	(508) 375-6603 Fax:	Project Name:	
Email:	eoconnell@barnstablecounty.org, stebo@barnstableco	Email:	stebo@barnstablecounty.org, rthibault@noverarmstrong	Site #:	BCFRTA
				Sampled By:	

Bottle Order #: 747591
COC #: C#747591-02-01
Project Manager: Patricia Legette

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

Regulation 153 (2011): ☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___

Other Regulations: ☐ CCME ☐ Sanitary Sewer Bylaw ☐ Reg 558 ☐ Storm Sewer Bylaw ☐ MISA Municipality ☐ PWQO ☐ Other

Special Instructions: MassDEP GW-1 std @ 0.020ug/L

Include Criteria on Certificate of Analysis (Y/N)? _____

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects
Regular (Standard) TAT: (will be applied if Rush TAT is not specified) ☒
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
Date Required: _____ Time Required: ____ ☐
Rush Confirmation Number: _____ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	ANALYSIS REQUESTED (PLEASE BE SPECIFIC): 537 m-PFAS (USEPA)	# of Bottles	Comments
1		HSW-1	2020/02/18	1205	GW		X	2	
2		PFW-1	2020/02/18	1205	GW		X	2	
3		OW-8A	2020/02/18	1310	GW		X	2	
4		PFW-5	2020/02/18	1310			X	2	
5		Duplicate 1	2020/02/18	0800			X	2	
6		PC-39	2020/02/19	1030			X	2	
7		PC-16D	2020/02/19	1130			X	2	
8		PC-30	2020/02/19	1135			X	2	
9		PC-11	2020/02/19	1220			X	2	
10		PC-6A	2020/02/19	1220	GW		X	2	

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Mykel Mendes / Mykel Mendes	20/02/20	1400	TRUSHNA PATEL	2020/02/21	13:05	

Laboratory Use Only
Time Sensitive
Temperature (°C) on Recei: 3.2 | 3.8 | 4.0
Custody Seal: Present ✓ Intact ✓ — Yes ✓ — No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

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

White: BV Labs Yellow: Client

Bureau Veritas Canada (2019) Inc.

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

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#29803 Barnstable County / Steve Tebo	Company Name:	BETA	Quotation #:	B57344	BV Labs Job #:	Bottle Order #: 747591
Attention:	Accounts Payable	Attention:	Steven Tebo / Roger Thibault	P.O. #:			
Address:	3195 Main Street PO Box 427 Barnstable MA 02630	Address:	701 George Washington Hwy Lincoln, RI 02865	Project:	BARNSTABLE COUNTY	COC #:	Project Manager:
Tel:	(508) 362-3828 Ext: 1234 Fax:	Tel:	(508) 375-6603 Fax:	Project Name:	BCFRTA	C#747591-01-01	Patricia Legette
Email:	eoconnell@barnstablecounty.org, stebo@barnstableco	Email:	stebo@barnstablecounty.org, rthibault@noverarmstrong	Site #:			
				Sampled By:	Mykel Mendes / Chris Oien		

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

Regulation 153 (2011)
☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ___

Other Regulations
☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558. ☐ Storm Sewer Bylaw
☐ MISA Municipality ___
☐ PWQO
☐ Other ___

Include Criteria on Certificate of Analysis (Y/N)? ___

Special Instructions
MassDEP GW-1 std @ 0.020 ug/L

Field Filtered (please circle): Metals / Hg / Cr VI

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered	PFAS 537 m									# of Bottles	Comments
1		PC-1	2020/02/19	1330	GW		X									2	
2		PC-28	2020/02/19	1530			X									2	
3		MW-12	20/02/19	1410			X									2	
4		MW-22	20/02/19	1325	GW		X									2	
5		Rinsate Blank	20/02/19	1530	GW		X									2	
6																	
7																	
8																	
9																	
10																	

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Mykel Mendes / Mykel Mendes	20/02/20	1400	SEE PAGE 1			

Laboratory Use Only				
Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
		Present		
		Intact		

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

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

White: BV Labs Yellow: Client

Bureau Veritas Canada (2019) Inc.

APPENDIX C
Public Notifications

June 2020

Mark S. Ells, Town Manager
Town of Barnstable
200 Main Street
Hi Marylou,

Hyannis, MA 02601

RE: Immediate Response Action Status and Remedial Monitoring Report #38
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. 39 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 from February 1 to February 29, 2020.

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 February 2020 reporting period, the treatment system was operable for approximately 29 days. The overall (average) system flow rate and total gallons of groundwater treated are based on the available Effluent flow totalizer readings reported for both systems by the O&M contractor. For the period of February 1 to February 29, 2020, both systems treated an approximate combined 0.56 million gallons

of groundwater from the downgradient recovery well PRW-4 at an average total (of the two systems) effluent flow rate of 13.3 gpm.

Approximately 0.007 kilograms of PFAs were estimated to have been removed from the plume area during this reporting period.
PFAs breakthrough into the effluent from the activated carbon treatment system was not observed.

At this time, IRA activities are ongoing. Continuing IRA activities will include operation and monitoring 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. 40 report document.

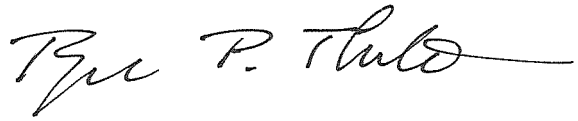
The IRA Status and RMR document is available electronically via the searchable sites database of the MassGOV / MassDEP website via the following link:

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

A copy of the Report is available upon request by contacting the undersigned at BETA at (508) 866.8383. It is also available for review at MassDEP Southeast Regional Office (SERO), 20 Riverside Drive in Lakeville, Massachusetts 02347. You also have the right to request additional Public Involvement activities under 310 CMR 40.1403(9).

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
47 Old Yarmouth Road
Hyannis, MA 02601