IMMEDIATE RESPONSE ACTION PLAN
Modification and Status Report 1

Barnstable Municipal Airport
Hyannis, Massachusetts

RTN 4-26347

April 2017

Prepared for:
Barnstable Municipal Airport
480 Barnstable Road
Hyannis, MA 02840

Prepared by:
Horsley Witten Group, Inc.
90 Route 6A
Sandwich, MA 02563

IMMEDIATE RESPONSE ACTION PLAN MODIFICATION /
IMMEDIATE RESPONSE ACTION STATUS REPORT

BARNSTABLE MUNICIPAL AIRPORT
HYANNIS, MASSACHUSETTS
RTN 4-26347

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1.0 INTRODUCTION

The Horsley Witten Group, Inc. (HW) has been retained by the Barnstable Municipal Airport (the Airport) to develop this Immediate Response Action (IRA) Plan Modification and Status Report for its property at 480 Barnstable Road, Hyannis, Massachusetts (Figure 1). HW has prepared this report in accordance with the Massachusetts Contingency Plan 310 CMR 40.0000 (MCP) on behalf of:

Ms. Katie Servis, Assistant Airport Manager
Barnstable Municipal Airport
Hyannis, Massachusetts 02601
(508) 775-2020

2.0 SUMMARY OF IRAP

An IRA was initiated in response to a Notice of Responsibility (NOR) dated November 10, 2016, issued to the Airport by the Massachusetts Department of Environmental Protection (DEP). The NOR requests that the Airport conduct additional field investigations to evaluate sources of two types of contaminants previously detected at the Airport and on adjacent properties, and to identify potential impacts to public water supply wells operated by the Hyannis Water District at the Mary Dunn and Maher wellfields (Figure 1).

The NOR specifically requests that the Airport investigate perfluoroalkyl substances (PFAS) including perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) previously detected in groundwater at the Airport and several adjacent properties. DEP also requested further evaluation of 1, 4-Dioxane previously detected in a monitoring well downgradient of the Airport on the Maher wellfield property.

The Airport conducted investigations on both contaminants in the past and provided results to DEP. In July 2015, HW sampled groundwater from seven wells for analysis of 1,4-Dioxane. The contaminant was detected in well OW-9DD at a concentration of 0.93 ug/L, above the 0.30 ug/L standard for 1,4-Dioxane. This well is screened from 77 to 87 feet below the ground surface. Samples taken from the other wells at the Airport did not contain 1,4-Dioxane above laboratory reporting levels.

A potential source of 1,4-Dioxane at the Airport is a historic release of 1,1,1-trichloroethane (1,1,1-TCA) from an oil water separator associated with a floor drain in the former Provincetown Boston Airlines hangar (currently leased to Cape Air).

On August 4, 2016 DEP issued a NOR/ Request for Information (RFI) to the Airport requiring investigation of PFAS. In response, the Airport contracted with HW to collect groundwater samples. On July 1 and 5, 2016, HW collected samples from six monitoring wells and submitted samples for laboratory analysis for the presence of PFOS and PFOA. These compounds were detected in each of the wells tested. At monitoring wells HW-3 and HW-5, concentrations were 0.084 and 0.12 ug/L respectively, above the EPA health advisory limit of 0.07 ug/L. Because of the extremely low detection requirements, HW collected confirmatory samples from these two wells. Results showed 0.16 ug/l in HW-3 and 0.12 ug/L in HW-5. The concentrations detected in all the other wells were below the standard. It should be noted that these compounds were also detected in well HW-1, located at the upgradient, western boundary of the Airport.

3.0 APPLICABLE MCP STANDARDS

In accordance with MCP Section 310 CMR 40.0900, the characterization of risk of harm to health, safety public welfare, and the environment must be evaluated at each disposal site. This characterization includes the determination of site-specific soil and groundwater categories based on site location and use, and the comparison of laboratory results to these standards (310 CMR 40.0930).

Groundwater located within a Current Drinking Water Source Area is considered category GW-1. The Airport is located within several zones of contribution (Zone II) for Barnstable Village, the Hyannis Water District and the Town of Yarmouth. Zone IIs are considered current drinking water sources as defined in 310 CMR 40.0006; thus category GW-1 is applicable.

Groundwater located within 30 feet of an occupied building that has an average annual depth of less than 15 feet is categorized as GW-2. This is primarily a concern because of the possibility of vapor impacts to indoor air. The average annual depth to groundwater at the site is greater than 15 feet, therefore GW-2 Standards do not apply. Also, all disposal sites shall be considered a potential source of discharge to surface water, and therefore categorized as GW-3. Based on these criteria, categories GW-1 and GW-3 are applicable to this site.

Surficial soil samples were collected and submitted for analysis of the various PFOS/PFOA. Currently, there are no DEP soil standards for these compounds.

4.0 FIELD INVESTIGATIONS

A proposed investigation plan was submitted for approval in response to the NOR. Subsequently, a meeting was held by DEP at the Airport that included other stakeholders including the Barnstable Department of Public Works, the Hyannis Water District and Barnstable County representatives (representing the Fire Training Academy. At the meeting IRA plans were coordinated between the Airport and Fire Training Academy including sampling locations, type of analysis, groundwater modeling, goals and next steps.

Following this meeting, HW finalized the plans for well installation and soil and groundwater sampling. Monitoring wells have been installed and groundwater samples have been collected for analysis, with results expected in approximately two weeks. Soils in two areas where fire fighting foam has been deployed have been collected for analysis. Additional soil sampling near the Airport Rescue and fire Fighting (ARFF) building is pending on further research on the storage of the foam at the building. Further information on the work conducted to date is provided below.

4.1 Soil Boring and Monitoring Well Installation

During March and April 2017, HW observed New England Geotech of Jamestown, Rhode Island, in the completion of eight soil borings (Figure 2). Groundwater monitoring wells were subsequently installed at all soil boring locations. Soil borings were completed utilizing macro-core soil sampling tooling that advances an outer-casing and inner-core barrel into the subsurface in five-foot increments. Soil cores were contained within a removable clear pvc liner to allow for visual inspection and field screening. In each boring there was no indication of the presence of oil and/or hazardous materials. Because the contaminants of concern are not volatile (as compared to a petroleum release) only some soil boring samples were field screened for the presence of volatile organic compounds (VOCs) utilizing a properly calibrated photoionization detector (PID) to measure jar headspace, in accordance with Massachusetts Department of Environmental Protection (DEP) policy WSC-02-411. There was no indication of soil contamination at any boring location and no positive PID readings. Boring and well construction logs are attached as Appendix A.

4.2 Groundwater Sampling

In accordance with MADEP groundwater sampling guidelines, a submersible pump is utilized to develop each monitoring well prior to sample collection. During well development, a properly calibrated InSitu smarTroll MP multi-parameter meter is utilized to measure temperature, pH, conductivity, DO, and oxidation reduction potential (orp). Samples to be analyzed for PFOS were sampled in accordance with the DEP Guidance on Sampling and Analysis for PFAS at Disposal Sites Regulated under the MCP, dated January 2017. Samples were submitted to ESS Laboratory, Cranston, Rhode Island for analysis. Laboratory results were not received at the time of this report.

During sampling, depth to groundwater was measured. Results were consistent with what is known for the site and the region. Water table is encountered at each location at 25-30 feet below ground surface and flows (in general) from northwest to southeast across the Airport.

<u>1,4-Dioxane</u>

Ten groundwater samples were collected and analyzed by ESS laboratory for the presence of 1,4-Dioxane using Method 8270 SIMS. Wells were sampled from locations hydrologically upgradient of the Airport, at the source of the 1,1,1-TCA release on the North Ramp, along the path of the plume from this source area, and downgradient of the Airport property at the Maher Wellfield (Figure 2). Upgradient wells were located proximate to the former Packaging Industries site where historic releases of Freon-12 were detected in groundwater.

PFOS and PFOA

Samples were collected as presented in the IRAP from suspected PFOS and/or PFOA use locations based on our understanding of past use or potential release locations. HW collected a sample of the FAA required aircraft fire fighting foam (foam) as it is applied during accident response or training. We also collected soil samples from areas of application during accident response or training. For groundwater, equipment rinse and trip blanks were collected.

We collected groundwater samples from existing and proposed monitoring wells from locations across the Airport to determine the potential presence of on-site and off-site sources (Figure 2). This will allow for a better understanding of the connection of PFOS and any application of foam, or other uses in the vicinity of the Airport. Samples were collected, submitted for laboratory analysis by EPA Method 537 (modified) and results are pending. When received they will be summarized and compared to applicable standards.

4.3 Soil and Foam Results

On December 9, 2016, surficial soil samples were collected from 3 locations where fire fighting foam has been used for training or during an aircraft accident. One sample of the foam as it is used when deployed for training was collected. Each of these samples was submitted to Maxxam for laboratory analysis to determine the presence or absence of PFAS.

HYA Soil / Foam Sampling Results

	DPU291	DPU292	DPU293	DPU294
Client Sample ID	**MCI DRILL**	**1991 SITE 2 ALPHA-1**	**ANNUAL DEPLOYMENT**	**FOAM MIX**
Lab Sample No.	1612316-01	1612316-02	1612316-03	1612316-04
Sample Date	12/09/2016	12/09/2016	12/09/2016	12/09/2016
Sample Time	11:30	11:00	12:00	14:15
Client Sample ID	MCI DRILL	1991 SITE 2 ALPHA-1	ANNUAL DEPLOYMENT	FOAM MIX
PFOA	23	0.2	100	19
PFOS	24	0.4	1.9	5
Total	47	0.6	101.9	24
Units	ug/kg	ug/kg	ug/kg	ug/l
EPA Health Advisory Limit	NA	NA	NA	0.07

Samples MCI Drill and Annual Deployment were collected where the foam is used during training events. The 1991 site is the location of a crash where foam may have been used during the response actions. The “foam mix” is the foam as it is delivered in concentrate then mixed with water diluted precisely how it is used during the training or response events. The foam is stored in the Airport Maintenance /ARFF building. See Figure 2 for sampling locations.

5.0 GROUND WATER MODELING AND CONTAMINANT TRANSPORT ANALYSIS

DEP requested that the Airport evaluate if potential sources on the western portion of the Airport could be upgradient of the Mary Dunn Wellfield. To answer this question, HW is using and modifying an existing U.S. Geological Survey groundwater model to evaluate groundwater flow under current and recent historical pumping conditions. This work is ongoing and will be informed by the results of the groundwater sampling and water level data collected under this IRA plan. The model will be used to document what areas of the Airport are upgradient of the Mary Dunn Wellfield. It will also be used to evaluate groundwater flow and contaminant transport from potential source areas on Airport property, as well as groundwater flow from the Fire Training Academy across the Airport to the southeast.

6.0 MANAGEMENT OF REMEDIAL WASTE

No remedial waste has been generated to date as a result of the work conducted under the IRA Plan.

7.0 IRA PLAN MODIFICATIONS

After review of the IRA Plan prepared by HW, DEP requested a modification to the Plan to include five additional requirements. They were provided in an email from Angela Gallagher to Mark Nelson of HW. Each requirement is summarized below along with a description of the work done to date to meet these requirements.

1) Private Well Assessment

DEP asked the airport to investigate whether or not there are private wells downgradient of the airport and potential source areas for 1,4-Dioxane and PFOS/PFOA. For properties in Barnstable, HW is reviewing the town's geographic information system (GIS) data base that includes information on whether or not a particular parcel is connected to the municipal water system. Health Department records in Yarmouth are also reviewed to identify public water supply connections. To date, we have evaluated properties within 0.5 miles of the airport boundary to the south, and approximately 0.5 to 1 miles to the east and southeast. All of the properties investigated to date are connected to town water.

HW will continue this evaluation upon receipt of our groundwater sampling data and upon completion of our groundwater modeling analysis to determine if any additional areas need to be investigated for the presence of private wells. The next status report will provide the complete results of our analysis, including a map documenting the extent of the area that was assessed.

Based on the review of records at the Yarmouth Health department, four properties in Yarmouth were identified as having an onsite well. They are located at:

- 32 Camp St
- 248 Camp St
- 10 New Holland Way
- 29 Washington St

Given that they are connected to public water it is likely that these wells are used for non-drinking water purposes and/or abandoned.

2) Schedule for Private Well Sampling

As the properties in the area identified as being downgradient of the Airport are connected to public water, no sampling is proposed at this time. If the ongoing investigation identifies a potential source such that additional research into private wells is needed, further analysis will be conducted to determine if private well sampling is needed.

3) How the Airport Will Abate or Mitigate Hazards Associated with Consumption of Contaminated Drinking Water

The goal of these IRA activities is to determine if the airport is a source of 1,4-Dioxane and/or PFAS contamination currently impacting the Mary Dunn and Maher wellfields. The results of the ongoing soil and groundwater analyses currently pending will be used to evaluate this question. If the airport is a source of contamination, HW will work with the Airport to evaluate what additional assessment and remediation activities are needed to eliminate the source. If needed, the Airport will also work with the Town of Barnstable and the Hyannis Water District on any further activities needed to treat the drinking water provided by the District's water supply wells.

4) Airport property within a Zone II Wellhead Protection Areas

The entire Airport is within Zone II wellhead protection areas to several public water supply wells serving Barnstable Village, Hyannis and Yarmouth (Figure 3). HW is working to evaluate groundwater flow to nearby water supply wells under historical pumping conditions to determine if the Airport could be a source of contamination to the Mary Dunn Wellfield. The results of that modeling will be provided in the next status report.

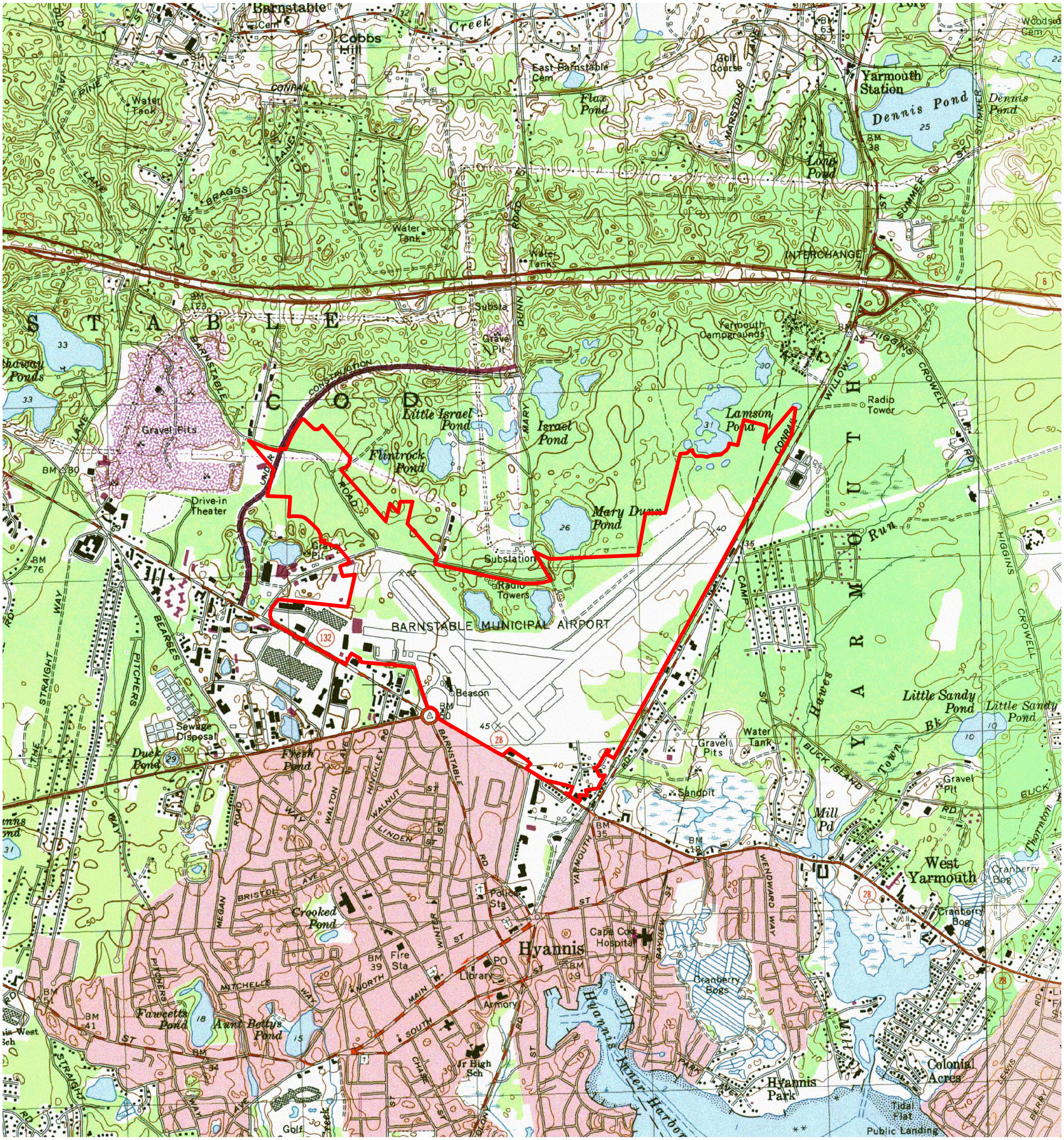
5) Soil analysis where Aircraft Fire Fighting Foam is stored

As discussed above, soil sampling in the vicinity of the ARFF building will be conducted after further research on the storage of the foam materials to determine potential areas where soil sampling is appropriate. The foam is stored in cabinets inside the ARFF building which is connected to town sewer.

8.0 PLANS FOR NEXT REPORTING PERIOD

The analysis of the soil and groundwater analyses will be completed in the next two to three weeks. This information will be evaluated to determine what additional testing is needed to determine potential sources of PFAS and 1,4-Dioxane at the Airport and the extent of contamination in soil and groundwater. The ongoing groundwater modeling will be used to support this evaluation. The Airport will set up a meeting with DEP, and other stakeholders as appropriate, to discuss the findings of the project after this round of sample results are received and evaluated.

FIGURES



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Legend

Airport Property Line

*Hyannis Topographic Quadrangle

N

0.5 Miles

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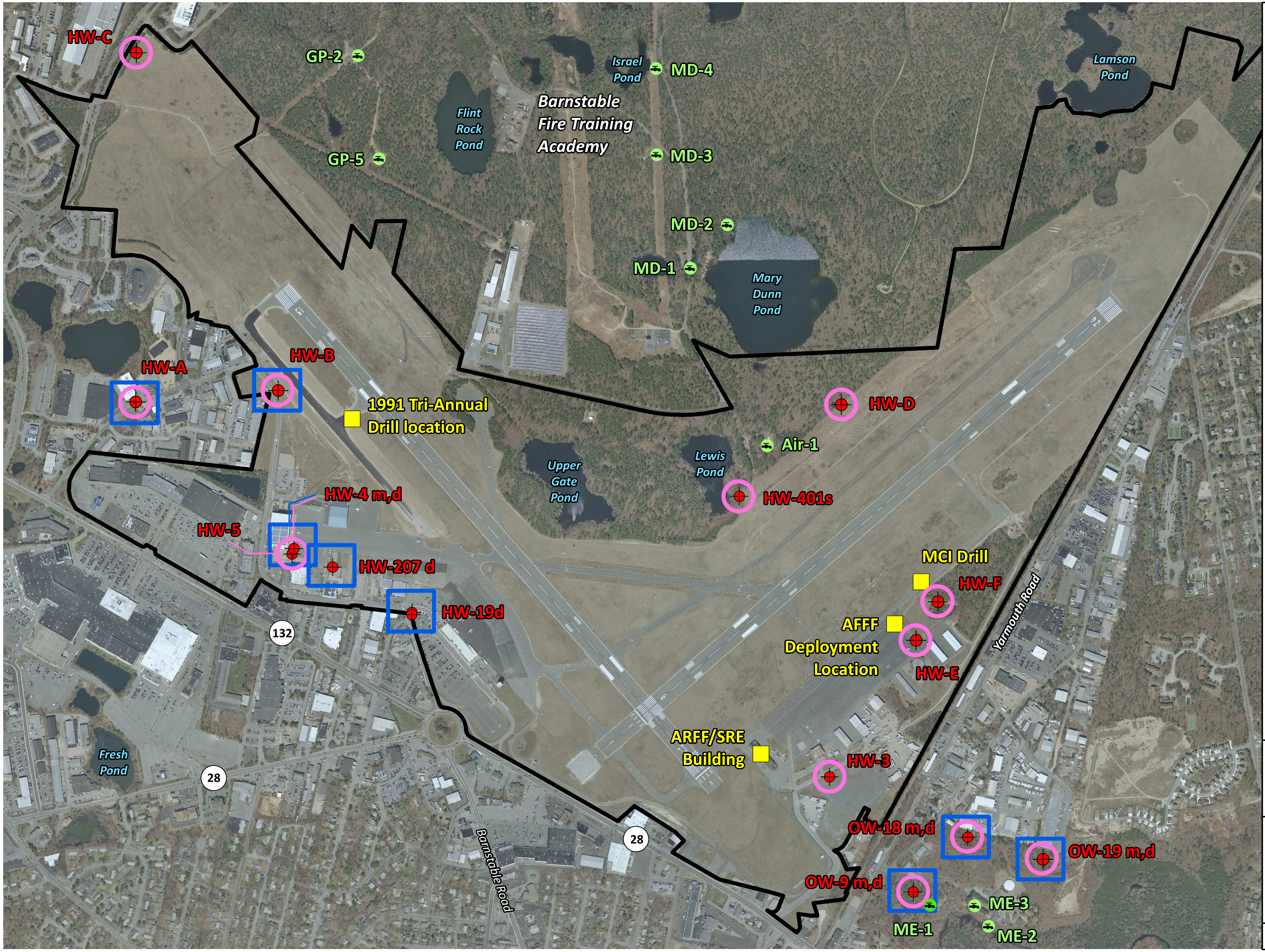
USGS Locus
Barnstable Municipal Airport
Hyannis, MA

Date: 8/15/2013

Figure 1



Legend

- Monitoring Wells
- PFOS/PFOA Soil Samples
- PFOS/PFOA Groundwater Samples
- 1,4-Dioxane Groundwater Samples
- Drinking Water Wells
- Barnstable Municipal Airport Property Boundary

*Imagery - MassGIS 2014

N

0 750

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Sampling Locations for PFOS/PFOA and 1,4 Dioxane
Barnstable Municipal Airport
Hyannis, MA

Date: 4/13/2017

Figure 2

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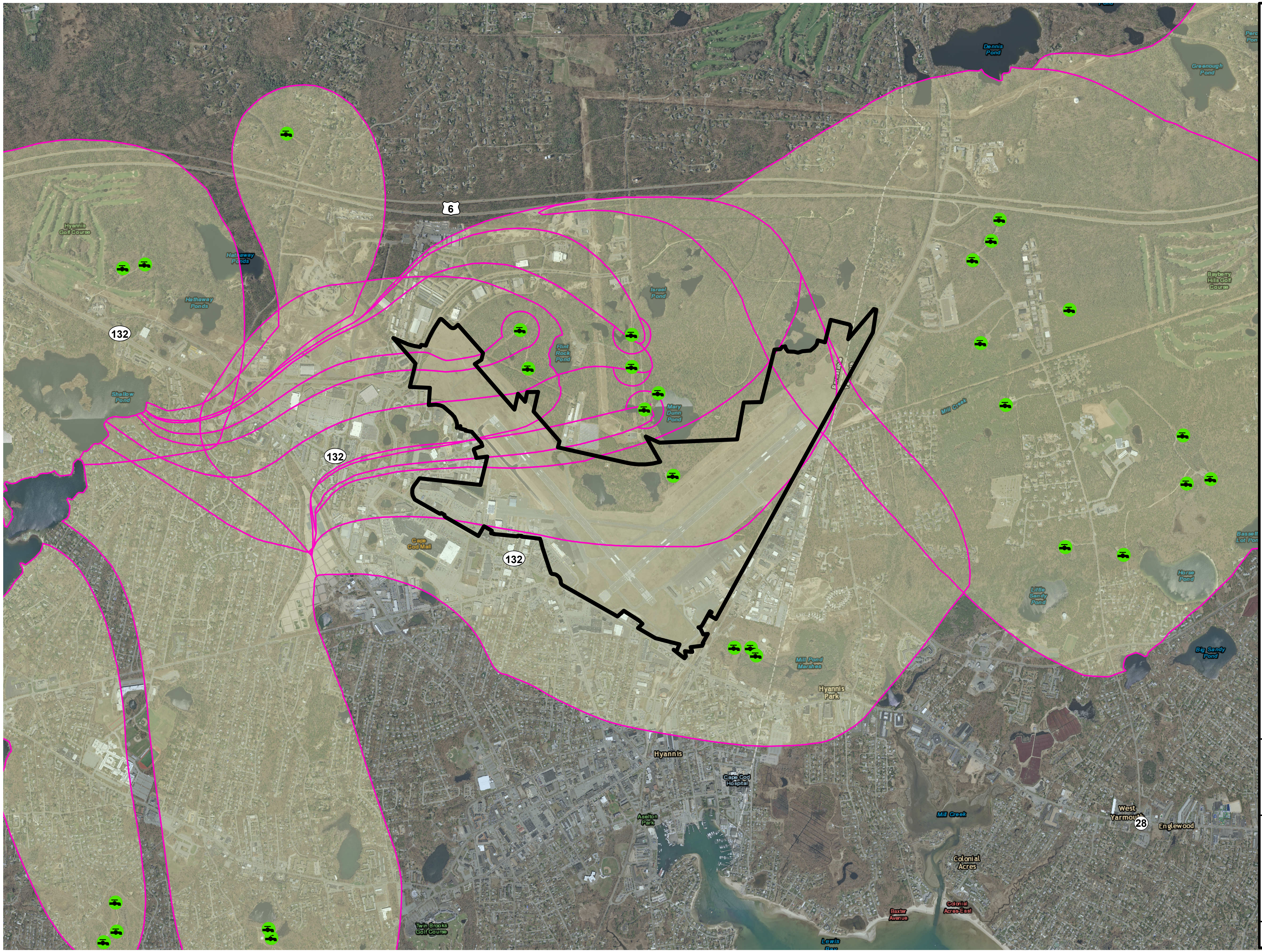

Legend

Approved Wellhead Protection Areas (Zone II)

Drinking Water Wells

Barnstable Municipal Airport Property Boundary

**Imagery - MassGIS 2014*

N

0 2,000

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Approved Wellhead Protection Areas (Zone II)
Barnstable Municipal Airport
Hyannis, MA

Date: 4/13/2017

Figure 3

Path: H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\170413_Figure3.mxd

APPENDICES

BORING LOGS

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MONITORING WELL BORING LOG

Boring No. HW-A(d) (cape gun works)

Project: 17027- Barnstable On-call #4
Client: Barnstable Minicipal Airport
Boring Contractor: New england Goetech
Boring Equipment: Direct Push, 3" casing

Date: 4/4/2017
Completion Depth: 58' bgs
Elevation:
Inspector: JDB

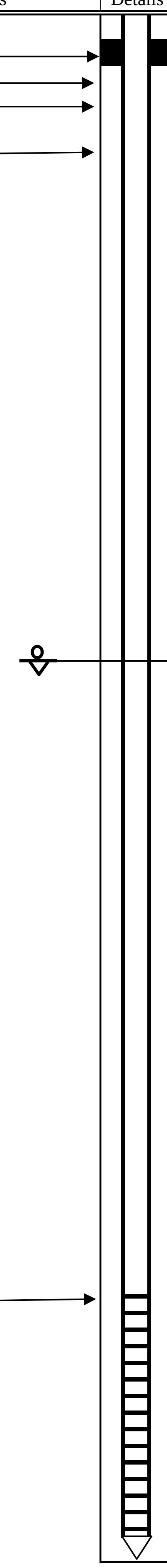
Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
			Below Land Surface (BLS)		
			Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0								Cement #2 sand @ 6" bgs Bontonite @ 2' bgs #2 sand @ 4' bgs		0
5										5
10										10
15										15
20								Groundwater @ 22.4' bgs		20
25										25
30										30
35										35
	35-40' bgs	0-3" - Med Br, F sand, little gravel; 3-12" - Lt Br, F sand; 12+" - Lt Br, well graded sand, some gravel		24"	ang	brn				
40										40
	40-45' bgs	0-2" - Lt Br, F sand, little gravel; 2-10" - Lt Br, M-C sand, some gravel		10"	ang	brn				
45										45
	45-50' bgs	Med Br, F sand, little gravel		2"	ang	brn		0.02 slot screen @ 48-58 ' bgs		
50										50
	50-55' bgs	Lt Br, well graded sand, some large gravel		24"	ang	brn				
55										55
	55-60' bgs	0-3" - Lt Br, F sand, little gravel; 3-12" - M sand, some C sand/gravel; 12-15" - Lt Br, F sand; 15-18" - Lt Br, F sand, little gravel		18"	ang	brn				
60										60



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MONITORING WELL BORING LOG

Boring No. HW-A(s) (cape gun works)

Project: 17027- Barnstable On-call #4
Client: Barnstable Minicipal Airport
Boring Contractor: New england Goetech
Boring Equipment: Direct Push, 3" casing

Date: 3/16/2017
Completion Depth: 32' bgs
Elevation:
Inspector: JDB

Proportions Used:

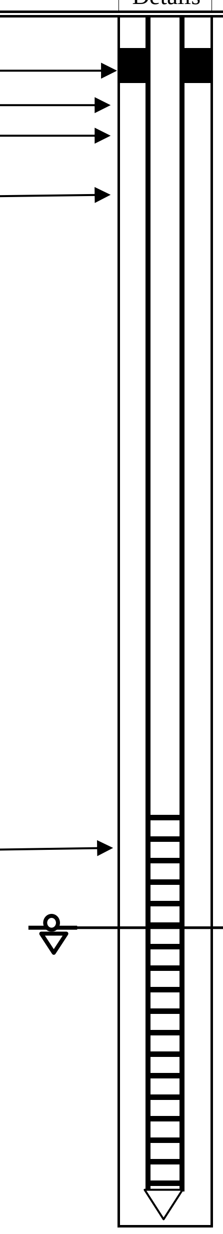
trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
			Below Land Surface (BLS)		
			Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Depth Feet
0	0"-4" asphalt							Cement	0
								#2 sand @ 6" bgs	
	0-5' bgs	Light Brown M-C sand, some F sand, little gravel		30"	ang	brn		Bontonite @ 2' bgs	
								#2 sand @ 4' bgs	
5									5
	5-10' bgs	Light Brown M-C sand, some F sand, little gravel; bottom 6" F white sand		43"	ang	brn			
10									10
	10-15' bgs	0-9"- Drk Br, M-C sand; some F sand; 9-32" - Lt Br, F-M sand; 22-26" - Drk Br, M-C sand; 32-48" - Lt Br, F-M sand		48"	ang	brn			
15									15
	15-20' bgs	0-27" - Lt Br, M-C sand, some F sand 27-43" - Drk Br, M-C sand; some F sand		43"	ang	brn			
20									20
	20-25' bgs	0-12" - Lt Br, M-C sand; 12+" - Drk Br, M-C sand, some gravel		48"	ang	brn		0.02 slot screen @ 22-32 ' bgs	
25								Groundwater @ 25.5' bgs	25
	25-30' bgs	0-24" - Lt Br, M-C sand, some F sand; 24+" - Drk Br, M-C sand; some F sand		43"	ang	brn			
30									30
35									
40									
45									
50									
55									

Well Details



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MONITORING WELL BORING LOG

Boring No. HW-B(d)

Project:	17027- Barnstable On-call #4	**Date:**	4/3/2017
Client:	Barnstable Minicipal Airport	**Completion Depth:**	57.2' bgs
Boring Contractor:	New england Goetech	**Elevation:**	
Boring Equipment:	Direct Push, 3" casing	**Inspector:**	JDB

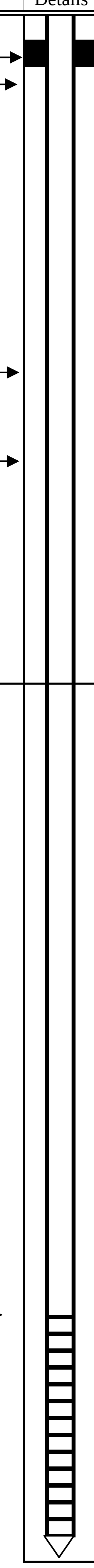
Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
			Below Land Surface (BLS)		
			Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0								Cement #2 sand @ 9" bgs		0
5										5
10								Bentonite @ 12' bgs		10
15								#2 sand @ 15' bgs		15
20								Groundwater @ 22.75' bgs		20
25										25
30										30
	30-35' bgs	0-16" - Lt Br, M sand, some C sand/gravel; 16-19" - Med Br, F sand, little gravel		19"	ang	brn				
35										35
	35-40' bgs	Lt brn, M sand, some C sand/silt.gravel		2"	ang	brn				
40										40
	40-45' bgs	Lt brn, M sand, some C sand/silt.gravel		2"	ang	brn				
45										45
	45-50' bgs	0-9" - Lt Br, M sand, some F/C sand; 9-12" - Lt Br, F sand, some silt, little gravel		12"	ang	brn		0.02 slot screen @ 47.2-57.2 ' bgs		
50										50
	50-55' bgs	NO RECOVERY		0"						
55										55
	55-60' bgs	Lt Br, well graded sand, some gravel		19"	ang	brn				
60										60



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MONITORING WELL BORING LOG

Boring No. HW-B(s)

Project: 17027- Barnstable On-call #4
Client: Barnstable Minicipal Airport
Boring Contractor: New england Goetech
Boring Equipment: Direct Push, 3" casing

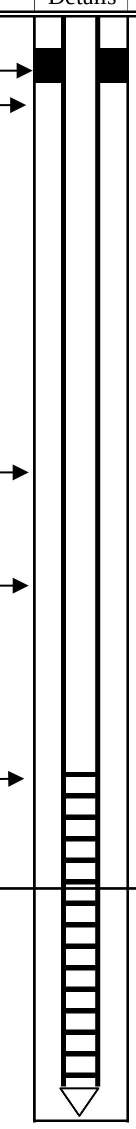
Date: 3/16/2017
Completion Depth: 30.5' bgs
Elevation:
Inspector: JDB

Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
			Below Land Surface (BLS)		
			Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-6" Organic							Cement		0
								#2 sand @ 9" bgs		
	0-5' bgs	0-6" - Lt Br, M-C sand, some F sand; 6-18" - Med Br, M-C sand, some F sand; 18+" - Drk Br, F-M sand, some C sand		50"	ang	brn				
5										5
	5-10' bgs	0-10" - Lt Br, F-M sand, some C sand 10+" - Med Br, M-C sand, some F sand		45"	ang	brn				
10										10
	10-15' bgs	0-12" - Med Br, M-C sand, some F sand/gravel; 12-36" - Lt Br, C sand, some F-M sand, little gravel; 36+" - Drk Br, F-M sand, some C/gravel		52"	ang	brn		Bentonite @ 12' bgs		
15								#2 sand @ 15' bgs		15
	15-20' bgs	0-20" - Lt Br, F-M sand; 20+" - F-M sand, some C sand, and large gravel		60"	ang	brn				
20								0.02 slot screen @ 20.5-30.5 ' bgs		20
	20-25' bgs	0-12" - Med Br, M-C sand, some F sand; 12-16" - Lt Br, F-M sand; 16-22" - Med Br, M-C sand, some F sand; 22+" - Lt Br, F-M sand		48"	ang	brn				
								Groundwater @ 23.5' bgs		
25										25
	25-30' bgs	M-C sand, some Fsand/gravel		36"	ang	brn				
30										30
35										
40										
45										
50										
55										

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MONITORING WELL BORING LOG

Boring No. HW-C

Project: 17027- Barnstable On-call #4
Client: Barnstable Minicipal Airport
Boring Contractor: New england Goetech
Boring Equipment: Direct Push, 3" casing

Date: 3/16/2017
Completion Depth: 42.5' bgs
Elevation:
Inspector: JDB

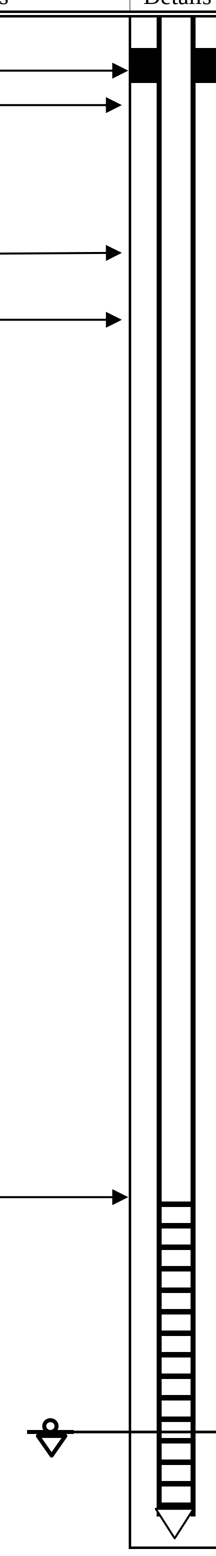
Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
			Below Land Surface (BLS)		
			Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-12" Organic							Cement		0
	0-5' bgs	0-8" - M-C sand, little gravel; 8- 26" - Lt Br, F sand, some silt; 26- 32" - Or Br, F-M sand; 32- 44 - Organic		44"	ang	brn		#2 sand @ 9" bgs		
5								Bontonite @ 12' bgs		5
	5-10' bgs	0-16" - Drk Br, C sand, some Fsand/gravel; 16- 30" - Med Br, M sand, some F sand/gravel; 30-34" - Lt Br, F sand; 34+" - Or Br, M-C sand, little Fsand/silt		44"	ang	brn		#2 sand @ 7' bgs		
10										10
	10-15' bgs	Med Br, M-C sand, some F sand/large gravel (1"+);		45"	ang	brn				
15										15
	15-20' bgs	Med Br, M-C sand, some F sand		53"	ang	brn				
20										20
	20-25' bgs	0-6" - Or Br, M-C sand, some gravel; 6- 12" - Lt Br, F-M sand, some gravel; 12- 26" - Lt Br, F sand; 26+" - Med Br, M-C sand, little F sand, some gravel		55"	ang	brn				
25										25
	25-30' bgs	0-18" - Lt Br, F-M sand, little C sand; 18+" - Med Br, F sand, some M sand/gravel		36"	ang	brn				
30										30
	30-35' bgs	0-12" - Lt Br, F sand, little C sand; 12+" - Med Br, C sand, some F-M sand, little gravel		48"				0.02 slot screen @ 32.5-42.5 ' bgs		
35										
	35-42" bgs	NO SAMPLE COLLECTED		0"						
40								Groundwater @ 39.3' bgs		
45										
50										
55										



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MONITORING WELL BORING LOG

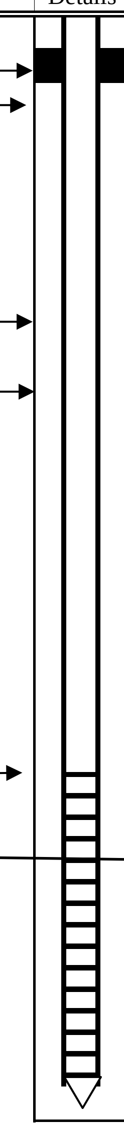
Boring No. HW-D

Project:	17027- Barnstable On-call #4	**Date:**	3/17/2017
Client:	Barnstable Minicipal Airport	**Completion Depth:**	29.5' bgs
Boring Contractor:	New england Goetech	**Elevation:**	
Boring Equipment:	Direct Push, 3" casing	**Inspector:**	JDB

Proportions Used: **Abbreviations:**

Proportions		Color		Angular	Misc.	Size	
trace (tr)	0 - 10%	Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
some (so)	20 - 35%	Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
and	35 - 50%	Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
		Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
					Poorly-Graded Gravel (GP)		
					Below Land Surface (BLS)		
					Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-6" Organic							Cement		0
	0-5' bgs	0-30" - Or Br, M sand, little F/C sand/gravel; 30-42" - F-M sand, some C sand/gravel; 42-48" - Organic		48"	ang	brn		#2 sand @ 1' bgs		
5										5
	5-10' bgs	0-16" - Med Br, C sand, little F-M sand/large gravel; 16-24" - Med Br, M sand, little F sand, some C sand/gravel; 24+" - Med Br, C sand, little F-M sand/large gravel		42"	ang	brn		Bontonite @ 7' bgs #2 sand @ 9' bgs		
10										10
	10-15' bgs	0-20" - Lt Br, M-C sand, some F sand/gravel; 20-43" - Lt Br, C sand, little F sand/gravel, some C sand; 43+" - F-M sand, some C sand/gravel		55"	ang	brn				
15										15
	15-20' bgs	0-15" - Med Br, M sand, some F/C sand/gravel; 15-25" - F-M sand, some C sand; 25+" - Drk Br, F-M sand, some C sand/gravel		40"	ang	brn				
20								0.02 slot screen @ 16.2-26.2 ' bgs		20
	20-25' bgs	0-20" - Lt Br, M sand, some C sand, littleF sand/gravel; 20+" - F-M sand, some C sand/gravel		38'	ang	brn		Groundwater @ 22.6' bgs		
25										25
	25-30' bgs	NO SAMPLE COLLECTED, SOIL SLUFFED OUT OF SLEEVE		0"						
30										30
35										
40										
45										
50										
55										



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MONITORING WELL BORING LOG

Boring No. HW-E

Project: 17027- Barnstable On-call #4
Client: Barnstable Minicipal Airport
Boring Contractor: New england Goetech
Boring Equipment: Direct Push, 3" casing

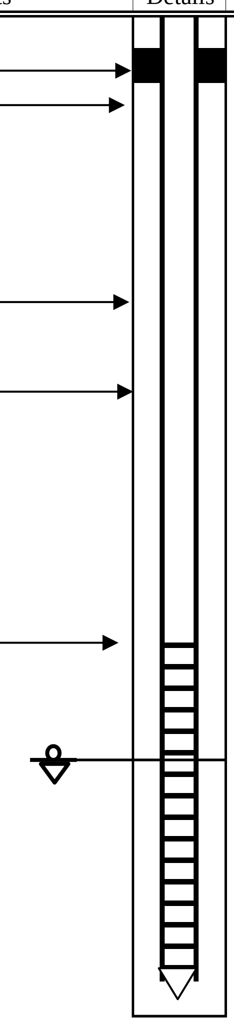
Date: 3/17/2017
Completion Depth: 26.5' bgs
Elevation:
Inspector: JDB

Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
			Below Land Surface (BLS)		
			Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-4" Organic							Cement		0
	0-5' bgs	0-12" - Med Br, M-C sand, some F sand, little gravel; 12-36" - Med Br, C sand, some F-M sand/gravel		40"	ang	brn		#2 sand @ 1' bgs		
5										5
	5-10' bgs	Med Br, C sand, little M-F sand/gravel		36"	ang	brn		Bontonite @ 6.5' bgs		
10								#2 sand @ 9' bgs		10
	10-15' bgs	0-12" - Lt Br, F sand; 12-24" - Lt Br, F-M sand, some C sand/gravel; 24-32" - Lt Br, F-M sand; 32+" - M-C sand, some F sand/gravel		60"	ang	brn				
15										15
	15-20' bgs	0-12" - Med Br, M-C sand, little F sand/gravel; 12-20" - F sand, some silt; 20+" - C sand, some F-M sand/gravel		58"	ang	brn		0.02 slot screen @ 16.2-26.2 ' bgs		
20								Groundwater @ 19.7' bgs		20
	20-25' bgs	Med Br, F sand, Little M-C sand/gravel ROCK IN SHOE		22"	ang	brn				
25										25
	25-30' bgs	Med Br, C sand, some M sand/gravel		24"	ang	brn				
30										30
35										
40										
45										
50										
55										

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MONITORING WELL BORING LOG

Boring No. HW-F

Project: 17027- Barnstable On-call #4
Client: Barnstable Minicipal Airport
Boring Contractor: New england Goetech
Boring Equipment: Direct Push, 3" casing

Date: 3/17/2017
Completion Depth: 27.2' bgs
Elevation:
Inspector: JDB

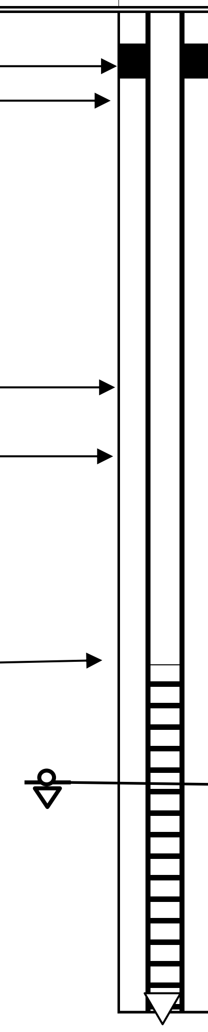
Proportions Used:

trace (tr)	0 - 10%
little (li)	10 - 20%
some (so)	20 - 35%
and	35 - 50%

Abbreviations:

Color		Angular	Misc.	Size	
Blue (Bl)	Green (Gr)	Round (rnd.)	Fragments (frag.)	Fine = (f)	Fine to Coarse = (f-c)
Red (R)	Gray (Gy)	Angular (ang.)	Cement (cem.)	Medium = (m)	Very = (v)
Light (lt)	Brown (Br)		Well-Graded Sand (SW)	Coarse = (c)	More/Less = (+/-)
Dark (dk)	Orange (Or)		Poorly-Graded Sand (SP)	Dark = (dk)	
Rust (Ru)	Black (Blk)		Well-Graded Gravel (GW)		
			Poorly-Graded Gravel (GP)		
			Below Land Surface (BLS)		
			Not Available (N/A)		

Depth Feet	Description		Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-5" Organic							Cement #2 sand @ 1' bgs		0
	0-5' bgs	0-12" - Med Br, M sand, liitle C sand; 12-32" - Drk Br, C sand, some M sand/gravel; 32-40" - Drk Br, F sand, Some M sand/gravel; 40+" - Organic		45"	ang	brn				
5										5
	5-10' bgs	C sand, some F-M sand, tr gravel		52"	ang	brn				
10								Bontonite @ 7' bgs		10
	10-15' bgs	0-16" - Lt Br, M sand, some C; 16-32" - Lt Br, F-M sand; 32-41" - Med Br, M sand, some C sand/gravel; 41+" F-M sand, tr gravel		56"	ang	brn		#2 sand @ 11' bgs		
15										15
	15-20' bgs	M-C sand, some F-M sand, little gravel		52"	ang	brn		0.02 slot screen @ 17.2-27.2 ' bgs		
20								Groundwater @ 22.6' bgs		20
	20-25' bgs	0-20" - Lt-Med Br, C sand, some F-M sand, little gravel; 20-28" - Gray, F-M sand, little C sand; 28+" - Drk Br, M-C sand, some Fsand/gravel		38'	ang	brn/gray				
25										25
	25-30' bgs	NO SAMPLE COLLECTED, SOIL SLUFFED OUT OF SLEEVE		0"						
30										30
35										
40										
45										
50										
55										



LABORATORY RESULTS

CERTIFICATE OF ANALYSIS

Joe Longo
Horsley & Witten
90 Route 6A
Sandwich, MA 02563

RE: HYA (14105)
ESS Laboratory Work Order Number: 1612316

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:41 pm, Dec 29, 2016

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state tandards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analyses

Maxxam Analytics - Cheektowaga, NY	PFOA, PFOS

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: HYA
ESS Laboratory Work Order: 1612316

SAMPLE RECEIPT

The following samples were received on December 12, 2016 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has performed and reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Data Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
1612316-01	MCI DRILL	Soil	$
1612316-02	1991 SITE 2 ALPHA-1	Soil	$
1612316-03	ANNUAL DEPLOYMENT	Soil	$
1612316-04	FOAM MIX	Aqueous	§

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: HYA

ESS Laboratory Work Order: 1612316

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: HYA
ESS Laboratory Work Order: 1612316

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: HYA

ESS Laboratory Work Order: 1612316

Subcontracted Analysis

Client Sample ID: MCI DRILL
Date Sampled: 12/09/16 11:30

ESS Laboratory Sample ID: 1612316-01
Sample Matrix: Soil

Analyte	Results	Units	MRL	Method	DF	Analyst	Analyzed	I/V	F/V
PFOS	See Attached								

Client Sample ID: 1991 SITE 2 ALPHA-1
Date Sampled: 12/09/16 11:00

ESS Laboratory Sample ID: 1612316-02
Sample Matrix: Soil

Analyte	Results	Units	MRL	Method	DF	Analyst	Analyzed	I/V	F/V
PFOS	See Attached								

Client Sample ID: ANNUAL DEPLOYMENT
Date Sampled: 12/09/16 12:00

ESS Laboratory Sample ID: 1612316-03
Sample Matrix: Soil

Analyte	Results	Units	MRL	Method	DF	Analyst	Analyzed	I/V	F/V
PFOS	See Attached								

Client Sample ID: FOAM MIX
Date Sampled: 12/09/16 14:15

ESS Laboratory Sample ID: 1612316-04
Sample Matrix: Aqueous

Analyte	Results	Units	MRL	Method	DF	Analyst	Analyzed	I/V	F/V
PFOA	See Attached								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: HYA
ESS Laboratory Work Order: 1612316

Notes and Definitions

Z-08	See Attached
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: HYA
ESS Laboratory Work Order: 1612316

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/documents/AllLabs.xls

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.depweb.state.pa.us/portal/server.pt/community/labs/13780/laboratory_accreditation_program/590095

Maxxam
A Bureau Veritas Group Company

Your P.O. #: B02623
Your Project #: 1612316
Your C.O.C. #: na

Attention:Shawn Morrell

ESS Laboratory
185 Frances Avenue
Cranston, RI
USA 02910-2211

Report Date: 2016/12/29
Report #: R4306211
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6R1181
Received: 2016/12/13, 15:04

Sample Matrix: Soil
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Moisture	3	N/A	2016/12/28	CAM SOP-00445	Carter 2nd ed 51.2 m
PFOS and PFOA in soil	3	2016/12/16	2016/12/20	CAM SOP-00894	EPA537 m

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PFOS and PFOA in water	1	2016/12/14	2016/12/16	CAM SOP-00894	EPA 537 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam 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.

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

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.
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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.

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Your P.O. #: B02623
Your Project #: 1612316
Your C.O.C. #: na

Attention:Shawn Morrell

ESS Laboratory
185 Frances Avenue
Cranston, RI
USA 02910-2211

Report Date: 2016/12/29
Report #: R4306211
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6R1181
Received: 2016/12/13, 15:04

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Melissa DiGrazia, Project Manager - ATUT
Email: MDiGrazia@maxxam.ca
Phone# (905) 817-5700
==
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Maxxam Job #: B6R1181
Report Date: 2016/12/29

ESS Laboratory
Client Project #: 1612316
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		DPU291		DPU292		DPU293		
Sampling Date		2016/12/09 11:30		2016/12/09 11:00		2016/12/09 12:00		
COC Number		na		na		na		
	UNITS	**1612316-01**	**RDL**	**1612316-02**	**RDL**	**1612316-03**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	9.3	1.0	3.5	1.0	10	1.0	4807644
Miscellaneous Parameters								
6:2 Fluorotelomer sulfonate	ug/kg	270 (1)	10	0.40 U	1.0	4300 (2)	100	4796218
8:2 Fluorotelomer sulfonate	ug/kg	550 (2)	100	0.40 U	1.0	1200 (2)	100	4796218
Perfluorobutane Sulfonate (PFBS)	ug/kg	0.40 U	1.0	0.40 U	1.0	4.0 U (1)	10	4796218
Perfluorobutanoic acid	ug/kg	2.1	1.0	0.40 U	1.0	13 (1)	10	4796218
Perfluorodecane Sulfonate	ug/kg	0.40 U	1.0	0.40 U	1.0	4.0 U (1)	10	4796218
Perfluorodecanoic Acid (PFDA)	ug/kg	20	1.0	0.40 U	1.0	69 (1)	10	4796218
Perfluorododecanoic Acid (PFDoA)	ug/kg	6.6	1.0	0.40 U	1.0	28 (1)	10	4796218
Perfluoroheptanoic Acid (PFHpA)	ug/kg	8.4	1.0	0.40 U	1.0	20 (1)	10	4796218
Perfluorohexane Sulfonate (PFHxS)	ug/kg	0.50 J	1.0	0.40 U	1.0	4.0 U (1)	10	4796218
Perfluorohexanoic Acid (PFHxA)	ug/kg	17	1.0	0.40 U	1.0	150 (1)	10	4796218
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	23	1.0	0.20 U	1.0	100 (1)	10	4796218
Perfluorononanoic Acid (PFNA)	ug/kg	14	1.0	0.20 U	1.0	31 (1)	10	4796218
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	0.30 J	1.0	0.40 U	1.0	4.0 U (1)	10	4796218
Perfluorooctane Sulfonate (PFOS)	ug/kg	24	1.0	0.40 U	1.0	1.9 J (1)	10	4796218
Perfluoropentanoic Acid (PFPeA)	ug/kg	6.0	1.0	0.40 U	1.0	29 (1)	10	4796218
Perfluorotetradecanoic Acid	ug/kg	2.1	1.0	0.40 U	1.0	10 (1)	10	4796218
Perfluorotridecanoic Acid	ug/kg	140 (1)	10	0.40 U	1.0	6.0 J (1)	10	4796218
Perfluoroundecanoic Acid (PFUnA)	ug/kg	440 (1)	10	0.40 U	1.0	15 (1)	10	4796218
Surrogate Recovery (%)								
13C4-Perfluorooctanesulfonate	%	72	N/A	81	N/A	88	N/A	4796218
13C4-Perfluorooctanoic acid	%	67	N/A	88	N/A	70	N/A	4796218
13C8-Perfluorooctanesulfonamide	%	75	N/A	83	N/A	91	N/A	4796218

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

N/A = Not Applicable

(1) Due to high concentration of the target analyte, sample required 10x dilution. Detection limit was adjusted accordingly.

(2) Due to high concentration of the target analyte, sample required 100x dilution. Detection limit was adjusted accordingly.

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Maxxam Job #: B6R1181
Report Date: 2016/12/29

ESS Laboratory
Client Project #: 1612316
Your P.O. #: B02623

RESULTS OF ANALYSES OF WATER

Maxxam ID		DPU294		
Sampling Date		2016/12/09 14:15		
COC Number		na		
	UNITS	**1612316-04**	**RDL**	**QC Batch**
Miscellaneous Parameters				
6:2 Fluorotelomer sulfonate	ug/L	33 (1)	8.0	4794191
8:2 Fluorotelomer sulfonate	ug/L	5.7 J (1)	8.0	4794191
Perfluorobutane Sulfonate (PFBS)	ug/L	5.0 U (1)	8.0	4794191
Perfluorobutanoic acid	ug/L	6.8 J (1)	8.0	4794191
Perfluorodecane Sulfonate	ug/L	5.0 U (1)	8.0	4794191
Perfluorodecanoic Acid (PFDA)	ug/L	2.8 J (1)	8.0	4794191
Perfluorododecanoic Acid (PFDoA)	ug/L	5.0 U (1)	8.0	4794191
Perfluoroheptanoic Acid (PFHpA)	ug/L	3.4 J (1)	8.0	4794191
Perfluorohexane Sulfonate (PFHxS)	ug/L	2.1 J (1)	8.0	4794191
Perfluorohexanoic Acid (PFHxA)	ug/L	14 (1)	8.0	4794191
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	19 (1)	8.0	4794191
Perfluorononanoic Acid (PFNA)	ug/L	93 (1)	8.0	4794191
Perfluorooctane Sulfonamide (PFOSA)	ug/L	5.0 U (1)	8.0	4794191
Perfluorooctane Sulfonate (PFOS)	ug/L	5.0 U (1)	8.0	4794191
Perfluoropentanoic Acid (PFPeA)	ug/L	3.7 J (1)	8.0	4794191
Perfluorotetradecanoic Acid	ug/L	5.0 U (1)	8.0	4794191
Perfluorotridecanoic Acid	ug/L	10 (1)	8.0	4794191
Perfluoroundecanoic Acid (PFUnA)	ug/L	29 (1)	8.0	4794191
Surrogate Recovery (%)				
13C4-Perfluorooctanesulfonate	%	90	N/A	4794191
13C4-Perfluorooctanoic acid	%	80	N/A	4794191
13C8-Perfluorooctanesulfonamide	%	63	N/A	4794191

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to sample matrix, sample required high level analysis with 10x dilution. Detection limit was adjusted accordingly.

TEST SUMMARY

Maxxam ID: DPU291
Sample ID: 1612316-01
Matrix: Soil

Collected: 2016/12/09
Shipped:
Received: 2016/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	4807644	N/A	2016/12/28	Chun Yan
PFOS and PFOA in soil	LCMS	4796218	2016/12/16	2016/12/20	Colm McNamara

Maxxam ID: DPU292
Sample ID: 1612316-02
Matrix: Soil

Collected: 2016/12/09
Shipped:
Received: 2016/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	4807644	N/A	2016/12/28	Chun Yan
PFOS and PFOA in soil	LCMS	4796218	2016/12/16	2016/12/20	Colm McNamara

Maxxam ID: DPU293
Sample ID: 1612316-03
Matrix: Soil

Collected: 2016/12/09
Shipped:
Received: 2016/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	4807644	N/A	2016/12/28	Chun Yan
PFOS and PFOA in soil	LCMS	4796218	2016/12/16	2016/12/20	Colm McNamara

Maxxam ID: DPU294
Sample ID: 1612316-04
Matrix: Water

Collected: 2016/12/09
Shipped:
Received: 2016/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4794191	2016/12/14	2016/12/16	Colm McNamara

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GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B6R1181
Report Date: 2016/12/29

ESS Laboratory
Client Project #: 1612316
Your P.O. #: B02623

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4794191	CM5	Matrix Spike	13C4-Perfluorooctanesulfonate	2016/12/16		91	%	70 - 130
			13C4-Perfluorooctanoic acid	2016/12/16		88	%	70 - 130
			13C8-Perfluorooctanesulfonamide	2016/12/16		87	%	60 - 120
			6:2 Fluorotelomer sulfonate	2016/12/16		96	%	70 - 130
			8:2 Fluorotelomer sulfonate	2016/12/16		99	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2016/12/16		91	%	70 - 130
			Perfluorobutanoic acid	2016/12/16		112	%	70 - 130
			Perfluorodecane Sulfonate	2016/12/16		111	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2016/12/16		100	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2016/12/16		99	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2016/12/16		97	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2016/12/16		103	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2016/12/16		101	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2016/12/16		102	%	70 - 130
			Perfluorotetradecanoic Acid	2016/12/16		110	%	70 - 130
			Perfluorotridecanoic Acid	2016/12/16		105	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2016/12/16		99	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2016/12/16		105	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2016/12/16		104	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2016/12/16		101	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2016/12/16		NC	%	70 - 130
4794191	CM5	RPD	6:2 Fluorotelomer sulfonate	2016/12/16	4.7		%	30
			8:2 Fluorotelomer sulfonate	2016/12/16	7.6		%	30
			Perfluorobutane Sulfonate (PFBS)	2016/12/16	12		%	30
			Perfluorobutanoic acid	2016/12/16	1.3		%	30
			Perfluorodecane Sulfonate	2016/12/16	6.3		%	30
			Perfluoroheptanoic Acid (PFHpA)	2016/12/16	1.8		%	30
			Perfluorohexane Sulfonate (PFHxS)	2016/12/16	6.0		%	30
			Perfluorohexanoic Acid (PFHxA)	2016/12/16	4.3		%	30
			Perfluorononanoic Acid (PFNA)	2016/12/16	5.1		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2016/12/16	13		%	30
			Perfluoropentanoic Acid (PFPeA)	2016/12/16	0.35		%	30
			Perfluorotetradecanoic Acid	2016/12/16	7.5		%	30
			Perfluorotridecanoic Acid	2016/12/16	3.0		%	30
			Perfluoroundecanoic Acid (PFUnA)	2016/12/16	4.2		%	30
			Perfluorodecanoic Acid (PFDA)	2016/12/16	4.6		%	30
			Perfluorododecanoic Acid (PFDoA)	2016/12/16	4.9		%	30
			Perfluoro-n-Octanoic Acid (PFOA)	2016/12/16	2.8		%	30
			Perfluorooctane Sulfonate (PFOS)	2016/12/16	NC		%	30
4794191	CM5	Spiked Blank	13C4-Perfluorooctanesulfonate	2016/12/16		97	%	70 - 130
			13C4-Perfluorooctanoic acid	2016/12/16		98	%	70 - 130
			13C8-Perfluorooctanesulfonamide	2016/12/16		97	%	60 - 120
			6:2 Fluorotelomer sulfonate	2016/12/16		104	%	70 - 130
			8:2 Fluorotelomer sulfonate	2016/12/16		106	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2016/12/16		111	%	70 - 130
			Perfluorobutanoic acid	2016/12/16		105	%	70 - 130
			Perfluorodecane Sulfonate	2016/12/16		104	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2016/12/16		101	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2016/12/16		110	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2016/12/16		101	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2016/12/16		110	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2016/12/16		109	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2016/12/16		106	%	70 - 130

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Maxxam Job #: B6R1181
Report Date: 2016/12/29

ESS Laboratory
Client Project #: 1612316
Your P.O. #: B02623

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Perfluorotetradecanoic Acid	2016/12/16		109	%	70 - 130
			Perfluorotridecanoic Acid	2016/12/16		111	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2016/12/16		105	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2016/12/16		109	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2016/12/16		113	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2016/12/16		108	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2016/12/16		108	%	70 - 130
4794191	CM5	Method Blank	13C4-Perfluorooctanesulfonate	2016/12/16		106	%	70 - 130
			13C4-Perfluorooctanoic acid	2016/12/16		96	%	70 - 130
			13C8-Perfluorooctanesulfonamide	2016/12/16		89	%	60 - 120
			6:2 Fluorotelomer sulfonate	2016/12/16	0.50 U, RDL=0.80		ug/L	
			8:2 Fluorotelomer sulfonate	2016/12/16	0.60 U, RDL=0.80		ug/L	
			Perfluorobutane Sulfonate (PFBS)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorobutanoic acid	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorodecane Sulfonate	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluoroheptanoic Acid (PFHpA)	2016/12/16	0.60 U, RDL=0.80		ug/L	
			Perfluorohexane Sulfonate (PFHxS)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorohexanoic Acid (PFHxA)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorononanoic Acid (PFNA)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorooctane Sulfonamide (PFOSA)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluoropentanoic Acid (PFPeA)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorotetradecanoic Acid	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorotridecanoic Acid	2016/12/16	0.60 U, RDL=0.80		ug/L	
			Perfluoroundecanoic Acid (PFUnA)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorodecanoic Acid (PFDA)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorododecanoic Acid (PFDoA)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluoro-n-Octanoic Acid (PFOA)	2016/12/16	0.50 U, RDL=0.80		ug/L	
			Perfluorooctane Sulfonate (PFOS)	2016/12/16	0.50 U, RDL=0.80		ug/L	
4796218	CM5	Matrix Spike	13C4-Perfluorooctanesulfonate	2016/12/20		82	%	50 - 130
			13C4-Perfluorooctanoic acid	2016/12/20		88	%	50 - 130
			13C8-Perfluorooctanesulfonamide	2016/12/20		70	%	50 - 130
			6:2 Fluorotelomer sulfonate	2016/12/20		102	%	70 - 130
			8:2 Fluorotelomer sulfonate	2016/12/20		99	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Perfluorobutane Sulfonate (PFBS)	2016/12/20		115	%	70 - 130
			Perfluorobutanoic acid	2016/12/20		120	%	70 - 130
			Perfluorodecane Sulfonate	2016/12/20		101	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2016/12/20		120	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2016/12/20		102	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2016/12/20		113	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2016/12/20		121	%	70 - 130
			Perfluorotetradecanoic Acid	2016/12/20		123	%	70 - 130
			Perfluorotridecanoic Acid	2016/12/20		122	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2016/12/20		110	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2016/12/20		111	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2016/12/20		116	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2016/12/20		118	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2016/12/20		117	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2016/12/20		111	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2016/12/20		105	%	70 - 130
4796218	CM5	RPD	6:2 Fluorotelomer sulfonate	2016/12/20	9.4		%	30
			8:2 Fluorotelomer sulfonate	2016/12/20	21		%	30
			Perfluorobutane Sulfonate (PFBS)	2016/12/20	2.7		%	30
			Perfluorobutanoic acid	2016/12/20	3.7		%	30
			Perfluorodecane Sulfonate	2016/12/20	8.3		%	30
			Perfluorodecanoic Acid (PFDA)	2016/12/20	1.0		%	30
			Perfluorododecanoic Acid (PFDoA)	2016/12/20	0.39		%	30
			Perfluorononanoic Acid (PFNA)	2016/12/20	11		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2016/12/20	5.4		%	25
			Perfluorotetradecanoic Acid	2016/12/20	8.1		%	30
			Perfluorotridecanoic Acid	2016/12/20	0		%	30
			Perfluoroundecanoic Acid (PFUnA)	2016/12/20	3.0		%	30
			Perfluoroheptanoic Acid (PFHpA)	2016/12/20	1.4		%	30
			Perfluorohexane Sulfonate (PFHxS)	2016/12/20	0.69		%	30
			Perfluorohexanoic Acid (PFHxA)	2016/12/20	1.0		%	30
			Perfluoro-n-Octanoic Acid (PFOA)	2016/12/20	2.4		%	30
			Perfluorooctane Sulfonate (PFOS)	2016/12/20	0.36		%	30
			Perfluoropentanoic Acid (PFPeA)	2016/12/20	1.9		%	30
4796218	CM5	Spiked Blank	13C4-Perfluorooctanesulfonate	2016/12/20		78	%	50 - 130
			13C4-Perfluorooctanoic acid	2016/12/20		84	%	50 - 130
			13C8-Perfluorooctanesulfonamide	2016/12/20		72	%	50 - 130
			6:2 Fluorotelomer sulfonate	2016/12/20		101	%	70 - 130
			8:2 Fluorotelomer sulfonate	2016/12/20		92	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2016/12/20		107	%	70 - 130
			Perfluorobutanoic acid	2016/12/20		97	%	70 - 130
			Perfluorodecane Sulfonate	2016/12/20		99	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2016/12/20		102	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2016/12/20		90	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2016/12/20		100	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2016/12/20		105	%	70 - 130
			Perfluorotetradecanoic Acid	2016/12/20		106	%	70 - 130
			Perfluorotridecanoic Acid	2016/12/20		112	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2016/12/20		97	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2016/12/20		103	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2016/12/20		109	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2016/12/20		107	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2016/12/20		106	%	70 - 130

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Perfluorooctane Sulfonate (PFOS)	2016/12/20		99	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2016/12/20		93	%	70 - 130
4796218	CM5	Method Blank	13C4-Perfluorooctanesulfonate	2016/12/20		116	%	50 - 130
			13C4-Perfluorooctanoic acid	2016/12/20		111	%	50 - 130
			13C8-Perfluorooctanesulfonamide	2016/12/20		83	%	50 - 130
			6:2 Fluorotelomer sulfonate	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			8:2 Fluorotelomer sulfonate	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorobutane Sulfonate (PFBS)	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorobutanoic acid	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorodecane Sulfonate	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorodecanoic Acid (PFDA)	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorododecanoic Acid (PFDoA)	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorononanoic Acid (PFNA)	2016/12/20	0.20 U, RDL=1.0		ug/kg	
			Perfluorooctane Sulfonamide (PFOSA)	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorotetradecanoic Acid	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorotridecanoic Acid	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluoroundecanoic Acid (PFUnA)	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluoroheptanoic Acid (PFHpA)	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorohexane Sulfonate (PFHxS)	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluorohexanoic Acid (PFHxA)	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluoro-n-Octanoic Acid (PFOA)	2016/12/20	0.20 U, RDL=1.0		ug/kg	
			Perfluorooctane Sulfonate (PFOS)	2016/12/20	0.40 U, RDL=1.0		ug/kg	
			Perfluoropentanoic Acid (PFPeA)	2016/12/20	0.40 U, RDL=1.0		ug/kg	

Maxxam Job #: B6R1181
Report Date: 2016/12/29

ESS Laboratory
Client Project #: 1612316
Your P.O. #: B02623

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4807644	NS3	RPD	Moisture	2016/12/28	0.71		%	20

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

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

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.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

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

VALIDATION SIGNATURE PAGE

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

Adam Robinson, Supervisor, LC/MS/MS

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Sin Chii Chia, Scientific Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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ESS Laboratory   MAXXAM   CHAIN OF CUSTODY

Division of Thielsch Engineering, Inc.
185 Frances Avenue,Cranston RI 02910-2211
Tel. (401)461-7181 Fax (401)461-4486
www.esslaboratory.com

ESS Lab # 1612316

Turn Time ____ Standard **DUE 12/19/16**

Regulatory State: **MA** RI CT NH NJ NY ME Other______

Is this project for any of the following:(please circle)
MA-MCP Navy USACE CT DEP Other________

Reporting Limits - ____________

Electonic Deliverables Excel Access PDF

Co. Name: ESS Laboratory		Project #:	Project Name: 1612316
Contact Person: Shawn Morrell		Proj. Location:	
Address:	City, State:	Zip:	PO #: B02623
Tel.: ext 3083	email: smorrell@thielsch.com		

Analysis

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container		PFOS/PFOA EPA 537							
	12/9/16	1130	C	S	1612316-01	1	1	P			X							
	12/9/16	1100	C	S	1612316-02	1	1	P			X							
	12/9/16	1200	C	S	1612316-03	1	1	P			X							
	12/9/16	1415	G	L	1612316-04	1	1	P			X							

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ______Yes _____No

Seals Intact ____ Yes _____No NA:____

Cooler Temperature: __________

Internal Use Only
[ ] Pickup
[ ] Technician____

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Sampled by :

Comments: **see attached analytes**

Relinquished by: (Signature, Date & Time) [signature] 12/12/16 1635	Received by: (Signature, Date & Time) FedEx	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
Relinquished by: (Signature, Date & Time) [signature]	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)

* By circling MA-MCP, client acknowledges sampels were collected in accordance with MADEP CAM VIIA

Please fax to the laboratory all changes to Chain of Custody

Report Method Blank & Laboratory Control Sample Results

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

Page 1 of 1

Turn Time ✓ Standard Other ____
If faster than 5 days, prior approval by laboratory is required # ____
State where samples were collected from: (MA) RI CT NH NJ NY ME Other ____
Is this project for any of the following: (MA-MCP) Navy USACE Other EPA Health Advisory

Reporting Limits: EPA Health Advisory
ESS LAB PROJECT ID: 1612316
Electronic Deliverable Yes ✓ No ____
Format: Excel ✓ Access __ PDF __ Other ____

Co. Name	Project #	Project Name (20 Char. or less)
Horsley Witten	14105	H/A

Contact Person: Joe Longo
Address:
City: Sandwich State: MA Zip: 02563
PO#:
Telephone #: 508 833 6600
Fax #:
Email Address: jlongo@horsleywitten.com

Write Required Analysis: PFOS / PFOA EPA 537

ESS LAB Sample #	Date	Collection Time	COMP	GRAB	MATRIX	Sample Identification (20 Char. or less)	Pres Code	Number of Containers	Type of Containers	PFOS / PFOA EPA 537
1	12/9/16	1130	X		S	MCI DRILL/[illegible]		1	P	X
2	12/9/16	1100	X		S	1991 SITE 2 ALPHA-1		1	P	X
3	12/9/16	1200	X		S	ANNUAL DEPLOYMENT		1	P	X
4	12/9/16	2:15		X	L	FOAM MIX		1	P	X

Container Type: (P-Poly) G-Glass S-Sterile V-VOA
Matrix: (S-Soil) SD-Solid D-Sludge WW-Waste Water GW-Ground Water SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filters

Cooler Present ✓ Yes __ No
Seals Intact __ Yes __ No NA: ✓
Cooler Temp: ice temp 1.6
Internal Use Only
[✓] Pickup
[ ] Technicians ____

Preservation Code: 1- NP, 2- HC1, 3- H_2SO_4, 4- HNO_3, 5- NaOH, 6- MeOH, 7- Asorbic Acid, 8- ZnAct, 9- NONE
Sampled by: Joe Longo
Comments:

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	12/12	R Graves	12/12/16 1209	R Graves	12/12/16 1623	[signature]	12/12/16 1623
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time

*By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VII A

Please fax all changes to Chain of Custody in writing.

1 (White) Lab Copy 2 (Yellow) Client Receipt

10/26/04 A