Barnstable AIRPORT HYANNIS

PHASE I REPORT AND TIER CLASSIFICATION REPORT

Barnstable Municipal Airport
Hyannis, Massachusetts

RTN 4-26347

November 2017

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

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

PHASE I REPORT AND TIER CLASSIFICATION

BARNSTABLE MUNICIPAL AIRPORT
HYANNIS, MASSACHUSETTS
RELEASE TRACKING NUMBER 4-26347

Table of Contents

TABLES

ATTACHMENTS

PHASE I REPORT AND TIER CLASSIFICATION
BARNSTABLE MUNICIPAL AIRPORT
HYANNIS, MASSACHUSETTS
RELEASE TRACKING NUMBER 4-26347

1.0 INTRODUCTION

The Horsley Witten Group, Inc. (HW) has prepared this Phase I Initial Site Investigation Report (Phase I) and Tier Classification on behalf of the Potentially Responsible Party (PRP), the Barnstable Municipal Airport (the Airport) of Hyannis, Massachusetts (Figure 1). The report was prepared 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

A Notice of Responsibility (NOR), dated November 10, 2016, was issued to the Airport by the Massachusetts Department of Environmental Protection (DEP). The NOR requested that the Airport conduct additional field investigations to evaluate sources of two types of contaminants 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.

The NOR specifically requested 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 hydrologically downgradient of the Airport property, on the Maher Wellfield property. Consequently, this Phase I report focuses on these contaminants. For information on past releases and potential contaminants at the Airport, please see RTN 4-0823.

HW, on behalf of the Airport, conducted investigations on these contaminants in the past and provided results to DEP. In July 2015, HW sampled groundwater from seven monitoring wells on and off the Airport property 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 located off Airport property, within the Maher Wellfield property, and is screened from 77 to 87 feet below the ground surface. All samples taken from the other wells at the Airport property did not contain 1,4-dioxane above laboratory reporting levels.

Groundwater in the vicinity of historic releases from a floor drain at the former Provincetown Boston Airlines hangar (currently leased to Cape Air) had been known to contain 1,1,1-trichloroethane (1,1,1-TCA). Since 1,1,1-TCA solvent products have been known to potentially contain 1,4-dioxane, the past release of 1,1,1-TCA was investigated as part of this project as a potential source.

In response to August 4, 2016 NOR/ Request for Information (RFI) the Airport contracted with HW to conduct additional groundwater investigations and collect samples for laboratory analysis. As described in the December 2016 Immediate Response Action Plan, these efforts were focused on suspected PFOS and/or PFOA contamination locations on the Airport property based on the understanding of past use or potential release locations. 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 above laboratory reporting limits in each of the wells tested. At monitoring wells HW-3 and HW-5, groundwater 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 thereby likely to be emanating in part from an off-Airport source.

In accordance with the MCP, HW prepared an Immediate Response Action Plan in December 2016, the most recent status report for which was dated October, 2017.

This Phase I has been prepared in accordance with 310 CMR 40.0480, and the Response Action Performance Standards established in 310 CMR 40.0191. The appropriate Massachusetts Department of Environmental Protection (DEP) Bureau of Waste Site Cleanup (BWSC) forms (BWSC 107 and 108) accompanying this Phase I and Tier Classification have been generated through DEP's electronic file submission system (eDEP). In accordance with 310 CMR 40.1403(3)e, written notification of the Phase I and Tier classification and a summary of findings and statement of conclusions will also be provided to the Barnstable Town Manager and Board of Health and an advertisement in the local newspaper will announce the availability of the report. The Phase I report has been compiled following the general requirements and format established in 310 CMR 40.0483 *Content of Phase I Report*.

2.0 GENERAL DISPOSAL SITE INFORMATION

2.1 DEP Release Tracking Number

The DEP Release Tracking Number assigned is 4-26347.

2.2 Disposal Site Location

The disposal sites described in this Phase 1 are located at the overall Airport address of 480 Barnstable Road, Hyannis, Massachusetts, 02601.

World Geodetic System 1984:

Latitude (Y):	41° 39' 35.61" North
Longitude (X):	70° 17' 4.17" East

Universal Transverse Mercator (UTM) NAD 1983

Northing (Y):	4612812
Easting (X):	393056

2.3 DEP Priority Resource Locus Map

A Disposal Site Locus Map based on a United States Geological Survey (USGS) topographic map was generated by the Massachusetts DEP BWSC Priority Resource Map online map tool (http://www.mass.gov/eea/agencies/massdep/service/massgis-massdep-priority-resource-maps.html). The Priority Resource Map depicts the 500 foot and 1/2 mile radii from the Airport (Figure 2).

2.4 Estimate of On-Site Workers at the Disposal Site

According to the Site owner and operator, the average number of on-site workers at the Airport varies depending upon airfield activities. Airport and tenant workers include office professionals, management, maintenance, FAA tower employees, and other temporary contractors that perform various ongoing maintenance, inspections, and other general activities. There are approximately 25 workers directly employed by the Airport. Tenant workers at the various businesses (e.g., Hertz, Cape Air, Rectrix, FAA) total approximately 400 people at any one day.

2.5 Estimate of Residential Population

According to Massachusetts Geographic Information Systems (MassGIS) datalayer from the 2010 United States Census, approximately 2,500 people reside within 1/2 mile of the Airport.

2.6 General Description of Surrounding Land Uses

The Airport is located on Barnstable Road, within a densely developed area of Hyannis, Massachusetts. Commercial properties including general offices, retail establishments, and commercial businesses, as well as residential homes, abut the Airport.

2.7 Public Institutions

A general reconnaissance of the properties located within 500 feet of the Airport has not identified any Institutions, defined in 310 CMR 40.006 as "*any public or privately owned hospital, health care facility, orphanage, nursing home, convalescent home, educational facility, or correctional facility, where such facility in whole or in part provides overnight housing.*"

2.8 Natural Resource Areas

According to MassGIS and the DEP BWSC Priority Resource Map online map tool, there are several surface waters on or within 500 feet of the Airport (Figure 2).

The Airport is located within several DEP designated zones of contribution (Zone 2) to municipal supply wells, and within an Environmental Protection Agency (EPA) Medium-Yield Sole Source Aquifer. Due to dense development of the surrounding urban areas, the Airport, and a large portion of the Zone 2 that it is located within, is also designated as Non-Potential Drinking Water Source Area (NPDWSA).

In accordance with 310 CMR 40.0932(4), disposal sites located within a Current Drinking Water Source Area (Zone 2) are designated as GW-1. The MCP Method 1 GW-1 cleanup standards would therefore be applicable to the Site, and are referenced throughout. The Airport and downgradient residential properties were confirmed to have municipally supplied drinking water. No private drinking water wells at the Airport or downgradient properties were identified by HW or the Town of Barnstable Department of Public Works, Water Supply Division, and the Town of Yarmouth Health Department, as part of the IRA actions and during the Phase I investigation.

According to MassGIS and the DEP BWSC Priority Resource Map online map tool, there are no Areas of Critical Environmental Concern; local, state, or federal protected open space; fish habitats; and, habitats of Species of Special Concern or Threatened or Endangered Species within 500 feet of the Airport. There is an area including Rare or Endangered species located approximately 500 feet north of the Airport boundary near Mary Dunn Pond.

3.0 DISPOSAL SITE MAP

In accordance with 310 CMR 40.0483(1)b, a disposal site map including the Airport parcels generally identified as 480 Barnstable Road property and neighboring parcels is included as Figure 3. This identifies the two known sites with PFAS compounds in soil and a third potential site; the 1991 drill location.

4.0 DISPOSAL SITE HISTORY

4.1 Site Ownership and Improvements

The Airport is located in Hyannis, Massachusetts, and provides scheduled airline service and general aviation services and other aviation related activities. The Airport is currently owned by the Town of Barnstable and is operated through the Barnstable Municipal Airport Commission (BMAC). The Airport began as a private airport consisting of a single grass runway before being given to the Town of Barnstable in the 1930's. During the 1940's, the U.S. Navy used the Airport and expanded the airfield to include three runways. In 1946, the Airport was returned to use as a two-runway municipal airport (each runway has a designation at each end, being 15-33 and 6-24).

The Airport is comprised of approximately 645 acres of land, with approximately 140 acres that are impervious (e.g. paved areas such as parking lots, runways, concrete walkways, and building rooftops). The Airport's structures include the main terminal and the Air Traffic Control Tower (ATCT), which are located south of the runways and taxiways, as well as several hangars used for general aviation services. The terminal is includes office space for Airport employees, ticketing counters for airlines, service counters for auto rental agencies, a restaurant, a retail/art store, space for the TSA, and a general lobby and passenger queuing area. The Airport is located in an area of Hyannis zoned for Business and Industrial uses.

The general aviation facilities are managed primarily by private companies who lease portions of the Airport property. Daily operations typically include a variety of activities from private aircraft flights and charter services, flight school operations, aircraft maintenance and storage, refueling of aircraft, and other aviation related actions. The Airport provides vehicle parking at a main lot located directly in front of the terminal as well as at other locations proximate to hangars across the airport. The Airport is currently served by electric power, telephone, natural gas, municipal sewer and private septic systems (for several hangars on the north end of the East Ramp area), a stormwater conveyance system including several leaching catch basins, and municipal drinking water. The stormwater conveyance systems generally run along the runways, taxiways, and parking areas and direct stormwater to several outfall pipes and infiltration basins.

4.2 Hazardous Materials Use and Storage

During its normal daily operations the Airport accepts, stores, handles and transfers a variety of oil and or hazardous materials (OHM), similar to most other airports and similar industries. Daily operations include refueling and maintenance of vehicles and aircraft that require a certain level of OHM storage and use. Over the past 20 years, it has been a priority of the Airport management to implement many OHM use reductions, improvements, and storage and training guidelines, as well as infrastructure

improvements that continue to reduce the risk of impacts to environmental receptors at the Airport. Additional details related to this have been previously reported under RTN 4-0823.

Additionally, the Airport Rescue and Fire Fighting Building (ARFF) building is where the emergency response vehicles and Aircraft Fire Fighting Foam (AFFF) and all fire fighting apparatus is stored. This is the only location where AFFF is stored at the Airport. Airport personnel are trained first responders and use and maintain the equipment in compliance with local, state and federal regulations.

The following data has been collected in response to DEP's NOR and RFI to further clarify the type, use, and storage of AFFF at the Airport.

- Annual testing per Federal Aviation Administration (FAA) regulations is required to ensure that there is the appropriate AFFF to water mixture. Historically, the test consists of essentially shooting the mixture of AFFF from the fire rescue vehicle at a small square target. Adjustments are made, if needed, to allow for proper spray coverage.
    - Approximately 80 gallons of AFFF is used annually to conduct the test.
    - All testing has been conducted in the same location on the Airport for the past 16 plus years (Drill / Deployment area).
- All firefighters must attend annual training which occurs off-site at various FAA approved training facilities such as Logan Airport or Concord New Hampshire.
- Tri-Annual Drill Dates:
    - With the exception of the drill in 1991 as shown on the attached figures, all drills occur on the East Ramp at the Drill / Deployment area
    - July 17, 1991
    - Nov. 16, 1994
    - Nov. 17, 1997
    - Nov. 2, 2000
    - Oct. 18, 2003
    - Oct. 25, 2006
    - Oct. 22, 2009
    - Oct. 11, 2012
    - Oct. 28, 2015 (No AFFF used during this drill – just water)
- FAA regulations require a supply of AFFF on hand to resupply two trucks. This is approximately 405 gallons. Current supply stored in the ARFF building is as follows:
    - 265 3% Chemguard C301 MS 265 gallon tote
    - 105 3% Chemguard C301 MS 21- 5 gallon pails
    - 20 3% Chemguard C306-MS-C 10- 5 gallon pails
- The Airport has 185 gallons of foam that will be removed by Global Remediation and is no longer useable for our operations as the expiration date has passed.

    - 3% Chemguard C301 MS 3- 5 gallon pails of old foam.
    - 3% Ansulite AFFF 1- 5 gallon pail of old foam.
    - 3% Chemguard C301 MS 3-55 gallon drums of old foam.
- To the best of the Airport management's knowledge, no foam has been donated, sold, or otherwise given to another entity.

4.3 Site Utilities

The Airport and its various buildings, terminal, hangars, include connections to municipal water, sewer, natural gas, cable, fiber, and stormwater facilities. Several hangars along the northern most section of the east ramp have on-site septic systems. The Airport has an overall Stormwater Pollution Prevention Plan (SWPPP) and map that is updated regularly. Stormwater runoff either infiltrates directly into the sandy soils, or is conveyed to other infiltration treatment units (e.g., Vortechs, raingardens, naturalized depressions, leaching catch basins). The SWPPP has been prepared in accordance with the requirements for the Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) Stormwater Multi-Sector General Permit (MSGP). As changes to runways, taxiways, and other infrastructure are made, the SWPPP is updated, reviewed, and approved by Airport Management.

4.4 Wastewater Disposal

The previous airport terminal was connected to town sewer for decades, prior to its demolition. The current terminal building has always been connected to Town sewer. The ARFF building has also been connected to town sewer since its construction in 1998. All wastewater generated at from these and most of the hangars at the Airport is discharged to the Town of Barnstable Water Pollution Control Facility (WPCF) located on Bearse's Way, Hyannis, Massachusetts.

4.5 Release History

The boundaries of the disposal Sites at the Airport related to PFAS compounds are identified on Figure 3. 1,4-dioxane has not been detected in groundwater underneath the Airport.

Personnel working at the Airport since 1980 were consulted to determine when AFFF use occurred during an actual aircraft accident and only two instances were identified. Please note that AFFF is NOT used unless there is a spark of fire. The majority of accidents do not result in the use of AFFF.

- 1981 crash of a Beech 18 aircraft east of runway 24 between Willow Street and the Airport.
- 2016 crash of a Cirrus aircraft in the parking lot of the rental car facility west of the terminal building. Approximately 10 gallons of AFFF concentrate was used

during the crash response. 100% of this AFFF liquid was contained within a solid bottom manhole and removed during response actions.

The following is a general summary of AFFF use at the Airport. After research regarding the use of AFFF at the Airport, it was determined that all drills and testing are conducted in the same area of the Airport, on the east ramp referred to as the deployment area (Figure 3). This includes annual fire fighting training, as well as regular testing of foam dispensing equipment conducted to comply with specific FAA requirements.

Based on this understanding, 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), Airport management and its representatives. At the meeting, specific areas of AFFF use were discussed, a sampling program was planned, and 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 were installed, groundwater and soil samples have been collected and analyzed, and results indicated PFAS in both groundwater and soil in two areas further described in this report.

4.6 Environmental Permits and Compliance History

The Airport has been a "release site" under RTN 4-0823 since the mid 1990's. There have been a number of releases that were combined under that RTN to coordinate and consolidate cleanup records. The Airport is designated as a very Small Quantity Generator (VSQG) of hazardous materials in accordance with Massachusetts Hazardous Waste Generator Regulations 310 CMR 30.0000, and is designated as Generator ID MAD019412147. No Resource Conservation and Recovery Act (RCRA) permits are associated with the Airport. A National Pollutant Discharge Elimination System (NPDES) permit (MAR053164) has been issued for the Airport as it discharges stormwater to waters of the US. Included are tables highlighting the quantities purchased and the approximate volume of AFFF concentrate used for training, drills, and FAA required testing, and the quantity stockpiled per FAA regulations for the past 17 years.

5.0 SUBSURFACE INVESTIGATION ACTIVITES COMPLETED TO DATE

HW completed a number of surface and subsurface investigative actions of the past year to determine the presence or absence of the contaminants of concern at the Airport, as well as at off-Airport properties. Please refer to the attached tables showing specific laboratory results for 1,4-dioxane and PFAS analysis in soil and groundwater. Figures 4 and 5 show sampling locations and results for groundwater testing of 1,4-dioxane and

PFAS compounds respectively. Figures 6 and 7 provide the details on soil sampling for PFAS compounds at the deployment area and ARFF building locations. The field work conducted to date includes the following activities:

5.1 1,4-Dioxane

- Ten groundwater samples were collected in April 2017 and analyzed by ESS laboratory for the presence of 1,4-dioxane using Method 8270 SIMS (Figure 4). Wells were sampled from locations hydrologically upgradient of the Airport, at the Airport's North Ramp, along the path of groundwater flow direction from the North Ramp towards the Maher Wells, and downgradient of and off the Airport property at the Maher Wellfield. The contaminant was detected at the Maher Wellfield in monitoring well OW-9DD at a concentration of 0.93 ug/L, above the 0.30 ug/L standard for 1,4-dioxane. However, samples taken from monitoring wells at the Airport did not contain 1,4-dioxane above laboratory reporting levels.

5.2 PFAS Compounds

- Groundwater monitoring wells were installed at six locations iin April 2017: in the vicinity of potential sources of PFOA at the Airport Rescue and Fire Fighting (ARFF) Building, at the deployment area and in upgradient locations to evaluate potential off site sources of PFAS (and 1,4-dioxane). Figure 5 provide the monitoring well locations and associated results used in the analysis to date.

- Groundwater samples for PFAS were collected on April 5-7 and April 11, 2017. Additional groundwater samples and one surface water sample were collected for analysis of PFAS on June 20, 2017.

- An initial round of three soil samples were taken on December 6, 2016 as reported in the first status report. One sample was taken from each location where it was determined that aircraft fire fighting foam (AFFF) had been used at the Airport, including the site of a single training event in 1991 (in previous IRA reports, this location had erroneously been stated to be a crash site), the deployment area and adjacent to the ARFF building (See Figures 3, 6 and 7).

- A second round of soil samples was taken on June 20, 2017 adjacent to the ARFF building and within the deployment area to begin to determine the extent of PFAS within the surface soils. Based on the results of these analyses, a third round of samples from these two locations were collected on September 26, 2017. The third round of sampling was designed to further map the extent of PFAS in soils both horizontally and vertically, with samples taken at the ground surface and at two and four feet below grade (Figures 6 and 7).

- In October, 2017, three composite soil samples were taken from piles of sediment and topsoil associated with the redevelopment of Runway 15/33 (Figure 3). These piles were located on Airport property at the site of the former Mildred's Restaurant and were analyzed for PFAS compounds to evaluate if sediment removed from the airport as part of this redevelopment contained PFAS.

- On October 26, 2017, ten additional PFAS samples were taken to evaluate background conditions in surficial soils on the Airport and in nearby locations in Hyannis. Refer to the Conceptual Site Model for additional details.

- Samples of AFFF have also been analyzed for PFAS compounds to evaluate the foam previously used at the Airport and that the foam that is currently in use, which per manufactures specifications should have reduced concentrations of PFAS compounds.

Soil and Groundwater samples were collected in accordance with the Massachusetts Department of Environmental Protection (DEP) Guidance on Sampling and Analysis for PFAS at Disposal Sites Regulated under the MCP, dated January 2017. A submersible pump was utilized to develop each monitoring well prior to sample collection. During well development, a properly calibrated InSitu smarTroll MP multi-parameter meter was utilized to measure temperature, pH, conductivity, DO, and oxidation reduction potential. Samples, including the trip and equipment blanks were submitted to ESS Laboratory, Cranston, Rhode Island for 1,4-dioxane analyses and to Maxxam Laboratory for PFAS analysis. Trip blanks and equipment rinse samples were collected and analyzed for PFAS compounds along with the monitoring well samples.

Soil samples were taken either directly into the sampling jar at the ground surface, or by using a hand auger that was decontaminated using Liquinox, and rinsed using Type II De-ionized water between each sample. Each boring was advanced to just above the desired depth of sample then the auger was decontaminated and rinsed again prior to sample collection, in order to minimize, to the greatest extent possible, cross contamination between samples/intervals. Each step was repeated in between each interval of sampling. Samples were collected by either shaking the sample directly from the hand auger into the bottle, or, if necessary, using a gloved hand to remove the sample from bottom of the auger and placing directly into bottle. A separate set of gloves was used for each sample.

6.0 NATURE AND EXTENT OF CONTAMINATION

Assessment activities performed by the Airport have identified 1,4-dioxane in groundwater at concentrations above the applicable MCP GW-1 standards at the Maher

well field property to the southeast of the Airport (Figure 4). No 1,4-dioxane has been detected on Airport property. The source of the 1,4-dioxane at the Maher well field could potentially be associated with a former Dichlorodifluoromethane (Freon) release at the Packaging Industries site upgradient of the Airport and further investigation of this possibility is planned as part of the Phase II assessment.

PFAS compounds have been identified in soil at the two release sites at the airport; at the deployment area and adjacent to the ARFF building. As explained further in the conceptual site model discussion, background testing and SPLP leaching tests of PFAS compounds in soil are underway to evaluate existing conditions outside the two known sites. PFAS compounds were detected at a depth of approximately 80 feet below the water table at the Maher well field. The potential source of this contamination may be the Barnstable Fire Training Academy upgradient of the Airport. PFOS/PFOA testing in shallow groundwater at the deployment area and ARFF building also identified concentrations slightly above the 0.070 ugL standard. This contamination is likely associated with the releases to soil in these areas. Further work in Phase II is needed to provide greater clarity to the extent of soil and groundwater contamination associated with these two sites.

7.0 MIGRATION PATHWAYS AND EXPOSURE POTENTIAL

In accordance with 310 CMR 40.0483(f), Phase I reports shall describe and evaluate known and potential contaminant migration pathways and exposure points, to the extent that such information is known.

The primary concern with the PFAS compounds is exposure through drinking water from foam deposited on the ground surface that migrates downward to groundwater and flows towards the Maher well field (Figure 8). The concentrations in soil that would create an exposure risk for people at the airport are significantly higher than the concentrations detected in soil at the two disposal site areas.

Past work identifying groundwater flow direction within and surrounding the Airport has shown a general flow from northeast to southwest along the Airport (Figure 8). As you move towards the east side of the Airport property and further off the Airport to the east, flow tends to move north to south. Groundwater below the northwest corner of the airport adjacent to Independence Drive may flow towards the Mary Dunn Wellfield. Further groundwater flow and modeling analysis needed to document groundwater flow in this area. Based on the depth and identified migration of the contaminant plume in groundwater and uniform subsurface geology, preferential flow pathways along subsurface utilities or unconsolidated sediments (i.e. gravel layers, fractured bedrock) are not expected to occur.

The Site is located within a Current Drinking Water Source Areas, designated as Zone 2's to various public drinking water supply wells include the Maher wellfield, located southeast of the Airport.

8.0 CONCEPTUAL SITE MODEL AND PHASE II SCOPE OF WORK

Assessment activities conducted to date have been completed for the IRA and this Phase 1 Report. Data collected to date provides initial information to develop a Conceptual Site Model (CSM) for planning a Phase II Comprehensive Site Assessment (CSA) in accordance with 310 CMR 40.0830. The Tier Classification submittal criteria require the preparation of a Phase II CSA scope of work or conceptual scope or work. The Phase II scope of work is provided below, with each compound addressed individually and each site for PFAS investigation discussed separately.

8.1 Conceptual Site Model

The purpose of this investigation is to evaluate the nature and extent of the release(s) including potential sources of 1,4-dioxane and PFAS compounds and risks including potential impacts to groundwater quality in the vicinity of the Airport. Soil contamination identified in source areas also presents a potential exposure point that requires risk evaluation. The potential exposure points for groundwater impacts are the public water supply wells operated at the Maher wellfield by the Hyannis Water District.

1,4-dioxane has not been detected in groundwater on the Airport property. It has only been found on the Maher wellfield property at the base on the aquifer, approximately 80 feet below the water table.

PFAS compounds have been detected at elevated concentrations in two areas; the deployment area and adjacent to the ARFF building. Concentrations of PFOS/PFOA in shallow groundwater below these two locations exceed the 0.07 ug/L standard for PFOS/PFOA. Samples collected from the deep wells on the Maher wellfield exceed the standard as well. This deep contamination may be associated with the Barnstable Fire Training Academy as shallow groundwater below the Airport's deployment area and ARFF building is not likely to migrate to the depth where PFOS/PFOA was detected at the Maher well field. Further hydrogeologic analysis of this issue will be conducted as part of the Phase II investigations.

Sampling of a third potential AFFF site, where training was conducted once in 1991, indicated that PFOS/PFOA was present, but at much lower concentration than detected at the other two Airport sites. Samples collected from other locations at the Airport and in nearby locations off the Airport property were submitted for laboratory analysis to assess background concentrations. Sample results are expected in mid-late November

2017. The results of these background samples will be used to evaluate the PFOS concentrations in soil at the 1991 training site.

1,4-Dioxane

The sampling of 1,4-dioxane to date was designed to evaluate if the presence of this contaminant in the vicinity of the Maher wellfield was associated with the former solvent plume that originated at the north ramp of the Airport. Laboratory results of samples collected from wells located within the flow pathway of this plume did not show the presence of any 1,4-dioxane (Figures 4 and 9). This includes wells selected to match how the plume would have migrated deeper into the aquifer as it moved downgradient.

1,4-dioxane was only found in samples collected from deep wells (OW-9DD, OW-18D and OW-19D) on top of a clay layer at the base of the aquifer on the Maher well field property (Figures 4 and 9). 1,4-dioxane was not detected in samples taken from monitoring wells on the Airport. A potential source of 1,4-dioxane is the former Freon plume that originated at the Packaging Industries site, upgradient of the Airport. The plume from this release flowed across the Airport and was traced to the Maher wellfield in past investigations. The installation of an additional deep well in the runway safety area, upgradient of the Maher wellfield, will help evaluate if any 1,4-dioxane is present on the Airport property and continuing to migrate from this upgradient source (Figure 4). Sampling of this new well and the deep wells on the Maher well field property for Freon-11 as well as 1,4-dioxane will help evaluate this second potential source.

PFAS Compounds

Background Concentrations

As mentioned earlier in this report, samples have been collected from ten sites on Airport property and in nearby areas to investigate the background concentrations of PFAS compounds in soil in the vicinity of the Airport. The laboratory results will be available in mid-late November 2017. They will be used to evaluate background conditions relative to the PFAS concentrations detected at the three known potential release areas at the Airport. In addition, an SPLP Leaching test using soils excavated from beside Runway 15/33 is currently being conducted and this will help evaluate the potential impacts to groundwater from PFAS compounds in soil. The SPLP test results are expected in mid-late November.

Deployment Area

AFFF was used during periodic drills and regular compliance training in an area on the East Ramp of the Airport (Figure 6). PFAS from the AFFF remains in soil in this area and is likely leaching to groundwater. During a phased sampling approach, PFAS compounds

were detected in soil samples collected at the ground surface and down to four feet below ground surface, and may extend further down in the soil column. It should be noted that several samples at the surface and at depth did not show the presence of PFAS. However, additional sampling is needed to define the horizontal and vertical extent of PFAS compounds in soil for this site, with sampling planned across the taxiway to the west in open areas to the northeast of the deployment area. Sampling below the East Ramp south of the deployment area is also planned to determine if foam that was sprayed onto the pavement might have washed through cracks into the underlying soil. Finally, sampling of sediment in leaching catch basins in the paved area just to the east of the deployment area is needed to determine if runoff into these structures is a source of groundwater contamination.

Shallow groundwater underneath the deployment area contains PFAS compounds above the 0.70 ug/L groundwater standard. Monitoring wells downgradient of the deployment area will be installed as part of the Phase II analysis to map the downgradient flow of groundwater from the deployment area towards the Maher well field. Multi-level well clusters will also be installed and tested to differentiate contamination from deployment area from that which might be related to the Fire Training Academy. The intent of these clusters is to fully assess the presence or absence of AFFF horizontally and vertically in groundwater.

ARFF Building

The practice of AFFF spraying, deployment, or use next to the ARFF building is not part of normal practice or procedures. However, it is possible that the storage and/or transfer of AFFF or the use of the vehicles General equipment maintenance and cleaning activities outside the ARFF building may have contributed to PFAS contamination in soils to the northeast of the building. Runoff into the catch basins on the north side of the building may have also provided a conduit to groundwater in this area. The Phase II analysis will include additional soil and groundwater testing to confirm the extent of soil contamination, and the impacts to groundwater.

The presence of PFAS in monitoring well HW-3 in what is referred to as “the Steamship Authority parking lot” (Figure 7) may be related to activities adjacent to ARFF in that HW-3 is downgradient of the ARFF building. Additional soil testing in the parking lot may be needed to evaluate the presence or absence of PFAS in the shallow soils in that area.

Additional surface, depth, and catch basin sediment samples will be collected at this site to further define the PFAS boundaries. A monitoring well cluster with shallow, intermediate and deep screens will be installed north of the ARFF building to evaluate groundwater contamination at depth and determine if this site could be a source of the contamination in the deep wells at the Maher wellfield property. Additional shallow monitoring wells will also be installed and sampled for PFAS compounds (Figure 5) at the

source area and downgradient to confirm the extent of contamination in groundwater in this area.

1991 Deployment Drill Location

Airport staff identified an area near the west end of Runway 15/33 where a drill using AFFF was conducted (Figure 3). An initial sample from this location contained low concentrations of PFOS and PFOA (0.4 ug/kg and 0.2 ug/kg respectively). The need for further investigation of this area will be determined based on the results of the background testing and the SPLP leaching test for which results are expected in mid-late November. If necessary and appropriate, soil and groundwater assessments will be completed in this area.

Upgradient Boundary of Airport

Although PFAS constituents are widely used, there is no identified source of PFAS near wells HW-1. PFAS in groundwater here could potentially be associated with an off Airport source. Testing of soils adjacent to the monitoring wells, and on the upgradient Kmart Plaza, may help identify the source and extent of contamination in this area of the Airport.

Well HW-19

There is no identified source of the PFAS compounds detected in well HW-19. Sampling of the soils in the vicinity of the well may help determine if the source is local or related to an off Airport release.

Well HW-1 and HW-5

Soil, surface water, and groundwater samples will be taken in the vicinity of these two wells to evaluate potential sources of PFAS compounds impacting groundwater within this area. Additional sample locations upgradient of the Kmart Plaza property will also be evaluated.

When appropriate, a Phase II CSA Completion Report and Risk Evaluation will be prepared to document information obtained as a result of any additional CSA activities and reference and incorporate the elements of this Phase I Report, and may be combined with a Phase III Remedial Action Plan. The Phase II CSA Completion Report and Phase III Remedial Action Plan will be prepared and submitted prior to the initiation of any Comprehensive Response Actions.

9.0 TIER CLASSIFICATION

Tier Classification is required for all disposal sites where Comprehensive Response Actions are necessary, and is intended to establish an appropriate level of DEP oversight for those response actions. The Tier Classification process consists of:

- Completion of a Phase I Initial Site Investigation Report in accordance with 310 CMR 40.0480;
- Comparison of conditions at the disposal site with the Tier I Criteria in 310 CMR 40.0520(2);
- Preparation and filing of a Tier Classification submittal; and
- Public involvement activities.

In accordance with 310 CMR 40.0520(2), the Site is designated as a Tier I disposal site, as assessment activities have identified groundwater contamination at concentrations above MCP RCGW-1 reportable concentrations, and the Site is located within a Zone 2.

Revisions to 310 CMR 40.000 that took effect on April 25, 2014, eliminate the requirement to submit and Initial Tier I Permit Application, Numerical Ranking System score sheet, or Tier I Permit Application fee.

9.1 Response Action Deadlines for Tier I Disposal Sites

Response action deadlines and requirements for Tier I disposal sites are described in 310 CMR 40.0560, and are as follows:

- A Phase II Comprehensive Site Investigation Report and a Phase III Remedial Action Plan shall be submitted within 2 years of the effective date of initial Tier Classification.
- A Phase IV Remedial Implementation Plan shall be submitted within 3 years of the effective date of initial Tier Classification.
- A Response Action Outcome shall be achieved at the Site within 5 years of the effective date of initial Tier Classification.

9.2 Tier Classification Public Notification

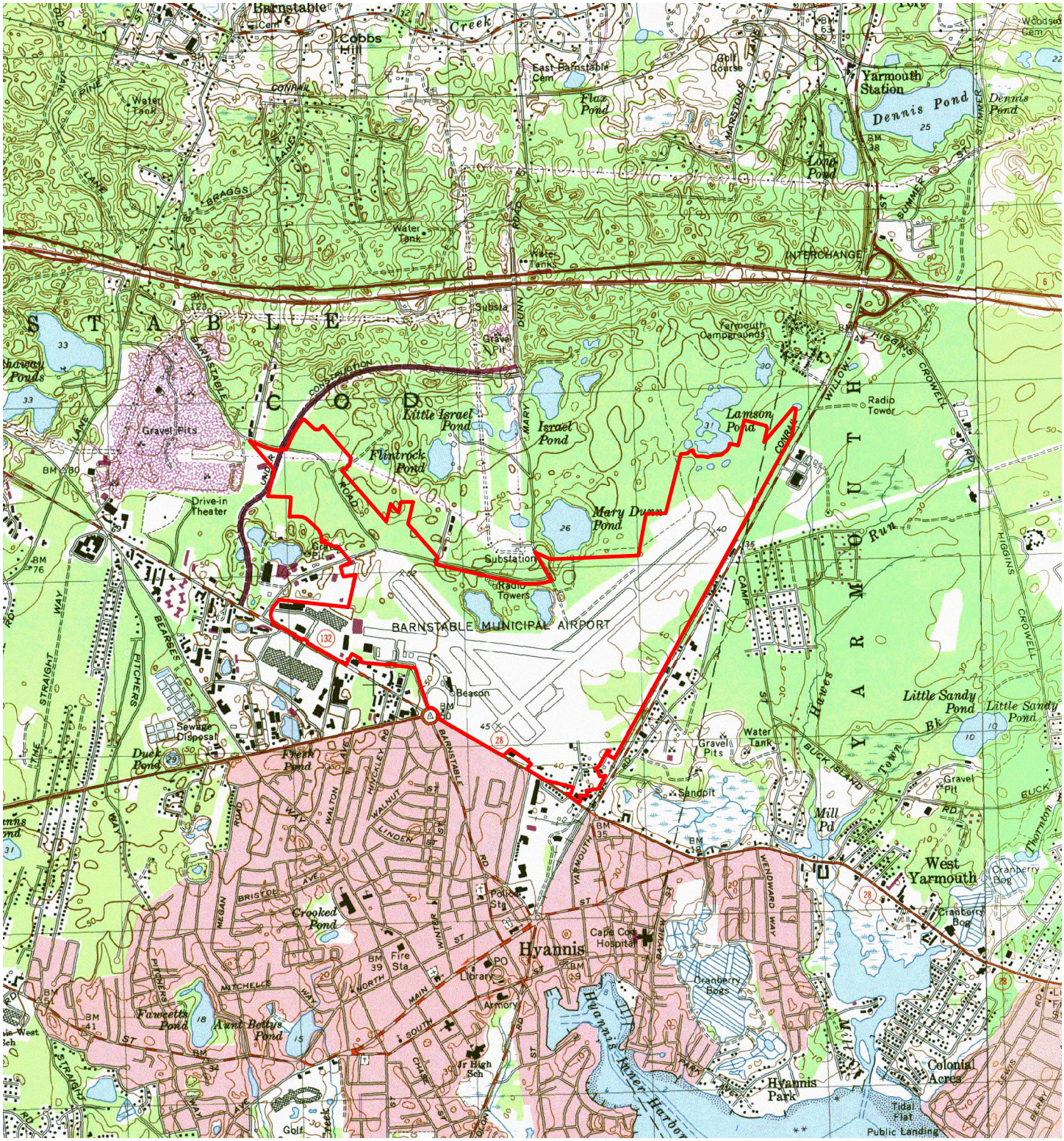
Within seven days of filing a Tier Classification Submittal, a legal notice must be published in a local newspaper pursuant to 310 CMR 40.1403(2)b. At least three days prior to public notification, copies of cover letters and notices shall be forwarded to the Barnstable Chief Municipal Officers, Board of Health, and owner of the Maher PWS wells. Copies of all public notices will be provided to DEP in accordance with 310 CMR 40.1403(2)(c)1.

10.0 CONCLUSIONS

This report has been prepared in response to the discovery of groundwater contamination at the Site above applicable MCP RCGW-1 standards, as noticed by DEP in the NOR of November 10, 2016.

At this time, a Response Action Outcome (RAO) cannot be issued for the Site, as contaminant concentrations remain above the GW-1 standards and Massachusetts Drinking Water Standards (310 CMR 22.00). Therefore, in accordance with 310 CMR 40.0800, HW has determined that Comprehensive Response Actions are necessary at the Site. Required Comprehensive Response Actions and associated timelines are described in Section 9.0.

Figures



Document Path: H:\Projects\HYA\11072 (697 Barnstable Airport)\GIS_Maps\USGS_Locus_20130815.mxd

Legend

Airport Property Line

**Hyannis Topographic Quadrangle*

N

Miles

0.5

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

USGS Locus
Barnstable Municipal Airport
Hyannis, MA

Date: 8/15/2013

Figure 1

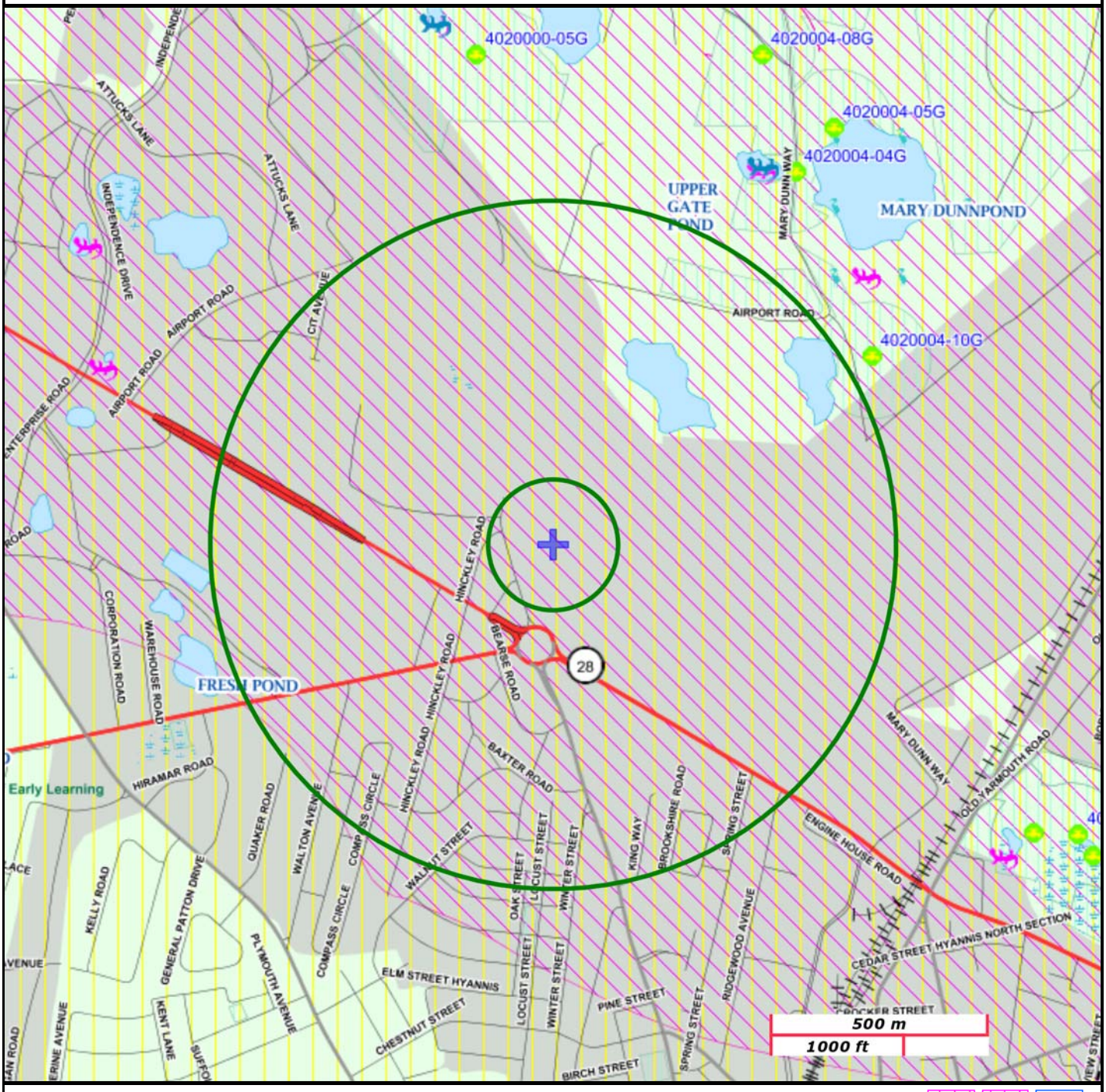
MassDEP - Bureau of Waste Site Cleanup

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

Site Information:
BARNSTABLE MUNICIPAL AIRPORT
480 BARNSTABLE ROAD HYANNIS, MA
4-000026347
NAD83 UTM Meters:
4613630mN , 392871mE (Zone: 19)
November 9, 2017

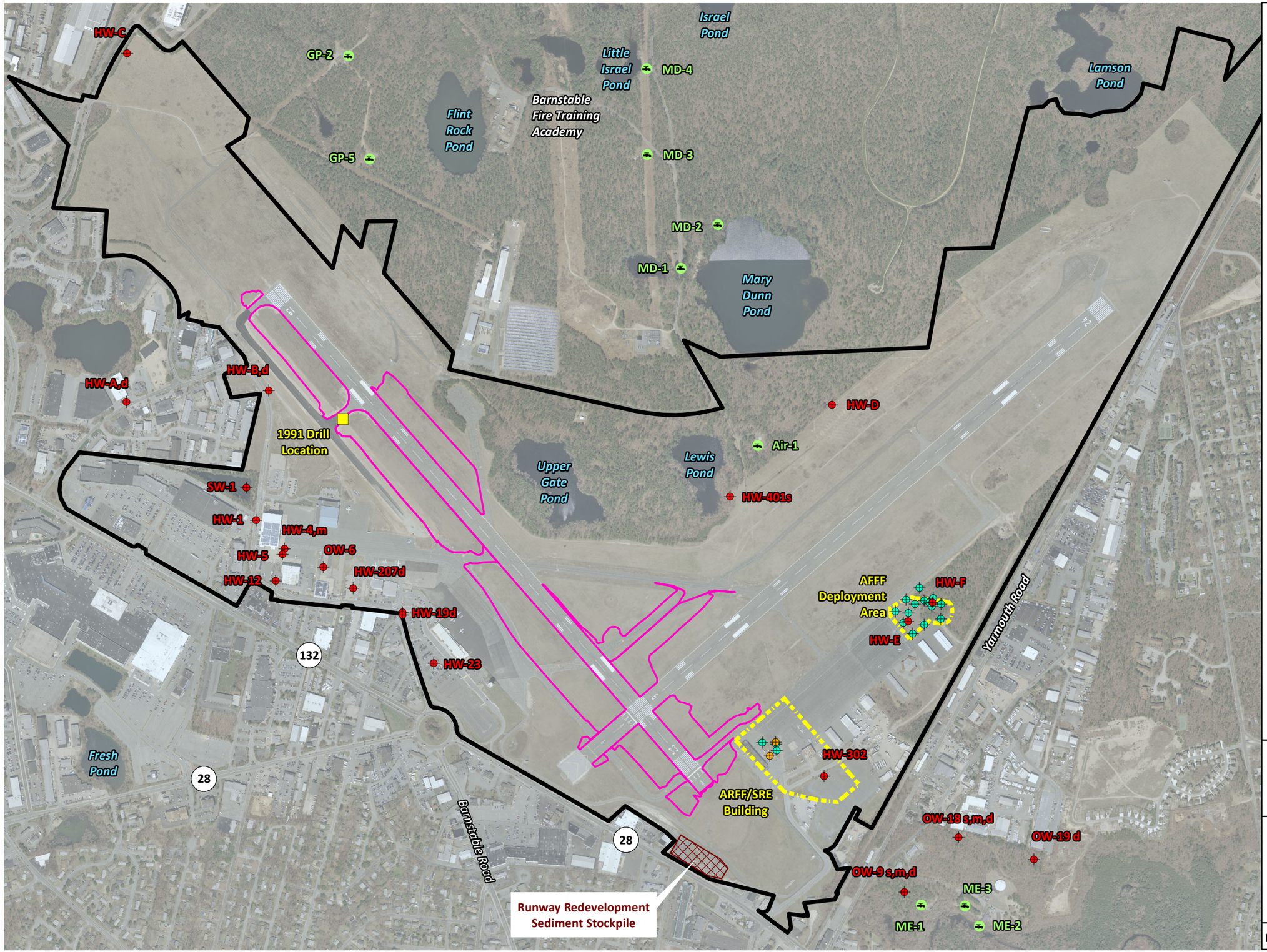
The information shown is the best available at the date of printing. However, it may be incomplete. The responsible party and LSP are ultimately responsible for ascertaining the true conditions surrounding the site. Metadata for data layers shown on this map can be found at: http://www.mass.gov/mgis/.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection



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

FIGURE 2 - Priority Resource Map



Legend

- Current Site Boundaries
- Existing Monitoring Wells
- Boundary of Runway Redevelopment Project
- PFOS/PFOA Soil Samples
- ARFF
- Drinking Water Wells
- Barnstable Municipal Airport Property Boundary

N

0 750

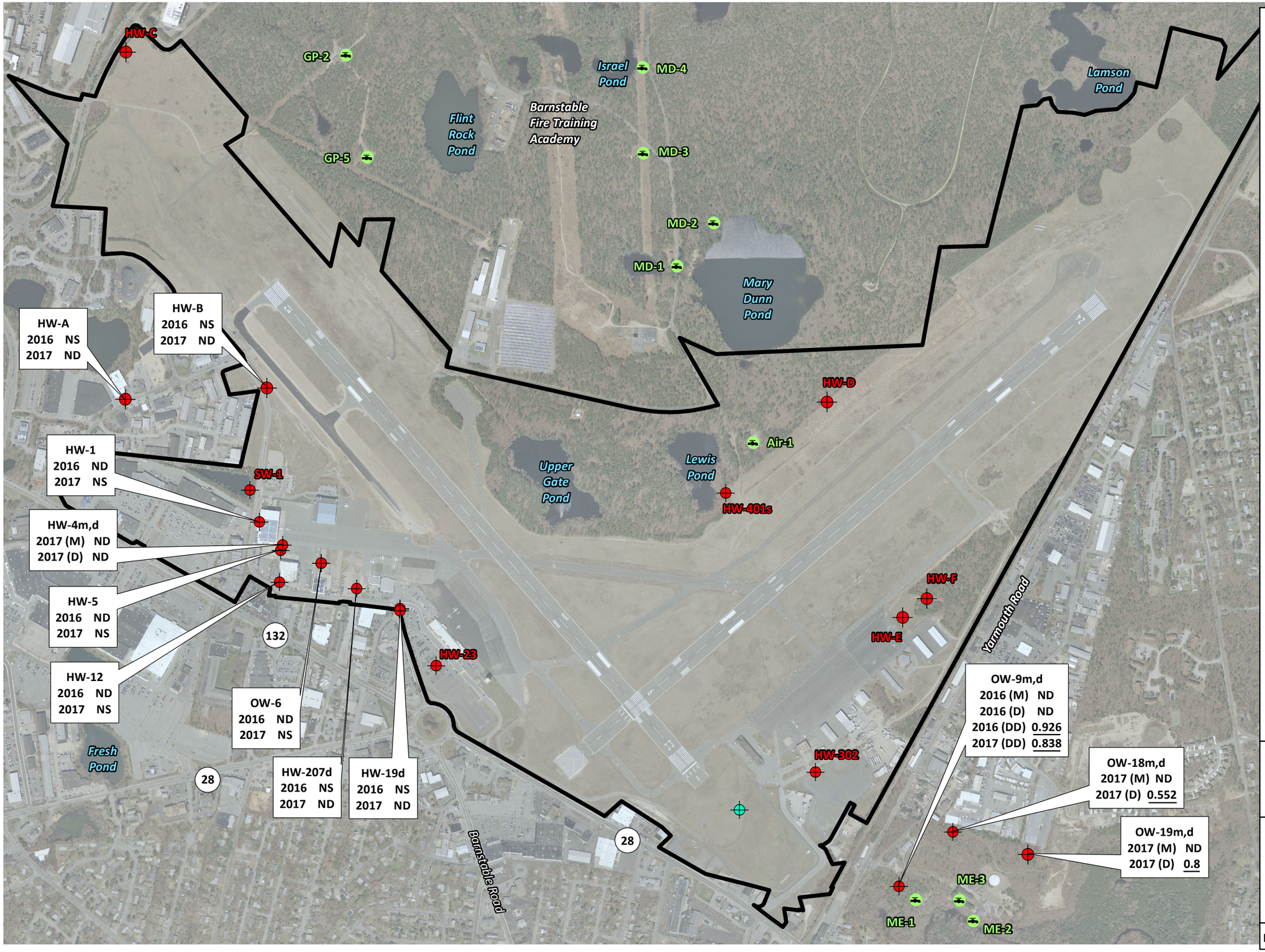
Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

PFAS Disposal Site Map
Barnstable Municipal Airport
Hyannis, MA

Date: 11/10/2017 Figure 3

*Imagery - MassGIS 2014

Path: \\hw-file2\HW-Server\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\Report_Maps\171109_PFAS_Sites_.mxd



Legend

- Existing Monitoring Wells
- Proposed Phase II Monitoring Well Cluster
- **ND** No Detect
- **NS** No Sample Collected
- **0.2** 1,4 Dioxane Below MassDEP Limit (0.3 ug/L)
- **0.8** 1,4 Dioxane Above MassDEP Limit (0.3 ug/L)
- Drinking Water Wells
- Barnstable Municipal Airport Property Boundary

N

0 750

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

Groundwater Sampling Results for 1,4 Dioxane Barnstable Municipal Airport Hyannis, MA

Date: 11/10/2017

Figure 4

*Imagery - MassGIS 2014

Path: \\hw-file2\HW-Server\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\Report_Maps\171108_DioxaneMap.mxd

HW-C
2016 NS
2017 ND

GP-2

Israel Pond

Little Israel Pond

MD-4

Lamson Pond

Barnstable Fire Training Academy

Flint Rock Pond

GP-5

MD-3

MD-2

MD-1

Mary Dunn Pond

SW-1
2016 NS
2017 ND

HW-B,d
2016 NS
2017 .0254

HW-D
2016 NS
2017 .012

HW-A,d
2016 NS
2017 ND

1991 Drill Location

Air-1

Upper Gate Pond

Lewis Pond

HW-401s
2016 NS
2017 .022

HW-F
2016 NS
2017 .075

HW-1
2016 .151
2017 NS

OW-6

HW-207d

HW-12

HW-E
2016 NS
2017 .100

AFFF Deployment Location

132

HW-4,m
2016 NS
2017 .054

HW-19d
2016 NS
2017 .100

HW-5
2016 .172
2017 .051

HW-3
2016 .0951
2017 .215

OW-18 s,m,d
2016 (S) .0263
2016 (M) .0498
2016 (D) .0239
2017 (D) .245

ARFF/SRE Building

Fresh Pond

28

HW-23
2016 NS
2017 .079

Barnstable Road

OW-19 d
2016 NS
2017 .029

OW-9 s,m,d
2016 (S) .0144
2016 (D) .0462
2017 (D) .555

ME-3

ME-1

ME-2

*Imagery - MassGIS 2014

Legend

- Current Site Boundaries
- Existing Monitoring Wells
- **ND** No Detect
- **NS** No Sample Collected
- **0.2** PFOS/PFOA Under EPA Limit (.070 ug/L)
- **0.8** PFOS/PFOA Over EPA Limit (.070 ug/L)
- Drinking Water Wells
- Barnstable Municipal Airport Property Boundary

Proposed - Phase II

- Monitoring Well Cluster
- Shallow Well

N

0 750

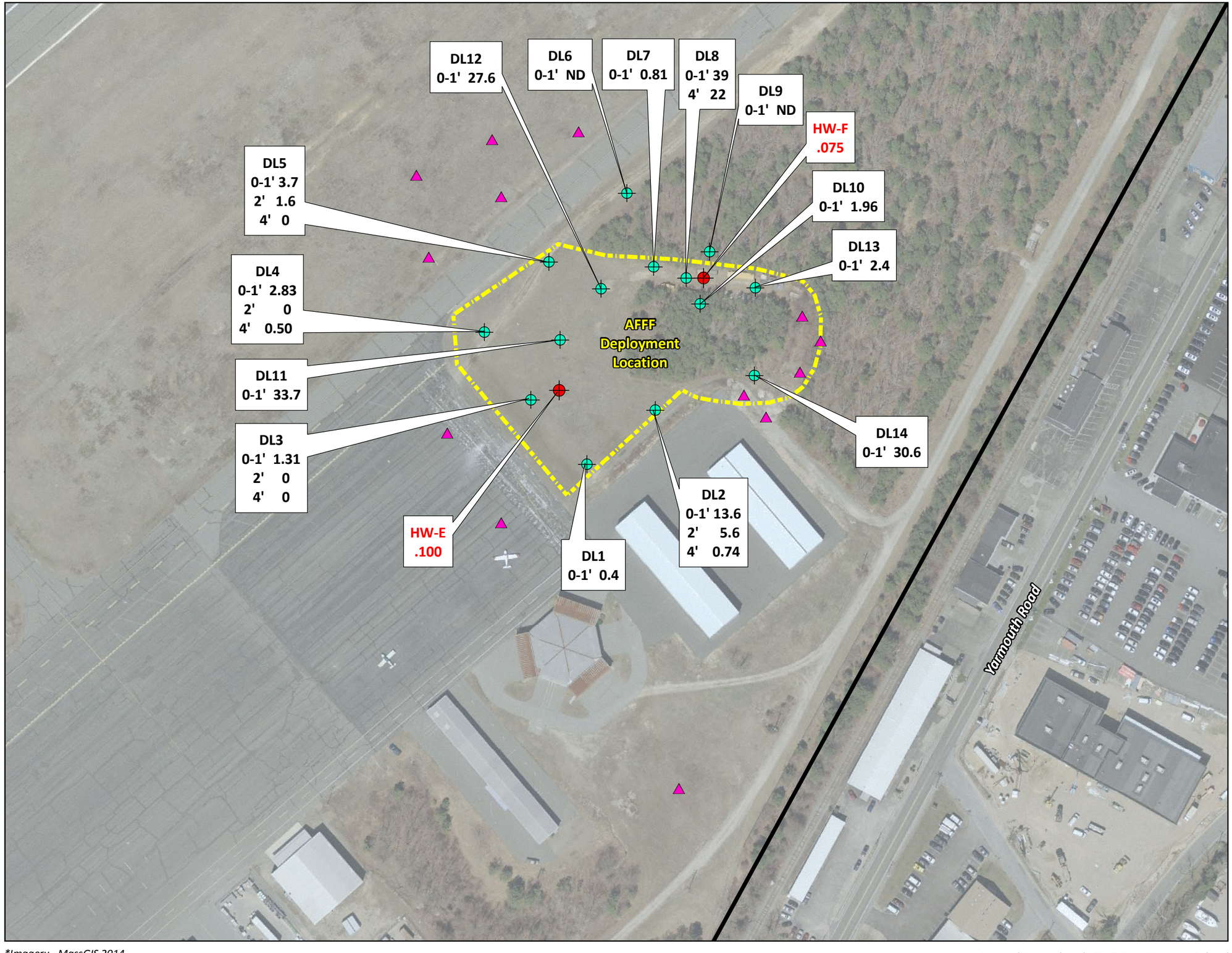
Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

Groundwater Sampling Results for PFAS Compounds Barnstable Municipal Airport Hyannis, MA

Date: 11/10/2017

Figure 5

Path: \\hw-file2\HW-Server\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\Report_Maps\171109_Prop_PFASWells.mxd



Legend

- Current Site Boundary
- Existing Monitoring Wells
- PFOS/PFOA Soil Samples
- Proposed Phase II Soil Test Sites
- **ND** — No Detect
- **0.2** — Soil Concentration (ug/kg PFOS+PFOA)
- **.075** — GW Concentration (ug/L PFOS+PFOA)
- Barnstable Municipal Airport Property Boundary

N

0 125

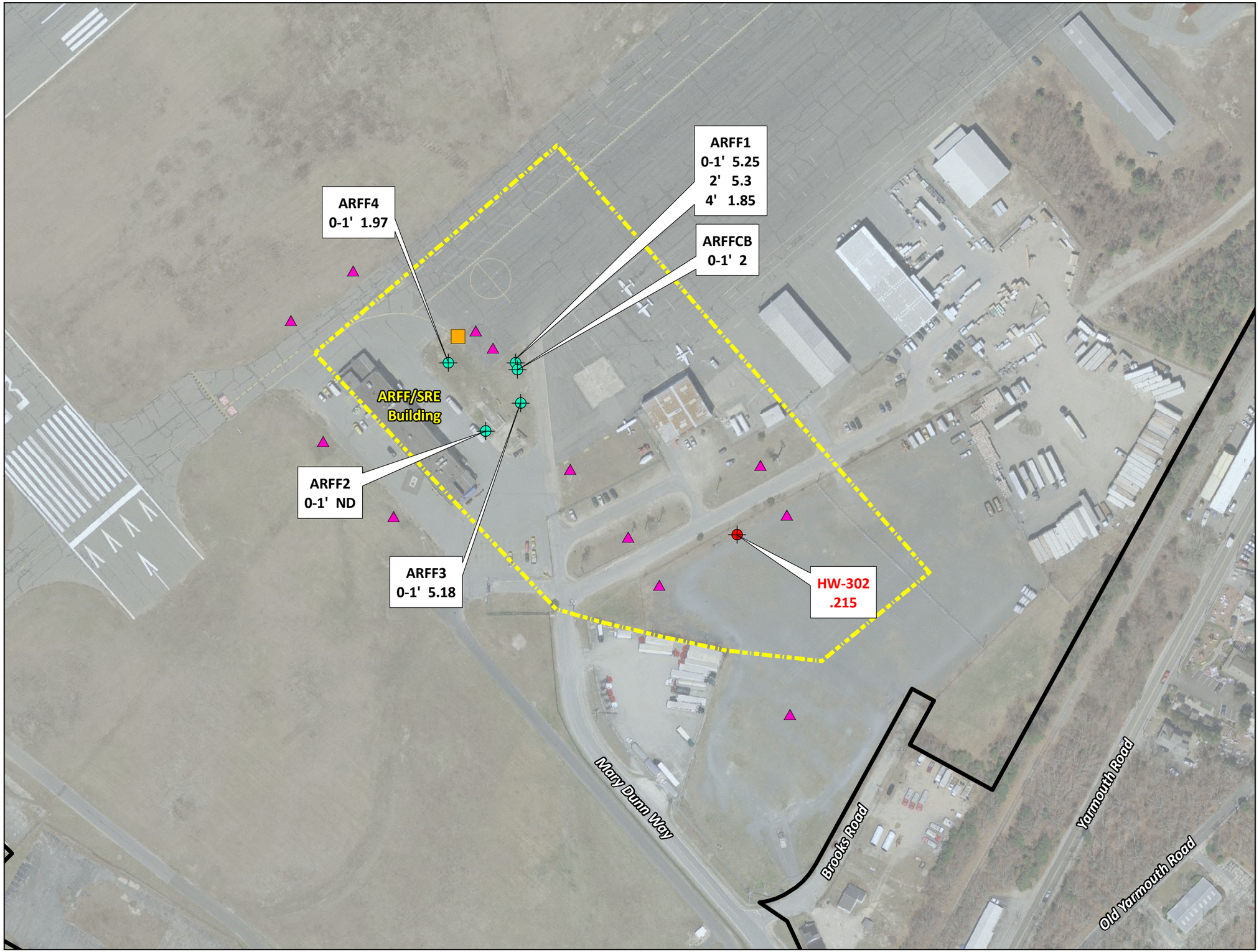
Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

Soil Sampling Results for PFAS Compounds - Deployment Area Hyannis, MA

Date: 11/10/2017 Figure 6

*Imagery - MassGIS 2014

Path: H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\Report_Maps\171108_Deployment Area Site.mxd



Legend

- Current Site Boundary
- Monitoring Well
- PFOS/PFOA Soil Samples
- Proposed Phase II Soil Test Sites
- 2nd Catch Basin
- ND — No Detect
- **0.2** — Soil Concentration (ug/kg PFOS+PFOA)
- Barnstable Municipal Airport Property Boundary

N

0 150

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

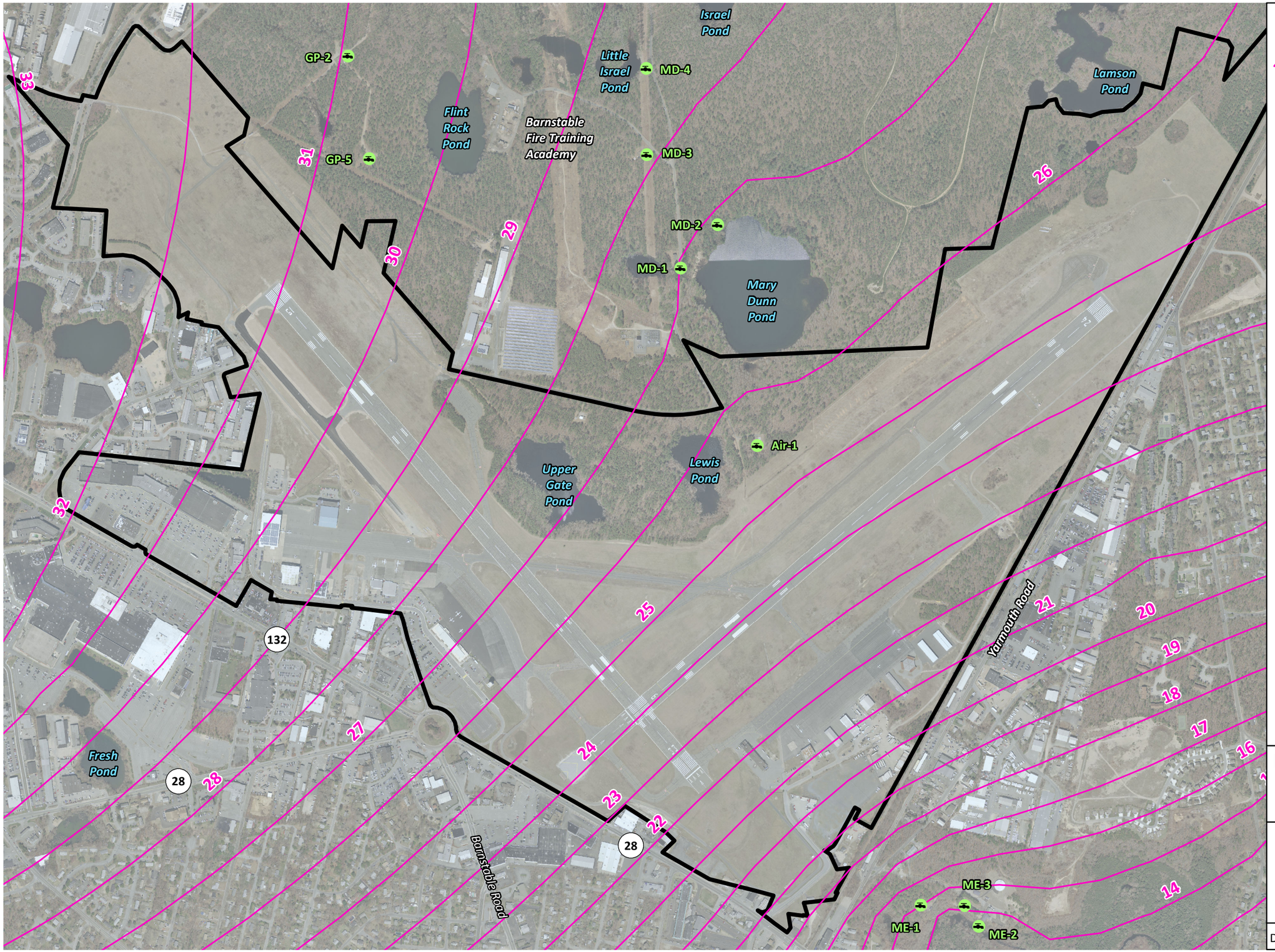
Soil Sampling for PFAS Compounds ARFF Building Hyannis, MA

Date: 11/10/2017

Figure 7

**Imagery - MassGIS 2014*

Path: H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\Report_Maps\171108_ARFF Building Site.mxd



Legend

- USGS Sagamore Lens Modeled Contours
- Drinking Water Wells
- Barnstable Municipal Airport Property Boundary

N

0 750

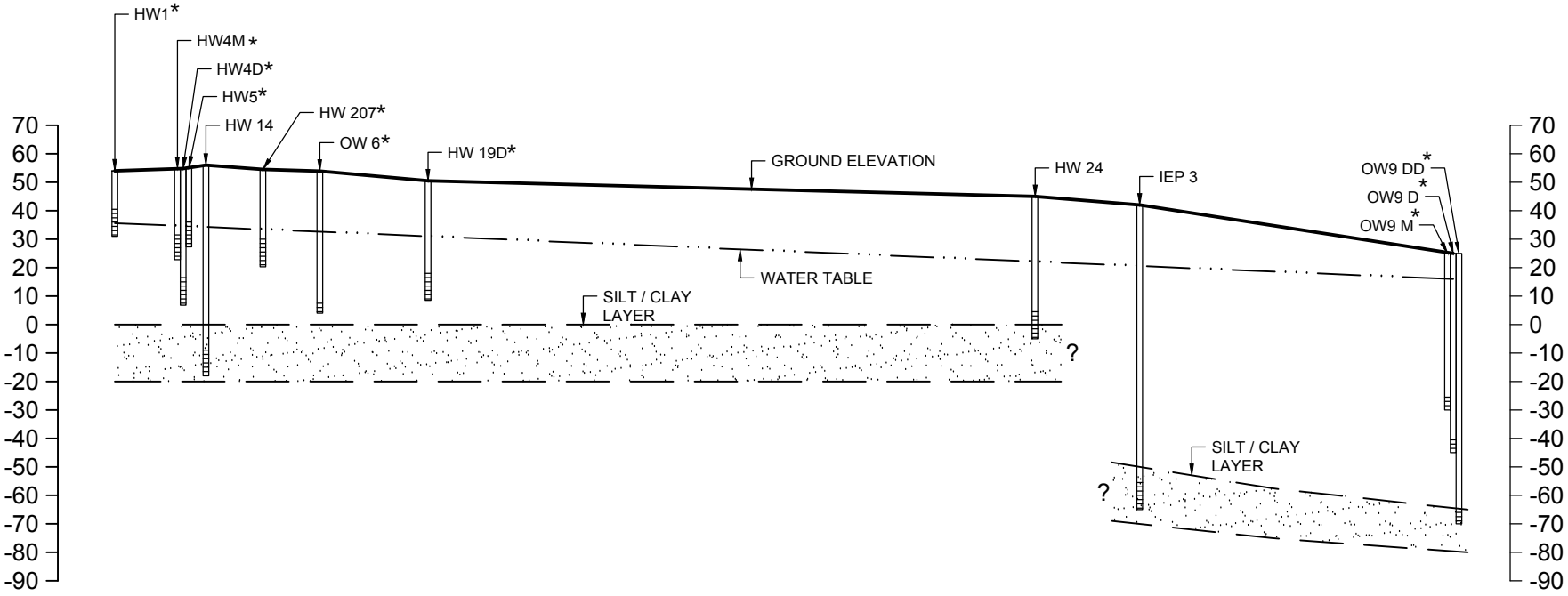
Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

USGS Sagamore Lens
Modeled Contours
Barnstable Municipal Airport
Hyannis, MA

Date: 11/10/2017 Figure 8

*Imagery - MassGIS 2014

Path: H:\Projects\HYA\17027 BMA PFOS 1-4 IRA\GIS\Maps\Report_Maps\171108_Groundwater.mxd



* 1,4, Dioxane Sample Collected

750 0 375 750 1500 3000

Title: HYDROGEOLOGIC PROFILE		Project: Figure 9: Hydrogeologic Cross Section	Prepared For: Barnstable Municipal Airport Barnstable, Massachusetts
Project: 17027	Sheet: 1 of 1	Date: OCTOBER 30, 2017	
Design By: MN/ ARM	Drawn By: MCL	Checked By: ARM	

Horsley Witten Group, Inc.
Sustainable Environmental Solutions
www.horsleywitten.com
90 Route 6A
Sandwich, MA 02563
508-833-6600 voice
508-833-3150 fax

Tables

Table 1. 1,4 Dioxane Groundwater Results

	GW-1	Date	HW-4D	HW-4M	HW-207D	HW-19D	HW-A(D)	HW-B(D)
1,4-Dioxane	0.3	4/5/2017	ND	ND	ND	ND	ND	ND
		Date		**OW-18M**	**OW-18D**	**OW-19D**	**OW-19M**	**OW-9DD**
1,4-Dioxane	0.3	4/11/2017		ND	**0.552**	**0.800**	ND	**0.838**

Notes:

ND= Not detected by method

ug/L = micrograms per liter

MDL = method detection limit

Table 2. Soil Results - June and September 2017

	DL1(0-1') 6/20/2017	DL2 (0-1') 6/20/2017	DL2 2' 9/26/2017	DL2 4' 9/26/2017	DL3 (0-1') 6/20/2017	DL3 (0-1') LAB DUP 6/20/2017	DL3 2' 9/26/2017	DL3 4' 9/26/2017
Perfluorobutanesulfonic acid (PFBS)	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroheptanoic acid (PFHpA)	0.30J	1.9	1.2	0.48J	0.84J	0.79J	ND	ND
Perfluorohexanesulfonic acid (PFHxS)	ND	1.8	0.74J	0.59J	0.34J	0.34J	ND	ND
Perfluorononanoic acid (PFNA)	ND	0.81J	2.5	ND	0.55J	0.51J	ND	ND
Perfluorooctane sulfonate (PFOS)	0.40J	12	1.5	ND	0.51J	0.45J	ND	ND
Perfluorooctanoic acid (PFOA)	ND	1.6	4.1	0.74J	0.80J	0.63J	ND	ND
PFOS+PFOA	0.40J	13.6	5.6	0.74	1.31	1.08	ND	ND
	DL4 (0-1') 6/20/2017	**DL4 2' 9/26/2017**	**DL4 4' 9/26/2017**	**DL5 (0-1') 6/20/2017**	**DL5 2' 9/26/2017**	**DL5 4' 9/26/2017**	**DL6 (0-1') 6/20/2017**	**DL7** (0-1') 6/20/2017**
Perfluorobutanesulfonic acid (PFBS)	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroheptanoic acid (PFHpA)	0.31J	ND	ND	2.5	0.40J	0.50J	5	2.5J
Perfluorohexanesulfonic acid (PFHxS)	ND	ND	ND	0.49J	0.49J	ND	ND	ND
Perfluorononanoic acid (PFNA)	2.7	ND	3.7	0.19J	ND	ND	0.19J	9.6J
Perfluorooctane sulfonate (PFOS)	2.0	ND	0.50J	ND	ND	ND	ND	3.9J
Perfluorooctanoic acid (PFOA)	0.83J	ND	ND	3.7	1.6	ND	ND	4.2J
PFOS+PFOA	2.83	ND	0.5	3.7	1.6	ND	ND	8.1
	DL8 (2') 6/20/2017**	**DL8** (4') 9/26/2017**	**DL9 (0-1') 6/20/2017**	**DL10 (0-1') 6/20/2017**	**DL 11 (0-1') 9/26/2017**	**DL12 (0-1') 9/26/2017**	**DL13 (0-1') 9/26/2017**	**DL14 (0-1') 9/26/2017**
Perfluorobutanesulfonic acid (PFBS)	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroheptanoic acid (PFHpA)	2.9J	4.7J	0.66J	1.3	2.1	1.2	1.6	4.9
Perfluorohexanesulfonic acid (PFHxS)	ND	ND	0.35J	0.94J	0.82J	ND	ND	0.71J
Perfluorononanoic acid (PFNA)	46	ND	0.22J	ND	16	7.3	1.5	10
Perfluorooctane sulfonate (PFOS)	14	ND	0.38J	0.26J	29	23	0.66J	7.6
Perfluorooctanoic acid (PFOA)	25	22	0.68J	1.7	4.7	4.6	2.4	23
PFOS+PFOA	39	22	1.06	1.96	33.7	27.6	3.06	30.6
	ARFF1 (0-1') 6/20/2017	**ARFF1 (2') 9/26/2017**	**ARFF1 (4') 9/26/2017**	**ARFF2 (0-1') 6/20/2017**	**ARFF3 (0-1') 9/26/2017**	**ARFF4 (0-1') 9/26/2017**	**ARFF4 (0-1') LAB DUP**	**ARFFCB (0-1) 9/26/2017**
Perfluorobutanesulfonic acid (PFBS)	ND	ND	ND	ND	ND	ND	NA	ND
Perfluoroheptanoic acid (PFHpA)	0.82J	1.8	0.66J	ND	0.60J	0.75J	NA	0.60J
Perfluorohexanesulfonic acid (PFHxS)	ND	ND	ND	ND	0.64J	ND	NA	ND
Perfluorononanoic acid (PFNA)	2.5	5.7	1.4	2.0J	0.91J	2.9	NA	ND
Perfluorooctane sulfonate (PFOS)	4.5	2.7	1.1	0.29J	4.4	1	NA	1.1
Perfluorooctanoic acid (PFOA)	0.75J	2.6	0.75J	ND	0.78J	0.97J	NA	0.90J
PFOS+PFOA	5.25	5.3	1.85	0.29	5.18	1.97	NA	2

	Stockpile East	Stockpile West	Loam Pile
Perfluorobutanesulfonic acid (PFBS)	ND	ND	ND
Perfluoroheptanoic acid (PFHpA)	ND	ND	ND
Perfluorohexanesulfonic acid (PFHxS)	ND	ND	ND
Perfluorononanoic acid (PFNA)	ND	ND	ND
Perfluorooctane sulfonate (PFOS)	0.39J	0.38J	0.81J
Perfluorooctanoic acid (PFOA)	ND	ND	ND
PFOS+PFOA	0.39	0.38	0.81

**Sample diluted, Detection limits adjusted accordingly
J = Results between RDL and MDL
ND= Not detected by method
ug/kg = micrograms per kilogram
MDL = method detection limit

Table 3. Groundwater Results 2016-2017

	North Ramp							Lewis Pond		
	HW-1	HW-1	HW-4M	HW-5		HW-23	HW-19D	HW-D	HW-401S	HW-C
	7/1/2016	6/20/2017	4/5/2017	7/1/2016	4/7/2017	6/20/2017	6/20/2017	4/7/2017	4/7/2017	4/7/2017
Perfluorobutanesulfonic acid (PFBS)	ND	0.02	0.005J	ND	ND	0.0051J	0.0081J	ND	ND	ND
Perfluoroheptanoic acid (PFHpA)	0.01	0.0042J	0.007J	0.01	0.0084J	0.0045J	0.0052J	ND	0.0043J	ND
Perfluorohexanesulfonic acid (PFHxS)	0.018	0.065	0.02	0.018	0.018J	0.021	0.046	0.0089J	0.011J	ND
Perfluorononanoic acid (PFNA)	ND	0.0057J	ND	ND	ND	ND	0.0065J	ND	ND	ND
Perfluorooctane sulfonate (PFOS)	0.017	**0.24**	0.043	0.017	0.052	0.0079J	0.061	0.022	0.012J	ND
Perfluorooctanoic acid (PFOA)	0.033	0.022	0.011J	0.033	0.020J	ND	0.017J	ND	ND	ND
PFOS+PFOA	0.05	**0.262**	0.054	0.05	**0.072**	0.0079	**0.078**	0.022	0.012	ND

	Steamship Parking Lot						Airfield		Airport Road	
	HW-2	HW-3		HW-300	HW-301	HW-302	HW-E	HW-F	HW-A	HW-B
	7/1/2016	7/1/2016	4/5/2017	7/1/2016	7/1/2016	7/1/2016	4/5/2017	4/5/2017	4/7/2017	4/7/2017
Perfluorobutanesulfonic acid (PFBS)	ND	ND	ND	ND	ND	ND	ND	ND	0.017J	0.0077J
Perfluoroheptanoic acid (PFHpA)	0.0071	0.016	0.1	0.0096	0.002	0.019	0.15	0.34	0.0048J	0.049
Perfluorohexanesulfonic acid (PFHxS)	0.0035	0.0043	0.020J	0.012	0.038	0.006.3	0.042	0.019J	0.0079J	0.044
Perfluorononanoic acid (PFNA)	ND	0.0063	0.027	ND	ND	0.054	0.0087J	ND	ND	ND
Perfluorooctane sulfonate (PFOS)	0.012	**0.084**	**0.15**	0.017	0.011	0.014	0.047	ND	ND	0.026
Perfluorooctanoic acid (PFOA)	0.0063	0.0091	0.065	0.0052	0.0037	0.033	0.053	**0.075**	ND	0.0094J
PFOS+PFOA	0.0183	**0.0931**	**0.215**	0.0222	0.0147	0.047	**0.1**	**0.075**	ND	0.0354

	Maher Wells								Kmart
	OW-9S	OW-9D		OW-18S	OW-18M	OW-18D		OW-18D Duplicate	OW-19D	Surface Water
	7/5/2016	7/5/2016	4/11/2017	7/5/2016	7/5/2016	7/5/2016	4/11/2017	7/5/2016	4/11/2017	6/20/2017
Perfluorobutanesulfonic acid (PFBS)	ND	ND	ND	ND	ND	ND	0.016J	ND	0.0055J	ND
Perfluoroheptanoic acid (PFHpA)	0.014	0.0028	0.034	0.00.1	0.0029	0.0071	0.015J	0.0063	0.0051J	ND
Perfluorohexanesulfonic acid (PFHxS)	ND	0.012	0.12	0.0068	0.016	0.01	0.13	0.011	0.029	ND
Perfluorononanoic acid (PFNA)	0.0077	0.0036	0.059	ND	0.0076	0.0065	ND	0.0058	0.006J	0.0043 (NA)
Perfluorooctane sulfonate (PFOS)	0.0074	0.041	**0.5**	0.0083	0.044	0.018	**0.22**	0.019	0.029	ND
Perfluorooctanoic acid (PFOA)	0.007	0.0052	0.055	0.018	0.0058	0.0059	0.025	0.0059	ND	ND
PFOS+PFOA	0.0144	0.0462	**0.555**	0.0263	0.0498	0.0239	**0.245**	0.0249	0.029	ND

J = Results between RDL and MDL
ug/L = micrograms per liter
Shaded / Bold results above DEP GW-1 standard (0.07 ug/L)
ND= Not detected by method
"North Ramp" or "Kmart" = denotes general location near sampling location

Monitoring Well Logs

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

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%

Color

Blue (Bl)	Green (Gr)
Red (R)	Gray (Gy)
Light (lt)	Brown (Br)
Dark (dk)	Orange (Or)
Rust (Ru)	Black (Blk)

Angular

Round (rnd.)
Angular (ang.)

Misc.

Fragments (frag.)
Cement (cem.)
Well-Graded Sand (SW)
Poorly-Graded Sand (SP)
Well-Graded Gravel (GW)
Poorly-Graded Gravel (GP)
Below Land Surface (BLS)
Not Available (N/A)

Abbreviations:

Size

Fine = (f)
Medium = (m)
Coarse = (c)
Dark = (dk)
Fine to Coarse = (f-c)
Very = (v)
More/Less = (+/-)

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		0
5							#2 sand @ 4' bgs		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

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

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

Blue (Bl)	Green (Gr)
Red (R)	Gray (Gy)
Light (lt)	Brown (Br)
Dark (dk)	Orange (Or)
Rust (Ru)	Black (Blk)

Angular

Round (rnd.)
Angular (ang.)

Misc.

Fragments (frag.)
Cement (cem.)
Well-Graded Sand (SW)
Poorly-Graded Sand (SP)
Well-Graded Gravel (GW)
Poorly-Graded Gravel (GP)
Below Land Surface (BLS)
Not Available (N/A)

Size

Fine = (f)
Medium = (m)
Coarse = (c)
Dark = (dk)
Fine to Coarse = (f-c)
Very = (v)
More/Less = (+/-)

Depth Feet	Description	Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-4" asphalt						Cement		0
	0-5' bgs — Light Brown M-C sand, some F sand, little gravel		30"	ang	brn		#2 sand @ 6" bgs Bontonite @ 2' bgs		
5							#2 sand @ 4' bgs		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									

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

MONITORING WELL BORING LOG

Boring No. HW-B(d)

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

Date: 4/3/2017
Completion Depth: 57.2' bgs
Elevation:
Inspector: JDB

Proportions Used:

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

Color

Blue (Bl)	Green (Gr)
Red (R)	Gray (Gy)
Light (lt)	Brown (Br)
Dark (dk)	Orange (Or)
Rust (Ru)	Black (Blk)

Angular

Round (rnd.)
Angular (ang.)

Misc.

Fragments (frag.)
Cement (cem.)
Well-Graded Sand (SW)
Poorly-Graded Sand (SP)
Well-Graded Gravel (GW)
Poorly-Graded Gravel (GP)
Below Land Surface (BLS)
Not Available (N/A)

Abbreviations:

Size

Fine = (f)
Medium = (m)
Coarse = (c)
Dark = (dk)
Fine to Coarse = (f-c)
Very = (v)
More/Less = (+/-)

Depth Feet	Description	Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0							Cement →		0
							#2 sand @ 9" bgs →		
5									5
10									10
							Bentonite @ 12' bgs →		
15							#2 sand @ 15' bgs →		15
20									20
							Groundwater @ 22.75' bgs		
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

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

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

Blue (Bl)	Green (Gr)
Red (R)	Gray (Gy)
Light (lt)	Brown (Br)
Dark (dk)	Orange (Or)
Rust (Ru)	Black (Blk)

Angular

Round (rnd.)
Angular (ang.)

Misc.

Fragments (frag.)
Cement (cem.)
Well-Graded Sand (SW)
Poorly-Graded Sand (SP)
Well-Graded Gravel (GW)
Poorly-Graded Gravel (GP)
Below Land Surface (BLS)
Not Available (N/A)

Size

Fine = (f)	Fine to Coarse = (f-c)
Medium = (m)	Very = (v)
Coarse = (c)	More/Less = (+/-)
Dark = (dk)	

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 — 0-6" - 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		#2 sand @ 9" bgs		
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									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		0.02 slot screen @ 20.5-30.5 ' bgs		
25							Groundwater @ 23.5' bgs		25
	25-30' bgs — M-C sand, some Fsand/gravel		36"	ang	brn				
30									30
35									
40									
45									
50									
55									

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

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

Blue (Bl)	Green (Gr)
Red (R)	Gray (Gy)
Light (lt)	Brown (Br)
Dark (dk)	Orange (Or)
Rust (Ru)	Black (Blk)

Angular

Round (rnd.)
Angular (ang.)

Misc.

Fragments (frag.)
Cement (cem.)
Well-Graded Sand (SW)
Poorly-Graded Sand (SP)
Well-Graded Gravel (GW)
Poorly-Graded Gravel (GP)
Below Land Surface (BLS)
Not Available (N/A)

Size

Fine = (f)	Fine to Coarse = (f-c)
Medium = (m)	Very = (v)
Coarse = (c)	More/Less = (+/-)
Dark = (dk)	

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									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		Bontonite @ 12' bgs → #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"				Groundwater @ 39.3' bgs →		
40									
45									
50									
55									

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

MONITORING WELL BORING LOG

Boring No. HW-D

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: 29.5' bgs
Elevation:
Inspector: JDB

Proportions Used:

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

Abbreviations:

Color

Blue (Bl)	Green (Gr)
Red (R)	Gray (Gy)
Light (lt)	Brown (Br)
Dark (dk)	Orange (Or)
Rust (Ru)	Black (Blk)

Angular

Round (rnd.)
Angular (ang.)

Misc.

Fragments (frag.)
Cement (cem.)
Well-Graded Sand (SW)
Poorly-Graded Sand (SP)
Well-Graded Gravel (GW)
Poorly-Graded Gravel (GP)
Below Land Surface (BLS)
Not Available (N/A)

Size

Fine = (f)	Fine to Coarse = (f-c)
Medium = (m)	Very = (v)
Coarse = (c)	More/Less = (+/-)
Dark = (dk)	

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		
10							#2 sand @ 9' bgs		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									

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

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

Blue (Bl)	Green (Gr)
Red (R)	Gray (Gy)
Light (lt)	Brown (Br)
Dark (dk)	Orange (Or)
Rust (Ru)	Black (Blk)

Angular

Round (rnd.)
Angular (ang.)

Misc.

Fragments (frag.)
Cement (cem.)
Well-Graded Sand (SW)
Poorly-Graded Sand (SP)
Well-Graded Gravel (GW)
Poorly-Graded Gravel (GP)
Below Land Surface (BLS)
Not Available (N/A)

Size

Fine = (f)	Fine to Coarse = (f-c)
Medium = (m)	Very = (v)
Coarse = (c)	More/Less = (+/-)
Dark = (dk)	

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										

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

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

Blue (Bl)	Green (Gr)
Red (R)	Gray (Gy)
Light (lt)	Brown (Br)
Dark (dk)	Orange (Or)
Rust (Ru)	Black (Blk)

Angular

Round (rnd.)
Angular (ang.)

Misc.

Fragments (frag.)
Cement (cem.)
Well-Graded Sand (SW)
Poorly-Graded Sand (SP)
Well-Graded Gravel (GW)
Poorly-Graded Gravel (GP)
Below Land Surface (BLS)
Not Available (N/A)

Size

Fine = (f)
Medium = (m)
Coarse = (c)
Dark = (dk)
Fine to Coarse = (f-c)
Very = (v)
More/Less = (+/-)

Depth Feet	Description	Penetration	Recovery	USCS Code	USCS Color	PID (parts per million)	Comments	Well Details	Depth Feet
0	0"-5" Organic						Cement		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		#2 sand @ 1' bgs		
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									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		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									

Laboratory Results

CERTIFICATE OF ANALYSIS

Jesse Bean
Horsley & Witten
90 Route 6A
Sandwich, MA 02563

RE: Barn. On-Call #4 (17027)
ESS Laboratory Work Order Number: 1704197

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 12:20 pm, May 02, 2017

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 standards, 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 PFOS

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1704197

SAMPLE RECEIPT

The following samples were received on April 10, 2017 for the analyses specified on the enclosed Chain of Custody Record.

Lab Number	Sample Name	Matrix	Analysis
1704197-01	HW-4D	Ground Water	8270D SIM
1704197-02	HW-4M	Ground Water	$, 8270D SIM
1704197-03	HW-207D	Ground Water	8270D SIM
1704197-04	HW-19D	Ground Water	8270D SIM
1704197-05	HW-3	Ground Water	$
1704197-06	HW-E	Ground Water	$
1704197-07	HW-F	Ground Water	$
1704197-08	HW-A (S)	Ground Water	$
1704197-09	HW-A (D)	Ground Water	8270D SIM
1704197-10	HW-B (S)	Ground Water	$
1704197-11	HW-5	Ground Water	$
1704197-12	HW- B (D)	Ground Water	8270D SIM
1704197-13	HW-C	Ground Water	$
1704197-14	HW-D	Ground Water	$
1704197-15	HW-401S	Ground Water	$
1704197-16	Equipment Blank	Aqueous	$

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1704197

PROJECT NARRATIVE

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

C7D0192-TUN1	**Benzidine tailing factor >2.**
C7D0192-TUN1	**DDT breakdown > 20%**
C7D0192-TUN1	**Pentachlorophenol tailing factor > 2.**

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

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: Barn. On-Call #4

ESS Laboratory Work Order: 1704197

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: Barn. On-Call #4
Client Sample ID: HW-4D
Date Sampled: 04/05/17 10:13
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/10/17 18:20

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	04/13/17 18:39	C7D0192	CD71038

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	53 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-4M
Date Sampled: 04/05/17 10:30
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/10/17 18:20

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	04/13/17 19:15	C7D0192	CD71038

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	58 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-4M
Date Sampled: 04/05/17 10:30

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-02
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-207D
Date Sampled: 04/05/17 11:25
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/10/17 18:20

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	04/13/17 19:50	C7D0192	CD71038

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	54 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-19D
Date Sampled: 04/05/17 13:00
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-04
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/10/17 18:20

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	04/13/17 20:26	C7D0192	CD71038

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	52 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-3
Date Sampled: 04/05/17 13:30

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-05
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-E
Date Sampled: 04/05/17 14:30

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-06
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-F
Date Sampled: 04/05/17 15:00

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-07
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-A (S)
Date Sampled: 04/07/17 08:50

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-08
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-A (D)
Date Sampled: 04/07/17 09:30
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-09
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/10/17 18:20

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	04/13/17 21:02	C7D0192	CD71038

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	47 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-B (S)
Date Sampled: 04/07/17 09:55

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-10
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-5
Date Sampled: 04/07/17 10:45

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-11
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW- B (D)
Date Sampled: 04/07/17 11:30
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-12
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/10/17 18:20

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	04/13/17 21:37	C7D0192	CD71038

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	56 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-C
Date Sampled: 04/07/17 12:50

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-13
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-D
Date Sampled: 04/07/17 14:20

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-14
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: HW-401S
Date Sampled: 04/07/17 14:40

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-15
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: Equipment Blank
Date Sampled: 04/05/17 10:00

ESS Laboratory Work Order: 1704197
ESS Laboratory Sample ID: 1704197-16
Sample Matrix: Aqueous
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1704197

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution										
Batch CD71038 - 3535A										
Blank										
1,4-Dioxane	ND	0.250	ug/L							
Surrogate: 1,4-Dioxane-d8	*3.08*		ug/L	*5.000*		*62*	*15-115*			
LCS										
1,4-Dioxane	11.0	0.250	ug/L	10.00		110	40-140			
Surrogate: 1,4-Dioxane-d8	*3.25*		ug/L	*5.000*		*65*	*15-115*			
LCS Dup										
1,4-Dioxane	11.2	0.250	ug/L	10.00		112	40-140	2	20	
Surrogate: 1,4-Dioxane-d8	*3.22*		ug/L	*5.000*		*64*	*15-115*			

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1704197

Notes and Definitions

Z-08	See Attached
U	Analyte included in the analysis, but not detected
PT	Pentachlorophenol tailing factor > 2.
DDT	DDT breakdown > 20%
BT	Benzidine tailing factor >2.
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
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1704197

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/dwp/partners/labCert.shtml

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.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Your P.O. #: B02623
Your Project #: 1704197
Your C.O.C. #: 1704197

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/05/01
Report #: R4444424
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B774990
Received: 2017/04/15, 14:19

Sample Matrix: GROUND WATER
Samples Received: 14

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PFOS and PFOA in water	14	2017/04/19	2017/04/20	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.

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.
U = Undetected at the limit of quantitation.
J = Estimated concentration between the EDL & RDL.
B = Blank Contamination.
Q = One or more quality control criteria failed.
E = Analyte concentration exceeds the maximum concentration level.
K = Estimated maximum possible concentration due to ion abundance ratio failure.

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

Your P.O. #: B02623
Your Project #: 1704197
Your C.O.C. #: 1704197

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/05/01
Report #: R4444424
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B774990
Received: 2017/04/15, 14:19

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Melissa DiGrazia, Customer Experience Team Lead
Email: MDiGrazia@maxxam.ca
Phone# (905) 817-5700

==========

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.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

RESULTS OF ANALYSES OF GROUND WATER

Maxxam ID		EFH010	EFH011			EFH012			
Sampling Date		2017/04/05 10:30	2017/04/05 13:30			2017/04/05 14:30			
COC Number		1704197	1704197			1704197			
	UNITS	1704197-02	1704197-05	RDL	MDL	1704197-06	RDL	MDL	QC Batch
Miscellaneous Parameters									
6:2 Fluorotelomer sulfonate	ug/L	0.0038 J	0.47	0.020	0.0032	2.0 (1)	0.10	0.016	4944832
8:2 Fluorotelomer sulfonate	ug/L	0.0036 U	0.012 J	0.020	0.0036	0.0050 J	0.020	0.0036	4944832
Perfluorobutane Sulfonate (PFBS)	ug/L	0.0050 J	0.0048 U	0.020	0.0048	0.0048 U	0.020	0.0048	4944832
Perfluorobutanoic acid	ug/L	0.0066 U	0.089	0.020	0.0066	0.11	0.020	0.0066	4944832
Perfluorodecane Sulfonate	ug/L	0.0046 U	0.0046 U	0.020	0.0046	0.0046 U	0.020	0.0046	4944832
Perfluorodecanoic Acid (PFDA)	ug/L	0.0040 U	0.0040 U	0.020	0.0040	0.0040 U	0.020	0.0040	4944832
Perfluorododecanoic Acid (PFDoA)	ug/L	0.0028 U	0.0028 U	0.020	0.0028	0.0028 U	0.020	0.0028	4944832
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.0070 J	0.10	0.020	0.0033	0.15	0.020	0.0033	4944832
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.020	0.020 J	0.020	0.0034	0.042	0.020	0.0034	4944832
Perfluorohexanoic Acid (PFHxA)	ug/L	0.0094 J	0.28	0.020	0.0029	0.32	0.020	0.0029	4944832
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.011 J	0.065	0.020	0.0046	0.053	0.020	0.0046	4944832
Perfluorononanoic Acid (PFNA)	ug/L	0.0046 U	0.027	0.020	0.0046	0.0087 J	0.020	0.0046	4944832
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0036 U	0.0036 U	0.020	0.0036	0.0036 U	0.020	0.0036	4944832
Perfluorooctane Sulfonate (PFOS)	ug/L	0.043	0.15	0.020	0.0026	0.047	0.020	0.0026	4944832
Perfluoropentanoic Acid (PFPeA)	ug/L	0.017 J	0.39	0.020	0.0027	0.49	0.020	0.0027	4944832
Perfluorotetradecanoic Acid	ug/L	0.0038 U	0.0038 U	0.020	0.0038	0.0038 U	0.020	0.0038	4944832
Perfluorotridecanoic Acid	ug/L	0.0033 U	0.0033 U	0.020	0.0033	0.0033 U	0.020	0.0033	4944832
Perfluoroundecanoic Acid (PFUnA)	ug/L	0.0043 U	0.0043 U	0.020	0.0043	0.0043 U	0.020	0.0043	4944832
Surrogate Recovery (%)									
13C4-Perfluorooctanesulfonate	%	97	88	N/A	N/A	76	N/A	N/A	4944832
13C4-Perfluorooctanoic acid	%	99	95	N/A	N/A	86	N/A	N/A	4944832
13C8-Perfluorooctane Sulfonamide	%	82	80	N/A	N/A	83	N/A	N/A	4944832

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to high concentration of the target analyte, sample required 5x dilution. Detection limit was adjusted accordingly.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

RESULTS OF ANALYSES OF GROUND WATER

Maxxam ID		EFH013			EFH014	EFH015			
Sampling Date		2017/04/05 15:00			2017/04/07 10:50	2017/04/07 09:55			
COC Number		1704197			1704197	1704197			
	UNITS	1704197-07	RDL	MDL	1704197-08	1704197-10	RDL	MDL	QC Batch
Miscellaneous Parameters									
6:2 Fluorotelomer sulfonate	ug/L	5.7 (1)	0.20	0.032	0.0032 U	0.0032 U	0.020	0.0032	4944832
8:2 Fluorotelomer sulfonate	ug/L	0.016 J	0.020	0.0036	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorobutane Sulfonate (PFBS)	ug/L	0.0048 U	0.020	0.0048	0.017 J	0.0077 J	0.020	0.0048	4944832
Perfluorobutanoic acid	ug/L	0.71	0.020	0.0066	0.012 J	0.040	0.020	0.0066	4944832
Perfluorodecane Sulfonate	ug/L	0.0046 U	0.020	0.0046	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorodecanoic Acid (PFDA)	ug/L	0.0040 U	0.020	0.0040	0.0040 U	0.0040 U	0.020	0.0040	4944832
Perfluorododecanoic Acid (PFDoA)	ug/L	0.0028 U	0.020	0.0028	0.0028 U	0.0028 U	0.020	0.0028	4944832
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.34	0.020	0.0033	0.0048 J	0.049	0.020	0.0033	4944832
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.019 J	0.020	0.0034	0.0079 J	0.044	0.020	0.0034	4944832
Perfluorohexanoic Acid (PFHxA)	ug/L	2.3 (1)	0.20	0.029	0.0092 J	0.13	0.020	0.0029	4944832
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.075	0.020	0.0046	0.0046 U	0.0094 J	0.020	0.0046	4944832
Perfluorononanoic Acid (PFNA)	ug/L	0.0046 U	0.020	0.0046	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0036 U	0.020	0.0036	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorooctane Sulfonate (PFOS)	ug/L	0.0026 U	0.020	0.0026	0.0026 U	0.026	0.020	0.0026	4944832
Perfluoropentanoic Acid (PFPeA)	ug/L	3.8 (1)	0.20	0.027	0.027	0.14	0.020	0.0027	4944832
Perfluorotetradecanoic Acid	ug/L	0.0038 U	0.020	0.0038	0.0038 U	0.0046 J	0.020	0.0038	4944832
Perfluorotridecanoic Acid	ug/L	0.0033 U	0.020	0.0033	0.0033 U	0.0054 J	0.020	0.0033	4944832
Perfluoroundecanoic Acid (PFUnA)	ug/L	0.0043 U	0.020	0.0043	0.0043 U	0.0043 U	0.020	0.0043	4944832
Surrogate Recovery (%)									
13C4-Perfluorooctanesulfonate	%	78	N/A	N/A	76	78	N/A	N/A	4944832
13C4-Perfluorooctanoic acid	%	88	N/A	N/A	87	92	N/A	N/A	4944832
13C8-Perfluorooctane Sulfonamide	%	80	N/A	N/A	83	97	N/A	N/A	4944832

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.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

RESULTS OF ANALYSES OF GROUND WATER

Maxxam ID		EFH016		EFH017	EFH018	EFH019			
Sampling Date		2017/04/07 10:45		2017/04/07 12:50	2017/04/07 14:20	2017/04/07 14:40			
COC Number		1704197		1704197	1704197	1704197			
	UNITS	1704197-11	RDL	1704197-13	1704197-14	1704197-15	RDL	MDL	QC Batch
Miscellaneous Parameters									
6:2 Fluorotelomer sulfonate	ug/L	0.0037 J	0.020	0.0034 J	0.0032 U	0.0040 J	0.020	0.0032	4944832
8:2 Fluorotelomer sulfonate	ug/L	0.0036 U	0.020	0.0036 U	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorobutane Sulfonate (PFBS)	ug/L	0.0048 U	0.020	0.0048 U	0.0048 U	0.0048 U	0.020	0.0048	4944832
Perfluorobutanoic acid	ug/L	2.9 (1)	0.20	0.0066 U	0.0066 U	0.0066 U	0.020	0.0066	4944832
Perfluorodecane Sulfonate	ug/L	0.0046 U	0.020	0.0046 U	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorodecanoic Acid (PFDA)	ug/L	0.0040 U	0.020	0.0040 U	0.0040 U	0.0040 U	0.020	0.0040	4944832
Perfluorododecanoic Acid (PFDoA)	ug/L	0.0028 U	0.020	0.0028 U	0.0028 U	0.0028 U	0.020	0.0028	4944832
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.0084 J	0.020	0.0033 U	0.0033 U	0.0043 J	0.020	0.0033	4944832
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.018 J	0.020	0.0034 U	0.0089 J	0.011 J	0.020	0.0034	4944832
Perfluorohexanoic Acid (PFHxA)	ug/L	0.0029 U	0.020	0.0029 U	0.0029 U	0.0029 U	0.020	0.0029	4944832
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.020 J	0.020	0.0046 U	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorononanoic Acid (PFNA)	ug/L	0.0046 U	0.020	0.0046 U	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0036 U	0.020	0.0036 U	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorooctane Sulfonate (PFOS)	ug/L	0.052	0.020	0.0026 U	0.022	0.012 J	0.020	0.0026	4944832
Perfluoropentanoic Acid (PFPeA)	ug/L	0.0027 U	0.020	0.0027 U	0.0027 U	0.0027 U	0.020	0.0027	4944832
Perfluorotetradecanoic Acid	ug/L	0.0038 U	0.020	0.0038 U	0.0038 U	0.0038 U	0.020	0.0038	4944832
Perfluorotridecanoic Acid	ug/L	0.0033 U	0.020	0.0033 U	0.0033 U	0.0033 U	0.020	0.0033	4944832
Perfluoroundecanoic Acid (PFUnA)	ug/L	0.0043 U	0.020	0.0043 U	0.0043 U	0.0043 U	0.020	0.0043	4944832
Surrogate Recovery (%)									
13C4-Perfluorooctanesulfonate	%	65 (2)	N/A	83	84	83	N/A	N/A	4944832
13C4-Perfluorooctanoic acid	%	81	N/A	100	88	81	N/A	N/A	4944832
13C8-Perfluorooctane Sulfonamide	%	74	N/A	82	92	82	N/A	N/A	4944832

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) Surrogate recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the surrogate. When considered together, these QC data suggest that matrix interferences may be biasing the data low. Because quantitation is performed using isotope dilution techniques, any losses of the native compound that may occur during any of the sample preparation, extraction, cleanup or determinative steps will be mirrored by a similar loss of the labeled standard, and as such can be accounted for and corrected. Therefore, the quantification of these target compounds is not affected by the low surrogate recovery.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

RESULTS OF ANALYSES OF GROUND WATER

Maxxam ID		EFH020	EFH021	EFH022	EFH023			
Sampling Date		2017/04/05 10:00	2017/04/11 12:20	2017/04/11 10:20	2017/04/11 15:30			
COC Number		1704197	1704197	1704197	1704197			
	UNITS	1704197-16	1704299-02	1704299-04	1704299-06	RDL	MDL	QC Batch
Miscellaneous Parameters								
6:2 Fluorotelomer sulfonate	ug/L	0.0032 U	0.0032 U	0.0032 U	0.13	0.020	0.0032	4944832
8:2 Fluorotelomer sulfonate	ug/L	0.0036 U	0.0036 U	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorobutane Sulfonate (PFBS)	ug/L	0.0048 U	0.016 J	0.0055 J	0.0048 U	0.020	0.0048	4944832
Perfluorobutanoic acid	ug/L	0.0066 U	0.015 J	0.0066 U	0.021	0.020	0.0066	4944832
Perfluorodecane Sulfonate	ug/L	0.0046 U	0.0046 U	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorodecanoic Acid (PFDA)	ug/L	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.020	0.0040	4944832
Perfluorododecanoic Acid (PFDoA)	ug/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.020	0.0028	4944832
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.0033 U	0.015 J	0.0051 J	0.034	0.020	0.0033	4944832
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.0034 U	0.13	0.029	0.12	0.020	0.0034	4944832
Perfluorohexanoic Acid (PFHxA)	ug/L	0.0029 U	0.046	0.0060 J	0.041	0.020	0.0029	4944832
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.0046 U	0.025	0.0046 U	0.055	0.020	0.0046	4944832
Perfluorononanoic Acid (PFNA)	ug/L	0.0046 U	0.0046 U	0.0060 J	0.059	0.020	0.0046	4944832
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0036 U	0.0036 U	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorooctane Sulfonate (PFOS)	ug/L	0.0026 U	0.22	0.029	0.50	0.020	0.0026	4944832
Perfluoropentanoic Acid (PFPeA)	ug/L	0.0027 U	0.039	0.013 J	0.060	0.020	0.0027	4944832
Perfluorotetradecanoic Acid	ug/L	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.020	0.0038	4944832
Perfluorotridecanoic Acid	ug/L	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.020	0.0033	4944832
Perfluoroundecanoic Acid (PFUnA)	ug/L	0.0043 U	0.0043 U	0.0043 U	0.0043 U	0.020	0.0043	4944832
Surrogate Recovery (%)								
13C4-Perfluorooctanesulfonate	%	82	91	94	82	N/A	N/A	4944832
13C4-Perfluorooctanoic acid	%	96	94	92	88	N/A	N/A	4944832
13C8-Perfluorooctane Sulfonamide	%	82	86	95	89	N/A	N/A	4944832

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

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

TEST SUMMARY

Maxxam ID: EFH010 **Collected:** 2017/04/05
Sample ID: 1704197-02 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH011 **Collected:** 2017/04/05
Sample ID: 1704197-05 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH012 **Collected:** 2017/04/05
Sample ID: 1704197-06 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH013 **Collected:** 2017/04/05
Sample ID: 1704197-07 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH014 **Collected:** 2017/04/07
Sample ID: 1704197-08 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH015 **Collected:** 2017/04/07
Sample ID: 1704197-10 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH016 **Collected:** 2017/04/07
Sample ID: 1704197-11 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

TEST SUMMARY

Maxxam ID: EFH017 **Collected:** 2017/04/07
Sample ID: 1704197-13 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH018 **Collected:** 2017/04/07
Sample ID: 1704197-14 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH019 **Collected:** 2017/04/07
Sample ID: 1704197-15 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH020 **Collected:** 2017/04/05
Sample ID: 1704197-16 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH021 **Collected:** 2017/04/11
Sample ID: 1704299-02 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH022 **Collected:** 2017/04/11
Sample ID: 1704299-04 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH023 **Collected:** 2017/04/11
Sample ID: 1704299-06 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

GENERAL COMMENTS

TBLK-EPEU-20161219 received however not listed on CoC. Sample will remain on hold as per client request.

Minimal sample volume received for 1704197-16. Please note this may result in elevated DLs.

Results relate only to the items tested.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
4944832	DZU	Spiked Blank	13C4-Perfluorooctanesulfonate	2017/04/20		92	%	70 - 130
			13C4-Perfluorooctanoic acid	2017/04/20		102	%	70 - 130
			13C8-Perfluorooctane Sulfonamide	2017/04/20		86	%	60 - 120
			6:2 Fluorotelomer sulfonate	2017/04/20		84	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/04/20		87	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/04/20		99	%	70 - 130
			Perfluorobutanoic acid	2017/04/20		82	%	70 - 130
			Perfluorodecane Sulfonate	2017/04/20		87	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/04/20		93	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/04/20		97	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/04/20		103	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/04/20		97	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/04/20		91	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/04/20		94	%	70 - 130
			Perfluorotetradecanoic Acid	2017/04/20		91	%	70 - 130
			Perfluorotridecanoic Acid	2017/04/20		84	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/04/20		100	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/04/20		101	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/04/20		109	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/04/20		97	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/04/20		94	%	70 - 130
4944832	DZU	Spiked Blank DUP	13C4-Perfluorooctanesulfonate	2017/04/20		93	%	70 - 130
			13C4-Perfluorooctanoic acid	2017/04/20		107	%	70 - 130
			13C8-Perfluorooctane Sulfonamide	2017/04/20		86	%	60 - 120
			6:2 Fluorotelomer sulfonate	2017/04/20		88	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/04/20		93	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/04/20		102	%	70 - 130
			Perfluorobutanoic acid	2017/04/20		97	%	70 - 130
			Perfluorodecane Sulfonate	2017/04/20		87	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/04/20		100	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/04/20		93	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/04/20		106	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/04/20		95	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/04/20		97	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/04/20		98	%	70 - 130
			Perfluorotetradecanoic Acid	2017/04/20		102	%	70 - 130
			Perfluorotridecanoic Acid	2017/04/20		95	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/04/20		107	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/04/20		97	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/04/20		98	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/04/20		92	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/04/20		87	%	70 - 130
4944832	DZU	RPD	6:2 Fluorotelomer sulfonate	2017/04/20	5.1		%	30
			8:2 Fluorotelomer sulfonate	2017/04/20	6.4		%	30
			Perfluorobutane Sulfonate (PFBS)	2017/04/20	3.2		%	30
			Perfluorobutanoic acid	2017/04/20	16		%	30
			Perfluorodecane Sulfonate	2017/04/20	0.23		%	30
			Perfluoroheptanoic Acid (PFHpA)	2017/04/20	7.7		%	30
			Perfluorohexane Sulfonate (PFHxS)	2017/04/20	4.8		%	30
			Perfluorohexanoic Acid (PFHxA)	2017/04/20	3.2		%	30
			Perfluorononanoic Acid (PFNA)	2017/04/20	2.3		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2017/04/20	5.5		%	30
			Perfluoropentanoic Acid (PFPeA)	2017/04/20	4.2		%	30

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorotetradecanoic Acid	2017/04/20	12		%	30
			Perfluorotridecanoic Acid	2017/04/20	13		%	30
			Perfluoroundecanoic Acid (PFUnA)	2017/04/20	7.0		%	30
			Perfluorodecanoic Acid (PFDA)	2017/04/20	4.0		%	30
			Perfluorododecanoic Acid (PFDoA)	2017/04/20	10		%	30
			Perfluoro-n-Octanoic Acid (PFOA)	2017/04/20	5.5		%	30
			Perfluorooctane Sulfonate (PFOS)	2017/04/20	6.9		%	30
4944832	DZU	Method Blank	13C4-Perfluorooctanesulfonate	2017/04/20		88	%	70 - 130
			13C4-Perfluorooctanoic acid	2017/04/20		93	%	70 - 130
			13C8-Perfluorooctane Sulfonamide	2017/04/20		86	%	60 - 120
			6:2 Fluorotelomer sulfonate	2017/04/20	0.0032 U, MDL=0.0032		ug/L	
			8:2 Fluorotelomer sulfonate	2017/04/20	0.0036 U, MDL=0.0036		ug/L	
			Perfluorobutane Sulfonate (PFBS)	2017/04/20	0.0048 U, MDL=0.0048		ug/L	
			Perfluorobutanoic acid	2017/04/20	0.0066 U, MDL=0.0066		ug/L	
			Perfluorodecane Sulfonate	2017/04/20	0.0046 U, MDL=0.0046		ug/L	
			Perfluoroheptanoic Acid (PFHpA)	2017/04/20	0.0033 U, MDL=0.0033		ug/L	
			Perfluorohexane Sulfonate (PFHxS)	2017/04/20	0.0034 U, MDL=0.0034		ug/L	
			Perfluorohexanoic Acid (PFHxA)	2017/04/20	0.0029 U, MDL=0.0029		ug/L	
			Perfluorononanoic Acid (PFNA)	2017/04/20	0.0046 U, MDL=0.0046		ug/L	
			Perfluorooctane Sulfonamide (PFOSA)	2017/04/20	0.0036 U, MDL=0.0036		ug/L	
			Perfluoropentanoic Acid (PFPeA)	2017/04/20	0.0027 U, MDL=0.0027		ug/L	
			Perfluorotetradecanoic Acid	2017/04/20	0.0038 U, MDL=0.0038		ug/L	
			Perfluorotridecanoic Acid	2017/04/20	0.0033 U, MDL=0.0033		ug/L	
			Perfluoroundecanoic Acid (PFUnA)	2017/04/20	0.0043 U, MDL=0.0043		ug/L	
			Perfluorodecanoic Acid (PFDA)	2017/04/20	0.0040 U, MDL=0.0040		ug/L	
			Perfluorododecanoic Acid (PFDoA)	2017/04/20	0.0028 U, MDL=0.0028		ug/L	
			Perfluoro-n-Octanoic Acid (PFOA)	2017/04/20	0.0046 U, MDL=0.0046		ug/L	

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorooctane Sulfonate (PFOS)	2017/04/20	0.0026 U, MDL=0.0026		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.

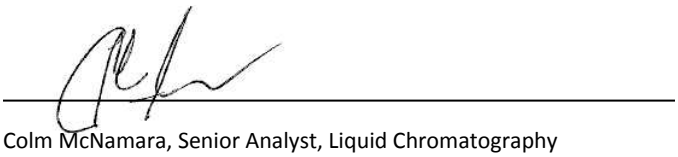
Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

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

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.

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

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

Turn Time: (X) 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 ____

Reporting Limits: GW-1

ESS LAB PROJECT ID: 1704197

Electronic Deliverable: Yes (6) No ____

Format: Excel (X) Access ( ) PDF (X) Other ____

Co. Name	Project #	Project Name (20 Char. or less)
HORSLEY WITTEN GROUP	17027	BARN. ON-CALL #4

Contact Person	Address
JESSE BEAN	90 Rt. 6A

City	State	Zip	PO#
SANDWICH	MA	02563	

Telephone #	Fax #	Email Address
508 833 6600	508 833 3150	jbean@horsleywitten.com

ESS LAB Sample #	Date	Collection Time	COMP	GRAB	MATRIX	Sample Identification (20 Char. or less)	Pres Code	Number of Containers	Type of Containers	Write Required Analysis: PFC's	Write Required Analysis: 1,4 Dioxane
1	4/5/17	1013		X	GW	HW-4D	1	1	G		X
2	4/5/17	1030		X	GW	HW-4M	1	1	GP	X	X
3	4/5/17	1125		X	GW	HW-207D	1	1	G		X
4	4/5/17	1300		X	GW	HW-19D	1	1	G		X
5	4/5/17	1330		X	GW	HW-3	1	1	P	X	
6	4/5/17	1430		X	GW	HW-E	1	1	P	X	
7	4/5/17	1500		X	GW	HW-F	1	1	P	X	
16	4/5/17	1000		X		EQUIPMENT BLANK	1	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: 3.9°C & 2.3°C ICE 4/10/17 Technicians ____

Internal Use Only: [ ] Pickup

Preservation Code: (1- NP), 2- HCl, 3- H_2SO_4, 4- HNO_3, 5- NaOH, 6- MeOH, 7- Asorbic Acid, 8- ZnAct, 9- ____

Sampled by:

Comments:

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
	4/7/17 1545		4/7/17 1545		4/10/17 1011		4/10/17 1049
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

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

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 ____

Reporting Limits: GW-1
ESS LAB PROJECT ID: 170497
Electronic Deliverable: ☑ Yes ___ No
Format: Excel ☑ Access ___ PDF ☑ Other ____

Co. Name	Project #	Project Name (20 Char. or less)
HORSLEY WITTEN GROUP	17027	BARN. ON-CAM #4

Contact Person	Address
JESSE BEAN	90 RT 6A

City	State	Zip	PO#
SANDWICH	MA	02563	—

Telephone #	Fax #	Email Address
508 833 6600	508 833 3150	jbean@horsleywitten.com

ESS LAB Sample#	Date	Collection Time	COMP	GRAB	MATRIX	Sample Identification (20 Char. or less)	Pres Code	Number of Containers	Type of Containers	Write Required Analysis: PFOS	1,4 DIOXANE
8	4/7/17	0850		X	GW	HW-A (S)	1	1	P	X	
9	4/7/17	0930		X	GW	HW-A(D)	1	2	G		X
10	4/7/17	0955		X	GW	HW-B(S)	1	1	P	X	
11	4/7/17	1045		X	GW	HW-5	1	1	P	X	
12	4/7/17	1130		X	GW	HW-B(D)	1	2	G	X	X
13	4/7/17	1250		X	GW	HW-C	1	1	P	X	
14	4/7/17	1420		X	GW	HW-D	1	1	P	X	
15	4/7/17	1440		X	GW	HW-401S	1	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 Internal Use Only
Seals Intact: ___ Yes ___ No NA: ✓ [ ] Pickup
Cooler Temp: 3.9°C & 2.3°C ICE 4/10/17 [ ] Technicians ____

Preservation Code: 1- NP, 2- HCl, 3- H_2SO_4, 4- HNO_3, 5- NaOH, 6- MeOH, 7- Asorbic Acid, 8- ZnAct, 9- ____
Sampled by: HW
Comments: HW-B(D) 1,4 DIOXANE ONLY (DS)

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	4/7/17 1545	[signature]	4/7/17 1545	[signature]	4/10/17 1011	[signature]	4/10/17 1049
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

CERTIFICATE OF ANALYSIS

Jesse Bean
Horsley & Witten
90 Route 6A
Sandwich, MA 02563

RE: Barn. On-Call #4 (17027)
ESS Laboratory Work Order Number: 1704299

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 3:18 pm, May 17, 2017

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 standards, 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 PFOS

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1704299

SAMPLE RECEIPT

The following samples were received on April 12, 2017 for the analyses specified on the enclosed Chain of Custody Record.

Lab Number	Sample Name	Matrix	Analysis
1704299-01	OW-18M	Ground Water	8270D SIM
1704299-02	OW-18D	Ground Water	$, 8270D SIM
1704299-03	OW-19D	Ground Water	8270D SIM
1704299-04	OW-19D	Ground Water	$
1704299-05	OW-19M	Ground Water	8270D SIM
1704299-06	OW-9DD	Ground Water	$, 8270D SIM

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1704299

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

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: Barn. On-Call #4

ESS Laboratory Work Order: 1704299

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: Barn. On-Call #4
Client Sample ID: OW-18M
Date Sampled: 04/11/17 10:40
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704299
ESS Laboratory Sample ID: 1704299-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/13/17 16:00

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	04/15/17 4:24	C7D0233	CD71343

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	65 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: OW-18D
Date Sampled: 04/11/17 12:20
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704299
ESS Laboratory Sample ID: 1704299-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/13/17 16:00

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	**0.552** (0.250)		8270D SIM		1	04/15/17 5:01	C7D0233	CD71343

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	59 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: OW-18D
Date Sampled: 04/11/17 12:20

ESS Laboratory Work Order: 1704299
ESS Laboratory Sample ID: 1704299-02
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: OW-19D
Date Sampled: 04/11/17 10:00
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704299
ESS Laboratory Sample ID: 1704299-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/13/17 16:00

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	**0.800** (0.250)		8270D SIM		1	04/15/17 5:37	C7D0233	CD71343

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	65 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: OW-19D
Date Sampled: 04/11/17 10:20

ESS Laboratory Work Order: 1704299
ESS Laboratory Sample ID: 1704299-04
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: OW-19M
Date Sampled: 04/11/17 11:40
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704299
ESS Laboratory Sample ID: 1704299-05
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/13/17 16:00

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	04/15/17 6:12	C7D0233	CD71343

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	61 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: OW-9DD
Date Sampled: 04/11/17 15:30
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1704299
ESS Laboratory Sample ID: 1704299-06
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 4/13/17 16:00

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	**0.838** (0.250)		8270D SIM		1	04/15/17 6:47	C7D0233	CD71343

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	62 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4
Client Sample ID: OW-9DD
Date Sampled: 04/11/17 15:30

ESS Laboratory Work Order: 1704299
ESS Laboratory Sample ID: 1704299-06
Sample Matrix: Ground Water
Units: %

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
PFOS	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1704299

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution										
Batch CD71343 - 3535A										
Blank										
1,4-Dioxane	ND	0.250	ug/L							
Surrogate: 1,4-Dioxane-d8	*2.42*		ug/L	*5.000*		*48*	*15-115*			
LCS										
1,4-Dioxane	11.6	0.250	ug/L	10.00		116	40-140			
Surrogate: 1,4-Dioxane-d8	*3.00*		ug/L	*5.000*		*60*	*15-115*			
LCS Dup										
1,4-Dioxane	11.3	0.250	ug/L	10.00		113	40-140	2	20	
Surrogate: 1,4-Dioxane-d8	*3.29*		ug/L	*5.000*		*66*	*15-115*			

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4 ESS Laboratory Work Order: 1704299

Notes and Definitions

Z-08	See Attached
U	Analyte included in the analysis, but not detected
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
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1704299

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/dwp/partners/labCert.shtml

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.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Your P.O. #: B02623
Your Project #: 1704197
Your C.O.C. #: 1704197

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/05/01
Report #: R4444424
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B774990
Received: 2017/04/15, 14:19

Sample Matrix: GROUND WATER
Samples Received: 14

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PFOS and PFOA in water	14	2017/04/19	2017/04/20	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.

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.
U = Undetected at the limit of quantitation.
J = Estimated concentration between the EDL & RDL.
B = Blank Contamination.
Q = One or more quality control criteria failed.
E = Analyte concentration exceeds the maximum concentration level.
K = Estimated maximum possible concentration due to ion abundance ratio failure.

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

Your P.O. #: B02623
Your Project #: 1704197
Your C.O.C. #: 1704197

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/05/01
Report #: R4444424
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B774990
Received: 2017/04/15, 14:19

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Melissa DiGrazia, Customer Experience Team Lead
Email: MDiGrazia@maxxam.ca
Phone# (905) 817-5700

==========

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.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

RESULTS OF ANALYSES OF GROUND WATER

Maxxam ID		EFH010	EFH011			EFH012			
Sampling Date		2017/04/05 10:30	2017/04/05 13:30			2017/04/05 14:30			
COC Number		1704197	1704197			1704197			
	UNITS	1704197-02	1704197-05	RDL	MDL	1704197-06	RDL	MDL	QC Batch
Miscellaneous Parameters									
6:2 Fluorotelomer sulfonate	ug/L	0.0038 J	0.47	0.020	0.0032	2.0 (1)	0.10	0.016	4944832
8:2 Fluorotelomer sulfonate	ug/L	0.0036 U	0.012 J	0.020	0.0036	0.0050 J	0.020	0.0036	4944832
Perfluorobutane Sulfonate (PFBS)	ug/L	0.0050 J	0.0048 U	0.020	0.0048	0.0048 U	0.020	0.0048	4944832
Perfluorobutanoic acid	ug/L	0.0066 U	0.089	0.020	0.0066	0.11	0.020	0.0066	4944832
Perfluorodecane Sulfonate	ug/L	0.0046 U	0.0046 U	0.020	0.0046	0.0046 U	0.020	0.0046	4944832
Perfluorodecanoic Acid (PFDA)	ug/L	0.0040 U	0.0040 U	0.020	0.0040	0.0040 U	0.020	0.0040	4944832
Perfluorododecanoic Acid (PFDoA)	ug/L	0.0028 U	0.0028 U	0.020	0.0028	0.0028 U	0.020	0.0028	4944832
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.0070 J	0.10	0.020	0.0033	0.15	0.020	0.0033	4944832
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.020	0.020 J	0.020	0.0034	0.042	0.020	0.0034	4944832
Perfluorohexanoic Acid (PFHxA)	ug/L	0.0094 J	0.28	0.020	0.0029	0.32	0.020	0.0029	4944832
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.011 J	0.065	0.020	0.0046	0.053	0.020	0.0046	4944832
Perfluorononanoic Acid (PFNA)	ug/L	0.0046 U	0.027	0.020	0.0046	0.0087 J	0.020	0.0046	4944832
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0036 U	0.0036 U	0.020	0.0036	0.0036 U	0.020	0.0036	4944832
Perfluorooctane Sulfonate (PFOS)	ug/L	0.043	0.15	0.020	0.0026	0.047	0.020	0.0026	4944832
Perfluoropentanoic Acid (PFPeA)	ug/L	0.017 J	0.39	0.020	0.0027	0.49	0.020	0.0027	4944832
Perfluorotetradecanoic Acid	ug/L	0.0038 U	0.0038 U	0.020	0.0038	0.0038 U	0.020	0.0038	4944832
Perfluorotridecanoic Acid	ug/L	0.0033 U	0.0033 U	0.020	0.0033	0.0033 U	0.020	0.0033	4944832
Perfluoroundecanoic Acid (PFUnA)	ug/L	0.0043 U	0.0043 U	0.020	0.0043	0.0043 U	0.020	0.0043	4944832
Surrogate Recovery (%)									
13C4-Perfluorooctanesulfonate	%	97	88	N/A	N/A	76	N/A	N/A	4944832
13C4-Perfluorooctanoic acid	%	99	95	N/A	N/A	86	N/A	N/A	4944832
13C8-Perfluorooctane Sulfonamide	%	82	80	N/A	N/A	83	N/A	N/A	4944832

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to high concentration of the target analyte, sample required 5x dilution. Detection limit was adjusted accordingly.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

RESULTS OF ANALYSES OF GROUND WATER

Maxxam ID		EFH013			EFH014	EFH015			
Sampling Date		2017/04/05 15:00			2017/04/07 10:50	2017/04/07 09:55			
COC Number		1704197			1704197	1704197			
	UNITS	1704197-07	RDL	MDL	1704197-08	1704197-10	RDL	MDL	QC Batch
Miscellaneous Parameters									
6:2 Fluorotelomer sulfonate	ug/L	5.7 (1)	0.20	0.032	0.0032 U	0.0032 U	0.020	0.0032	4944832
8:2 Fluorotelomer sulfonate	ug/L	0.016 J	0.020	0.0036	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorobutane Sulfonate (PFBS)	ug/L	0.0048 U	0.020	0.0048	0.017 J	0.0077 J	0.020	0.0048	4944832
Perfluorobutanoic acid	ug/L	0.71	0.020	0.0066	0.012 J	0.040	0.020	0.0066	4944832
Perfluorodecane Sulfonate	ug/L	0.0046 U	0.020	0.0046	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorodecanoic Acid (PFDA)	ug/L	0.0040 U	0.020	0.0040	0.0040 U	0.0040 U	0.020	0.0040	4944832
Perfluorododecanoic Acid (PFDoA)	ug/L	0.0028 U	0.020	0.0028	0.0028 U	0.0028 U	0.020	0.0028	4944832
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.34	0.020	0.0033	0.0048 J	0.049	0.020	0.0033	4944832
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.019 J	0.020	0.0034	0.0079 J	0.044	0.020	0.0034	4944832
Perfluorohexanoic Acid (PFHxA)	ug/L	2.3 (1)	0.20	0.029	0.0092 J	0.13	0.020	0.0029	4944832
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.075	0.020	0.0046	0.0046 U	0.0094 J	0.020	0.0046	4944832
Perfluorononanoic Acid (PFNA)	ug/L	0.0046 U	0.020	0.0046	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0036 U	0.020	0.0036	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorooctane Sulfonate (PFOS)	ug/L	0.0026 U	0.020	0.0026	0.0026 U	0.026	0.020	0.0026	4944832
Perfluoropentanoic Acid (PFPeA)	ug/L	3.8 (1)	0.20	0.027	0.027	0.14	0.020	0.0027	4944832
Perfluorotetradecanoic Acid	ug/L	0.0038 U	0.020	0.0038	0.0038 U	0.0046 J	0.020	0.0038	4944832
Perfluorotridecanoic Acid	ug/L	0.0033 U	0.020	0.0033	0.0033 U	0.0054 J	0.020	0.0033	4944832
Perfluoroundecanoic Acid (PFUnA)	ug/L	0.0043 U	0.020	0.0043	0.0043 U	0.0043 U	0.020	0.0043	4944832
Surrogate Recovery (%)									
13C4-Perfluorooctanesulfonate	%	78	N/A	N/A	76	78	N/A	N/A	4944832
13C4-Perfluorooctanoic acid	%	88	N/A	N/A	87	92	N/A	N/A	4944832
13C8-Perfluorooctane Sulfonamide	%	80	N/A	N/A	83	97	N/A	N/A	4944832

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.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

RESULTS OF ANALYSES OF GROUND WATER

Maxxam ID		EFH016		EFH017	EFH018	EFH019			
Sampling Date		2017/04/07 10:45		2017/04/07 12:50	2017/04/07 14:20	2017/04/07 14:40			
COC Number		1704197		1704197	1704197	1704197			
	UNITS	1704197-11	RDL	1704197-13	1704197-14	1704197-15	RDL	MDL	QC Batch
Miscellaneous Parameters									
6:2 Fluorotelomer sulfonate	ug/L	0.0037 J	0.020	0.0034 J	0.0032 U	0.0040 J	0.020	0.0032	4944832
8:2 Fluorotelomer sulfonate	ug/L	0.0036 U	0.020	0.0036 U	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorobutane Sulfonate (PFBS)	ug/L	0.0048 U	0.020	0.0048 U	0.0048 U	0.0048 U	0.020	0.0048	4944832
Perfluorobutanoic acid	ug/L	2.9 (1)	0.20	0.0066 U	0.0066 U	0.0066 U	0.020	0.0066	4944832
Perfluorodecane Sulfonate	ug/L	0.0046 U	0.020	0.0046 U	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorodecanoic Acid (PFDA)	ug/L	0.0040 U	0.020	0.0040 U	0.0040 U	0.0040 U	0.020	0.0040	4944832
Perfluorododecanoic Acid (PFDoA)	ug/L	0.0028 U	0.020	0.0028 U	0.0028 U	0.0028 U	0.020	0.0028	4944832
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.0084 J	0.020	0.0033 U	0.0033 U	0.0043 J	0.020	0.0033	4944832
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.018 J	0.020	0.0034 U	0.0089 J	0.011 J	0.020	0.0034	4944832
Perfluorohexanoic Acid (PFHxA)	ug/L	0.0029 U	0.020	0.0029 U	0.0029 U	0.0029 U	0.020	0.0029	4944832
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.020 J	0.020	0.0046 U	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorononanoic Acid (PFNA)	ug/L	0.0046 U	0.020	0.0046 U	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0036 U	0.020	0.0036 U	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorooctane Sulfonate (PFOS)	ug/L	0.052	0.020	0.0026 U	0.022	0.012 J	0.020	0.0026	4944832
Perfluoropentanoic Acid (PFPeA)	ug/L	0.0027 U	0.020	0.0027 U	0.0027 U	0.0027 U	0.020	0.0027	4944832
Perfluorotetradecanoic Acid	ug/L	0.0038 U	0.020	0.0038 U	0.0038 U	0.0038 U	0.020	0.0038	4944832
Perfluorotridecanoic Acid	ug/L	0.0033 U	0.020	0.0033 U	0.0033 U	0.0033 U	0.020	0.0033	4944832
Perfluoroundecanoic Acid (PFUnA)	ug/L	0.0043 U	0.020	0.0043 U	0.0043 U	0.0043 U	0.020	0.0043	4944832
Surrogate Recovery (%)									
13C4-Perfluorooctanesulfonate	%	65 (2)	N/A	83	84	83	N/A	N/A	4944832
13C4-Perfluorooctanoic acid	%	81	N/A	100	88	81	N/A	N/A	4944832
13C8-Perfluorooctane Sulfonamide	%	74	N/A	82	92	82	N/A	N/A	4944832

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) Surrogate recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the surrogate. When considered together, these QC data suggest that matrix interferences may be biasing the data low. Because quantitation is performed using isotope dilution techniques, any losses of the native compound that may occur during any of the sample preparation, extraction, cleanup or determinative steps will be mirrored by a similar loss of the labeled standard, and as such can be accounted for and corrected. Therefore, the quantification of these target compounds is not affected by the low surrogate recovery.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

RESULTS OF ANALYSES OF GROUND WATER

Maxxam ID		EFH020	EFH021	EFH022	EFH023			
Sampling Date		2017/04/05 10:00	2017/04/11 12:20	2017/04/11 10:20	2017/04/11 15:30			
COC Number		1704197	1704197	1704197	1704197			
	UNITS	1704197-16	1704299-02	1704299-04	1704299-06	RDL	MDL	QC Batch
Miscellaneous Parameters								
6:2 Fluorotelomer sulfonate	ug/L	0.0032 U	0.0032 U	0.0032 U	0.13	0.020	0.0032	4944832
8:2 Fluorotelomer sulfonate	ug/L	0.0036 U	0.0036 U	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorobutane Sulfonate (PFBS)	ug/L	0.0048 U	0.016 J	0.0055 J	0.0048 U	0.020	0.0048	4944832
Perfluorobutanoic acid	ug/L	0.0066 U	0.015 J	0.0066 U	0.021	0.020	0.0066	4944832
Perfluorodecane Sulfonate	ug/L	0.0046 U	0.0046 U	0.0046 U	0.0046 U	0.020	0.0046	4944832
Perfluorodecanoic Acid (PFDA)	ug/L	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.020	0.0040	4944832
Perfluorododecanoic Acid (PFDoA)	ug/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.020	0.0028	4944832
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.0033 U	0.015 J	0.0051 J	0.034	0.020	0.0033	4944832
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.0034 U	0.13	0.029	0.12	0.020	0.0034	4944832
Perfluorohexanoic Acid (PFHxA)	ug/L	0.0029 U	0.046	0.0060 J	0.041	0.020	0.0029	4944832
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.0046 U	0.025	0.0046 U	0.055	0.020	0.0046	4944832
Perfluorononanoic Acid (PFNA)	ug/L	0.0046 U	0.0046 U	0.0060 J	0.059	0.020	0.0046	4944832
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0036 U	0.0036 U	0.0036 U	0.0036 U	0.020	0.0036	4944832
Perfluorooctane Sulfonate (PFOS)	ug/L	0.0026 U	0.22	0.029	0.50	0.020	0.0026	4944832
Perfluoropentanoic Acid (PFPeA)	ug/L	0.0027 U	0.039	0.013 J	0.060	0.020	0.0027	4944832
Perfluorotetradecanoic Acid	ug/L	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.020	0.0038	4944832
Perfluorotridecanoic Acid	ug/L	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.020	0.0033	4944832
Perfluoroundecanoic Acid (PFUnA)	ug/L	0.0043 U	0.0043 U	0.0043 U	0.0043 U	0.020	0.0043	4944832
Surrogate Recovery (%)								
13C4-Perfluorooctanesulfonate	%	82	91	94	82	N/A	N/A	4944832
13C4-Perfluorooctanoic acid	%	96	94	92	88	N/A	N/A	4944832
13C8-Perfluorooctane Sulfonamide	%	82	86	95	89	N/A	N/A	4944832

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

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

TEST SUMMARY

Maxxam ID: EFH010 **Collected:** 2017/04/05
Sample ID: 1704197-02 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH011 **Collected:** 2017/04/05
Sample ID: 1704197-05 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH012 **Collected:** 2017/04/05
Sample ID: 1704197-06 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH013 **Collected:** 2017/04/05
Sample ID: 1704197-07 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH014 **Collected:** 2017/04/07
Sample ID: 1704197-08 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH015 **Collected:** 2017/04/07
Sample ID: 1704197-10 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH016 **Collected:** 2017/04/07
Sample ID: 1704197-11 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

TEST SUMMARY

Maxxam ID: EFH017 **Collected:** 2017/04/07
Sample ID: 1704197-13 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH018 **Collected:** 2017/04/07
Sample ID: 1704197-14 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH019 **Collected:** 2017/04/07
Sample ID: 1704197-15 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH020 **Collected:** 2017/04/05
Sample ID: 1704197-16 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH021 **Collected:** 2017/04/11
Sample ID: 1704299-02 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH022 **Collected:** 2017/04/11
Sample ID: 1704299-04 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

Maxxam ID: EFH023 **Collected:** 2017/04/11
Sample ID: 1704299-06 **Shipped:**
Matrix: GROUND WATER **Received:** 2017/04/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water	LCMS	4944832	2017/04/19	2017/04/20	Daniela Zupu

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

GENERAL COMMENTS

TBLK-EPEU-20161219 received however not listed on CoC. Sample will remain on hold as per client request.

Minimal sample volume received for 1704197-16. Please note this may result in elevated DLs.

Results relate only to the items tested.

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
4944832	DZU	Spiked Blank	13C4-Perfluorooctanesulfonate	2017/04/20		92	%	70 - 130
			13C4-Perfluorooctanoic acid	2017/04/20		102	%	70 - 130
			13C8-Perfluorooctane Sulfonamide	2017/04/20		86	%	60 - 120
			6:2 Fluorotelomer sulfonate	2017/04/20		84	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/04/20		87	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/04/20		99	%	70 - 130
			Perfluorobutanoic acid	2017/04/20		82	%	70 - 130
			Perfluorodecane Sulfonate	2017/04/20		87	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/04/20		93	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/04/20		97	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/04/20		103	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/04/20		97	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/04/20		91	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/04/20		94	%	70 - 130
			Perfluorotetradecanoic Acid	2017/04/20		91	%	70 - 130
			Perfluorotridecanoic Acid	2017/04/20		84	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/04/20		100	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/04/20		101	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/04/20		109	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/04/20		97	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/04/20		94	%	70 - 130
4944832	DZU	Spiked Blank DUP	13C4-Perfluorooctanesulfonate	2017/04/20		93	%	70 - 130
			13C4-Perfluorooctanoic acid	2017/04/20		107	%	70 - 130
			13C8-Perfluorooctane Sulfonamide	2017/04/20		86	%	60 - 120
			6:2 Fluorotelomer sulfonate	2017/04/20		88	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/04/20		93	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/04/20		102	%	70 - 130
			Perfluorobutanoic acid	2017/04/20		97	%	70 - 130
			Perfluorodecane Sulfonate	2017/04/20		87	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/04/20		100	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/04/20		93	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/04/20		106	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/04/20		95	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/04/20		97	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/04/20		98	%	70 - 130
			Perfluorotetradecanoic Acid	2017/04/20		102	%	70 - 130
			Perfluorotridecanoic Acid	2017/04/20		95	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/04/20		107	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/04/20		97	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/04/20		98	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/04/20		92	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/04/20		87	%	70 - 130
4944832	DZU	RPD	6:2 Fluorotelomer sulfonate	2017/04/20	5.1		%	30
			8:2 Fluorotelomer sulfonate	2017/04/20	6.4		%	30
			Perfluorobutane Sulfonate (PFBS)	2017/04/20	3.2		%	30
			Perfluorobutanoic acid	2017/04/20	16		%	30
			Perfluorodecane Sulfonate	2017/04/20	0.23		%	30
			Perfluoroheptanoic Acid (PFHpA)	2017/04/20	7.7		%	30
			Perfluorohexane Sulfonate (PFHxS)	2017/04/20	4.8		%	30
			Perfluorohexanoic Acid (PFHxA)	2017/04/20	3.2		%	30
			Perfluorononanoic Acid (PFNA)	2017/04/20	2.3		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2017/04/20	5.5		%	30
			Perfluoropentanoic Acid (PFPeA)	2017/04/20	4.2		%	30

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorotetradecanoic Acid	2017/04/20	12		%	30
			Perfluorotridecanoic Acid	2017/04/20	13		%	30
			Perfluoroundecanoic Acid (PFUnA)	2017/04/20	7.0		%	30
			Perfluorodecanoic Acid (PFDA)	2017/04/20	4.0		%	30
			Perfluorododecanoic Acid (PFDoA)	2017/04/20	10		%	30
			Perfluoro-n-Octanoic Acid (PFOA)	2017/04/20	5.5		%	30
			Perfluorooctane Sulfonate (PFOS)	2017/04/20	6.9		%	30
4944832	DZU	Method Blank	13C4-Perfluorooctanesulfonate	2017/04/20		88	%	70 - 130
			13C4-Perfluorooctanoic acid	2017/04/20		93	%	70 - 130
			13C8-Perfluorooctane Sulfonamide	2017/04/20		86	%	60 - 120
			6:2 Fluorotelomer sulfonate	2017/04/20	0.0032 U, MDL=0.0032		ug/L	
			8:2 Fluorotelomer sulfonate	2017/04/20	0.0036 U, MDL=0.0036		ug/L	
			Perfluorobutane Sulfonate (PFBS)	2017/04/20	0.0048 U, MDL=0.0048		ug/L	
			Perfluorobutanoic acid	2017/04/20	0.0066 U, MDL=0.0066		ug/L	
			Perfluorodecane Sulfonate	2017/04/20	0.0046 U, MDL=0.0046		ug/L	
			Perfluoroheptanoic Acid (PFHpA)	2017/04/20	0.0033 U, MDL=0.0033		ug/L	
			Perfluorohexane Sulfonate (PFHxS)	2017/04/20	0.0034 U, MDL=0.0034		ug/L	
			Perfluorohexanoic Acid (PFHxA)	2017/04/20	0.0029 U, MDL=0.0029		ug/L	
			Perfluorononanoic Acid (PFNA)	2017/04/20	0.0046 U, MDL=0.0046		ug/L	
			Perfluorooctane Sulfonamide (PFOSA)	2017/04/20	0.0036 U, MDL=0.0036		ug/L	
			Perfluoropentanoic Acid (PFPeA)	2017/04/20	0.0027 U, MDL=0.0027		ug/L	
			Perfluorotetradecanoic Acid	2017/04/20	0.0038 U, MDL=0.0038		ug/L	
			Perfluorotridecanoic Acid	2017/04/20	0.0033 U, MDL=0.0033		ug/L	
			Perfluoroundecanoic Acid (PFUnA)	2017/04/20	0.0043 U, MDL=0.0043		ug/L	
			Perfluorodecanoic Acid (PFDA)	2017/04/20	0.0040 U, MDL=0.0040		ug/L	
			Perfluorododecanoic Acid (PFDoA)	2017/04/20	0.0028 U, MDL=0.0028		ug/L	
			Perfluoro-n-Octanoic Acid (PFOA)	2017/04/20	0.0046 U, MDL=0.0046		ug/L	

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

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorooctane Sulfonate (PFOS)	2017/04/20	0.0026 U, MDL=0.0026		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.

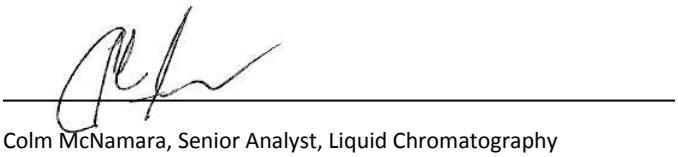
Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B774990
Report Date: 2017/05/01

ESS Laboratory
Client Project #: 1704197
Your P.O. #: B02623

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

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.

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

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 # 1704299

Turn Time ____**Standard** Other_____

Reporting Limits - **GW-1**

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_____

Electonic Deliverables Excel Access PDF

Co. Name	Project #	Project Name	
ESS Laboratory		1704299	
Contact Person	Proj. Location		
Shawn Morrell			
Address	City , State	Zip	PO #
			B02623
Tel. ext 3083	email: smorrell@thielsch.com		

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis	PFOS
	4/11/17	**1220**		**GW**	**1704299-02**	**1**	**1**	**P**			**X**
	4/11/17	**1020**		**GW**	**1704299-04**	**1**	**1**	**P**			**X**
	4/11/17	**1530**		**GW**	**1704299-06**	**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 Internal Use Only

Seals Intact ____ Yes _____No NA:____ [ ] Pickup

Cooler Temperature: _____ [ ] Technician____

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

Sampled by :

Comments:

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
4/13/17 1500	FED EX		
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 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 _____ of _____

Turn Time: (X) 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 _____

Reporting Limits: GW-1

ESS LAB PROJECT ID: 1704299

Electronic Deliverable: (X) Yes ( ) No
Format: Excel (X) Access ( ) PDF (X) Other _____

Co. Name	Project #	Project Name (20 Char. or less)
HORSLEY WITTEN GROUP	17027	BARN. ON - CALL #4

Contact Person	Address
JESSE BEAN	90 RT 6A

City	State	Zip	PO#
SANDWICH	MA	02563	—

Telephone #	Fax #	Email Address
508 833 6600	508 833 3150	jbean@horsleywitten.com

ESS LAB Sample#	Date	Collection Time	COMP	GRAB	MATRIX	Sample Identification (20 Char. or less)	Pres Code	Number of Containers	Type of Containers	Write Required Analysis: 1,4 DIOXANE	Write Required Analysis: PFCs
1	4/11/17	1040		X	GW	OW-18M	1	2	G	X	
2	4/11/17	1220		X	GW	OW-18D	1	2	G P	X	X
3	4/11/17	1060		X	GW	OW-19D	1	2	G	X	
4	4/11/17	1020		X	GW	OW-19D	1	1	P		X
5	4/11/17	1140		X	GW	OW-19M	1	2	G	X	
6	4/11/17	1530		X	GW	OW 9DD	1	2	G P	X	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: (X) Yes ( ) No
Seals Intact: ( ) Yes ( ) No (X) NA
Cooler Temp: 2.8 ice

Internal Use Only
[X] Pickup
[ ] Technicians _____

Preservation Code: 1- NP, 2- HCl, 3- H_2SO_4, 4- HNO_3, 5- NaOH, 6- MeOH, 7- Asorbic Acid, 8- ZnAct, 9- _____

Sampled by: GW

Comments:

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
	4/11/17 1630		4/12/17 1615		4/12/17 1702		4/12/17 1727
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 Copy

10/26/04 A

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 # 1704299

Turn Time ______ **Standard** Other__________

Reporting Limits - **GW-1**

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_________

Electonic Deliverables Excel Access PDF

Co. Name: ESS Laboratory

Project #:

Project Name: 1704299

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
	4/11/17	1220		GW	1704299-02	1	1	P			X
	4/11/17	1020		GW	1704299-04	1	1	P			X
	4/11/17	1530		GW	1704299-06	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:

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
[signature] 4/13/17 1500	FED EX		
Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
	KLAPNESLPPA [signature] 2017/04/15		

* 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

3.1 13.2 / 3.2 14:19

CERTIFICATE OF ANALYSIS

Jesse Bean
Horsley & Witten
90 Route 6A
Sandwich, MA 02563

RE: Barn. On-Call #4 (17027)
ESS Laboratory Work Order Number: 1709723

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 3:26 pm, Oct 23, 2017

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 standards, 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 PFOS

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1709723

SAMPLE RECEIPT

The following samples were received on September 26, 2017 for the analyses specified on the enclosed Chain of Custody Record.

Lab Number	Sample Name	Matrix	Analysis
1709723-01	DL-2 2'	Soil	§
1709723-02	DL-2 4'	Soil	§
1709723-03	DL-3 2'	Soil	§
1709723-04	DL-3 4'	Soil	§
1709723-05	DL-11 0-1'	Soil	§
1709723-06	DL-4 2'	Soil	§
1709723-07	DL-4 4'	Soil	§
1709723-08	DL-12 0-1'	Soil	§
1709723-09	DL-5 2'	Soil	§
1709723-10	DL-5 4'	Soil	§
1709723-11	DL-8 4'	Soil	§
1709723-12	DL-13 0-1'	Soil	§
1709723-13	DL-14 0-1'	Soil	§
1709723-14	ARFF-1 2'	Soil	§
1709723-15	ARFF-1 4'	Soil	§
1709723-16	ARFF-CB 0-1'	Soil	§
1709723-17	ARFF-3 0-1'	Soil	§
1709723-18	ARFF-4 0-1'	Soil	§

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1709723

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

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: Barn. On-Call #4

ESS Laboratory Work Order: 1709723

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: Barn. On-Call #4

ESS Laboratory Work Order: 1709723

Subcontracted Analysis

Client Sample ID: DL-2 2'
Date Sampled: 09/26/17 08:10

ESS Laboratory Sample ID: 1709723-01
Sample Matrix: Soil

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

Client Sample ID: DL-2 4'
Date Sampled: 09/26/17 08:15

ESS Laboratory Sample ID: 1709723-02
Sample Matrix: Soil

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

Client Sample ID: DL-3 2'
Date Sampled: 09/26/17 08:50

ESS Laboratory Sample ID: 1709723-03
Sample Matrix: Soil

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

Client Sample ID: DL-3 4'
Date Sampled: 09/26/17 09:00

ESS Laboratory Sample ID: 1709723-04
Sample Matrix: Soil

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

Client Sample ID: DL-11 0-1'
Date Sampled: 09/26/17 09:15

ESS Laboratory Sample ID: 1709723-05
Sample Matrix: Soil

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

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1709723

Subcontracted Analysis

Client Sample ID: DL-4 2'
Date Sampled: 09/26/17 09:25

ESS Laboratory Sample ID: 1709723-06
Sample Matrix: Soil

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

Client Sample ID: DL-4 4'
Date Sampled: 09/26/17 09:35

ESS Laboratory Sample ID: 1709723-07
Sample Matrix: Soil

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

Client Sample ID: DL-12 0-1'
Date Sampled: 09/26/17 09:45

ESS Laboratory Sample ID: 1709723-08
Sample Matrix: Soil

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

Client Sample ID: DL-5 2'
Date Sampled: 09/26/17 09:55

ESS Laboratory Sample ID: 1709723-09
Sample Matrix: Soil

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

Client Sample ID: DL-5 4'
Date Sampled: 09/26/17 10:05

ESS Laboratory Sample ID: 1709723-10
Sample Matrix: Soil

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

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1709723

Subcontracted Analysis

Client Sample ID: DL-8 4'
Date Sampled: 09/26/17 10:35

ESS Laboratory Sample ID: 1709723-11
Sample Matrix: Soil

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

Client Sample ID: DL-13 0-1'
Date Sampled: 09/26/17 11:00

ESS Laboratory Sample ID: 1709723-12
Sample Matrix: Soil

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

Client Sample ID: DL-14 0-1'
Date Sampled: 09/26/17 11:10

ESS Laboratory Sample ID: 1709723-13
Sample Matrix: Soil

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

Client Sample ID: ARFF-1 2'
Date Sampled: 09/26/17 11:40

ESS Laboratory Sample ID: 1709723-14
Sample Matrix: Soil

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

Client Sample ID: ARFF-1 4'
Date Sampled: 09/26/17 11:50

ESS Laboratory Sample ID: 1709723-15
Sample Matrix: Soil

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

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1709723

Subcontracted Analysis

Client Sample ID: ARFF-CB 0-1'
Date Sampled: 09/26/17 11:55

ESS Laboratory Sample ID: 1709723-16
Sample Matrix: Soil

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

Client Sample ID: ARFF-3 0-1'
Date Sampled: 09/26/17 12:05

ESS Laboratory Sample ID: 1709723-17
Sample Matrix: Soil

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

Client Sample ID: ARFF-4 0-1'
Date Sampled: 09/26/17 12:10

ESS Laboratory Sample ID: 1709723-18
Sample Matrix: Soil

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

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1709723

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4 ESS Laboratory Work Order: 1709723

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
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1709723

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/dwp/partners/labCert.shtml

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.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Maxxam
A Bureau Veritas Group Company

Your P.O. #: B02623
Your Project #: 1709723
Your C.O.C. #: na

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/10/18
Report #: R4790410
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7L3940
Received: 2017/09/28, 16:04

Sample Matrix: Soil
Samples Received: 18

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Moisture	18	N/A	2017/09/30	CAM SOP-00445	Carter 2nd ed 51.2 m
PFOS and PFOA in soil by SPE/LCMS (1)	3	2017/10/10	2017/10/17	CAM SOP-00894	EPA537 m
PFOS and PFOA in soil by SPE/LCMS (1)	15	2017/10/10	2017/10/18	CAM SOP-00894	EPA537 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.

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.

U = Undetected at the limit of quantitation.
J = Estimated concentration between the EDL & RDL.
B = Blank Contamination.
Q = One or more quality control criteria failed.
E = Analyte concentration exceeds the maximum concentration level.
K = Estimated maximum possible concentration due to ion abundance ratio failure.

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

Maxxam
A Bureau Veritas Group Company

Your P.O. #: B02623
Your Project #: 1709723
Your C.O.C. #: na

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/10/18
Report #: R4790410
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7L3940
Received: 2017/09/28, 16:04

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Stephanie Pollen, Project Manager
Email: SPollen@maxxam.ca
Phone# (905) 817-5700
==========
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.

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL325	FFL326	FFL327	FFL328	FFL329	FFL330			
Sampling Date		2017/09/26 08:10	2017/09/26 08:15	2017/09/26 08:50	2017/09/26 09:00	2017/09/26 09:15	2017/09/26 09:25			
COC Number		na	na	na	na	na	na			
	UNITS	1709723-01	1709723-02	1709723-03	1709723-04	1709723-05	1709723-06	RDL	MDL	QC Batch
Inorganics										
Moisture	%	4.3	2.2	4.4	2.8	9.3	2.8	1.0	0.50	5191056
Miscellaneous Parameters										
6:2 Fluorotelomer sulfonate	ug/kg	0.23 U	0.57 J	1.5	1.0	7.8	0.23 U	1.0	0.23	5203646
8:2 Fluorotelomer sulfonate	ug/kg	0.32 U	0.32 U	1.0	1.1	14	0.32 U	1.0	0.32	5203646
Perfluorobutane Sulfonate (PFBS)	ug/kg	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	1.0	0.17	5203646
Perfluorobutanoic acid	ug/kg	0.23 U	0.23 U	0.23 U	0.23 U	1.4	0.23 U	1.0	0.23	5203646
Perfluorodecane Sulfonate	ug/kg	0.23 U	0.23 U	0.23 U	0.86 J	0.23 U	0.23 U	1.0	0.23	5203646
Perfluorodecanoic Acid (PFDA)	ug/kg	0.13 U	0.13 U	0.13 U	0.13 U	1.8	0.13 U	1.0	0.13	5203646
Perfluorododecanoic Acid (PFDoA)	ug/kg	0.22 U	0.22 U	0.71 J	0.22 U	0.22 U	0.22 U	1.0	0.22	5203646
Perfluoroheptanoic Acid (PFHpA)	ug/kg	1.2	0.48 J	0.17 U	0.17 U	2.1	0.17 U	1.0	0.17	5203646
Perfluorohexane Sulfonate (PFHxS)	ug/kg	1.3	0.59 J	0.23 U	0.23 U	0.82 J	0.23 U	1.0	0.23	5203646
Perfluorohexanoic Acid (PFHxA)	ug/kg	0.74 J	0.19 U	0.19 U	0.19 U	2.7	0.19 U	1.0	0.19	5203646
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	4.1	0.74 J	0.26 U	0.26 U	4.7	0.26 U	1.0	0.26	5203646
Perfluorononanoic Acid (PFNA)	ug/kg	2.5	0.17 U	0.17 U	0.17 U	16	0.17 U	1.0	0.17	5203646
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	0.26 U	0.26 U	0.26 U	0.84 J	0.26 U	0.26 U	1.0	0.26	5203646
Perfluorooctane Sulfonate (PFOS)	ug/kg	1.5	0.21 U	0.21 U	0.21 U	29	0.21 U	1.0	0.21	5203646
Perfluoropentanoic Acid (PFPeA)	ug/kg	0.83 J	0.18 U	0.18 U	0.18 U	3.5	0.18 U	1.0	0.18	5203646
Perfluorotetradecanoic Acid	ug/kg	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	1.0	0.11	5203646
Perfluorotridecanoic Acid	ug/kg	0.12 U	0.12 U	5.6	0.21 J	0.20 J	0.12 U	1.0	0.12	5203646
Perfluoroundecanoic Acid (PFUnA)	ug/kg	0.18 U	0.18 U	0.75 J	9.8	1.2	0.88 J	1.0	0.18	5203646
Surrogate Recovery (%)										
13C2-6:2 Fluorotelomer sulfonate	%	105	116	113	105	103	98	N/A	N/A	5203646
13C2-8:2 Fluorotelomer sulfonate	%	98	114	99	101	94	100	N/A	N/A	5203646
13C2-Perfluorodecanoic acid	%	109	111	107	101	106	98	N/A	N/A	5203646
13C2-Perfluorododecanoic acid	%	90	98	97	99	99	91	N/A	N/A	5203646
13C2-Perfluorohexanoic acid	%	98	112	100	97	105	100	N/A	N/A	5203646
13C2-perfluorotetradecanoic acid	%	80	105	109	103	85	100	N/A	N/A	5203646
13C2-Perfluoroundecanoic acid	%	101	109	101	96	108	102	N/A	N/A	5203646
13C4-Perfluorobutanoic acid	%	104	107	104	101	104	101	N/A	N/A	5203646
13C4-Perfluoroheptanoic acid	%	102	116	113	109	103	101	N/A	N/A	5203646
13C4-Perfluorooctanesulfonate	%	98	103	102	104	106	94	N/A	N/A	5203646
13C4-Perfluorooctanoic acid	%	102	120	113	106	106	102	N/A	N/A	5203646
13C5-Perfluorononanoic acid	%	101	107	99	102	106	96	N/A	N/A	5203646
13C5-Perfluoropentanoic acid	%	103	108	101	105	103	100	N/A	N/A	5203646

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

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL325	FFL326	FFL327	FFL328	FFL329	FFL330			
Sampling Date		2017/09/26 08:10	2017/09/26 08:15	2017/09/26 08:50	2017/09/26 09:00	2017/09/26 09:15	2017/09/26 09:25			
COC Number		na	na	na	na	na	na			
	UNITS	**1709723-01**	**1709723-02**	**1709723-03**	**1709723-04**	**1709723-05**	**1709723-06**	**RDL**	**MDL**	**QC Batch**
13C8-Perfluorooctane Sulfonamide	%	105	114	108	101	114	96	N/A	N/A	5203646
18O2-Perfluorohexanesulfonate	%	108	102	101	99	95	83	N/A	N/A	5203646

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

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL331			FFL332			FFL333	FFL334			
Sampling Date		2017/09/26 09:35			2017/09/26 09:45			2017/09/26 09:55	2017/09/26 10:05			
COC Number		na			na			na	na			
	UNITS	1709723-07	RDL	MDL	1709723-08	RDL	MDL	1709723-09	1709723-10	RDL	MDL	QC Batch
Inorganics												
Moisture	%	2.5	1.0	0.50	17	1.0	0.50	5.1	3.3	1.0	0.50	5191056
Miscellaneous Parameters												
6:2 Fluorotelomer sulfonate	ug/kg	1.7	1.0	0.23	62	10	2.3	0.23 U	0.23 U	1.0	0.23	5203646
8:2 Fluorotelomer sulfonate	ug/kg	0.32 U	1.0	0.32	7.0	1.0	0.32	0.32 U	0.32 U	1.0	0.32	5203646
Perfluorobutane Sulfonate (PFBS)	ug/kg	0.17 U	1.0	0.17	0.17 U	1.0	0.17	0.17 U	0.17 U	1.0	0.17	5203646
Perfluorobutanoic acid	ug/kg	0.23 U	1.0	0.23	0.23 U	1.0	0.23	0.23 U	0.23 U	1.0	0.23	5203646
Perfluorodecane Sulfonate	ug/kg	0.23 U	1.0	0.23	0.23 U	1.0	0.23	0.23 U	0.23 U	1.0	0.23	5203646
Perfluorodecanoic Acid (PFDA)	ug/kg	0.13 U	1.0	0.13	0.66 J	1.0	0.13	0.13 U	0.13 U	1.0	0.13	5203646
Perfluorododecanoic Acid (PFDoA)	ug/kg	0.22 U	1.0	0.22	0.22 U	1.0	0.22	0.22 U	0.22 U	1.0	0.22	5203646
Perfluoroheptanoic Acid (PFHpA)	ug/kg	0.17 U	1.0	0.17	1.2	1.0	0.17	0.40 J	0.50 J	1.0	0.17	5203646
Perfluorohexane Sulfonate (PFHxS)	ug/kg	0.23 U	1.0	0.23	0.23 U	1.0	0.23	0.49 J	0.23 U	1.0	0.23	5203646
Perfluorohexanoic Acid (PFHxA)	ug/kg	0.19 U	1.0	0.19	1.2	1.0	0.19	0.19 U	0.19 U	1.0	0.19	5203646
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	0.26 U	1.0	0.26	4.6	1.0	0.26	1.6	0.26 U	1.0	0.26	5203646
Perfluorononanoic Acid (PFNA)	ug/kg	3.7	1.0	0.17	7.3	1.0	0.17	0.17 U	0.17 U	1.0	0.17	5203646
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	0.26 U	1.0	0.26	0.26 U	1.0	0.26	0.26 U	0.26 U	1.0	0.26	5203646
Perfluorooctane Sulfonate (PFOS)	ug/kg	0.50 J	1.0	0.21	23	1.0	0.21	0.21 U	0.21 U	1.0	0.21	5203646
Perfluoropentanoic Acid (PFPeA)	ug/kg	0.18 U	1.0	0.18	1.6	1.0	0.18	0.18 U	0.18 U	1.0	0.18	5203646
Perfluorotetradecanoic Acid	ug/kg	0.11 U	1.0	0.11	0.11 U	1.0	0.11	0.11 U	0.11 U	1.0	0.11	5203646
Perfluorotridecanoic Acid	ug/kg	0.12 U	1.0	0.12	0.12 U	1.0	0.12	0.12 U	0.12 U	1.0	0.12	5203646
Perfluoroundecanoic Acid (PFUnA)	ug/kg	0.18 U	1.0	0.18	0.18 U	1.0	0.18	0.18 U	0.18 U	1.0	0.18	5203646
Surrogate Recovery (%)												
13C2-6:2 Fluorotelomer sulfonate	%	112	N/A	N/A	102	N/A	N/A	111	113	N/A	N/A	5203646
13C2-8:2 Fluorotelomer sulfonate	%	107	N/A	N/A	85	N/A	N/A	95	101	N/A	N/A	5203646
13C2-Perfluorodecanoic acid	%	124	N/A	N/A	104	N/A	N/A	112	105	N/A	N/A	5203646
13C2-Perfluorododecanoic acid	%	108	N/A	N/A	96	N/A	N/A	98	96	N/A	N/A	5203646
13C2-Perfluorohexanoic acid	%	109	N/A	N/A	95	N/A	N/A	101	111	N/A	N/A	5203646
13C2-perfluorotetradecanoic acid	%	112	N/A	N/A	100	N/A	N/A	103	94	N/A	N/A	5203646
13C2-Perfluoroundecanoic acid	%	116	N/A	N/A	96	N/A	N/A	103	103	N/A	N/A	5203646
13C4-Perfluorobutanoic acid	%	108	N/A	N/A	94	N/A	N/A	109	108	N/A	N/A	5203646
13C4-Perfluoroheptanoic acid	%	111	N/A	N/A	97	N/A	N/A	111	118	N/A	N/A	5203646
13C4-Perfluorooctanesulfonate	%	104	N/A	N/A	91	N/A	N/A	111	96	N/A	N/A	5203646
13C4-Perfluorooctanoic acid	%	114	N/A	N/A	98	N/A	N/A	110	115	N/A	N/A	5203646
13C5-Perfluorononanoic acid	%	106	N/A	N/A	99	N/A	N/A	106	108	N/A	N/A	5203646
13C5-Perfluoropentanoic acid	%	110	N/A	N/A	93	N/A	N/A	102	109	N/A	N/A	5203646

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

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL331			FFL332			FFL333	FFL334			
Sampling Date		2017/09/26 09:35			2017/09/26 09:45			2017/09/26 09:55	2017/09/26 10:05			
COC Number		na			na			na	na			
	UNITS	**1709723-07**	**RDL**	**MDL**	**1709723-08**	**RDL**	**MDL**	**1709723-09**	**1709723-10**	**RDL**	**MDL**	**QC Batch**
13C8-Perfluorooctane Sulfonamide	%	124	N/A	N/A	102	N/A	N/A	108	114	N/A	N/A	5203646
18O2-Perfluorohexanesulfonate	%	106	N/A	N/A	92	N/A	N/A	114	108	N/A	N/A	5203646

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

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL335			FFL336			FFL337			
Sampling Date		2017/09/26 10:35			2017/09/26 11:00			2017/09/26 11:10			
COC Number		na			na			na			
	UNITS	1709723-11	RDL	MDL	1709723-12	RDL	MDL	1709723-13	RDL	MDL	QC Batch
Inorganics											
Moisture	%	2.4	1.0	0.50	8.1	1.0	0.50	14	1.0	0.50	5191056
Miscellaneous Parameters											
6:2 Fluorotelomer sulfonate	ug/kg	900 (1)	100	23	320 (2)	10	2.3	230 (2)	10	2.3	5203646
8:2 Fluorotelomer sulfonate	ug/kg	7.9 J (2)	10	3.2	160 (2)	10	3.2	220 (2)	10	3.2	5203646
Perfluorobutane Sulfonate (PFBS)	ug/kg	1.7 U (2)	10	1.7	0.17 U	1.0	0.17	0.17 U	1.0	0.17	5203646
Perfluorobutanoic acid	ug/kg	2.3 U (2)	10	2.3	1.5	1.0	0.23	4.6	1.0	0.23	5203646
Perfluorodecane Sulfonate	ug/kg	2.3 U (2)	10	2.3	0.23 U	1.0	0.23	0.43 J	1.0	0.23	5203646
Perfluorodecanoic Acid (PFDA)	ug/kg	1.3 U (2)	10	1.3	7.4	1.0	0.13	9.6	1.0	0.13	5203646
Perfluorododecanoic Acid (PFDoA)	ug/kg	2.2 U (2)	10	2.2	0.77 J	1.0	0.22	2.1	1.0	0.22	5203646
Perfluoroheptanoic Acid (PFHpA)	ug/kg	4.7 J (2)	10	1.7	1.6	1.0	0.17	4.9	1.0	0.17	5203646
Perfluorohexane Sulfonate (PFHxS)	ug/kg	2.3 U (2)	10	2.3	0.23 U	1.0	0.23	0.71 J	1.0	0.23	5203646
Perfluorohexanoic Acid (PFHxA)	ug/kg	9.7 J (2)	10	1.9	9.4	1.0	0.19	20	1.0	0.19	5203646
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	22 (2)	10	2.6	2.4	1.0	0.26	23	1.0	0.26	5203646
Perfluorononanoic Acid (PFNA)	ug/kg	1.7 U (2)	10	1.7	1.5	1.0	0.17	10	1.0	0.17	5203646
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	2.6 U (2)	10	2.6	0.26 U	1.0	0.26	0.26 U	1.0	0.26	5203646
Perfluorooctane Sulfonate (PFOS)	ug/kg	2.1 U (2)	10	2.1	0.66 J	1.0	0.21	7.6	1.0	0.21	5203646
Perfluoropentanoic Acid (PFPeA)	ug/kg	5.3 J (2)	10	1.8	9.4	1.0	0.18	39	1.0	0.18	5203646
Perfluorotetradecanoic Acid	ug/kg	1.1 U (2)	10	1.1	0.11 U	1.0	0.11	1.1 U (3)	10	1.1	5203646
Perfluorotridecanoic Acid	ug/kg	1.2 U (2)	10	1.2	0.23 J	1.0	0.12	9.3 J (3)	10	1.2	5203646
Perfluoroundecanoic Acid (PFUnA)	ug/kg	1.8 U (2)	10	1.8	6.4	1.0	0.18	17	1.0	0.18	5203646
Surrogate Recovery (%)											
13C2-6:2 Fluorotelomer sulfonate	%	97	N/A	N/A	94	N/A	N/A	93	N/A	N/A	5203646
13C2-8:2 Fluorotelomer sulfonate	%	94	N/A	N/A	86	N/A	N/A	99	N/A	N/A	5203646
13C2-Perfluorodecanoic acid	%	107	N/A	N/A	96	N/A	N/A	111	N/A	N/A	5203646
13C2-Perfluorododecanoic acid	%	101	N/A	N/A	73	N/A	N/A	87	N/A	N/A	5203646
13C2-Perfluorohexanoic acid	%	99	N/A	N/A	102	N/A	N/A	107	N/A	N/A	5203646
13C2-perfluorotetradecanoic acid	%	102	N/A	N/A	63	N/A	N/A	100	N/A	N/A	5203646
13C2-Perfluoroundecanoic acid	%	105	N/A	N/A	86	N/A	N/A	100	N/A	N/A	5203646

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to high concentration of the target analyte, sample required 100x dilution. Detection limit was adjusted accordingly.

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

(3) Due to potential matrix interference, the extracted internal standard analyte exhibited low recovery and as such, may not have allowed for accurate recovery correction of the associated native compound. Sample was diluted 10x. Detection limit was adjusted accordingly.

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL335			FFL336			FFL337			
Sampling Date		2017/09/26 10:35			2017/09/26 11:00			2017/09/26 11:10			
COC Number		na			na			na			
	UNITS	**1709723-11**	**RDL**	**MDL**	**1709723-12**	**RDL**	**MDL**	**1709723-13**	**RDL**	**MDL**	**QC Batch**
13C4-Perfluorobutanoic acid	%	99	N/A	N/A	97	N/A	N/A	105	N/A	N/A	5203646
13C4-Perfluoroheptanoic acid	%	97	N/A	N/A	105	N/A	N/A	105	N/A	N/A	5203646
13C4-Perfluorooctanesulfonate	%	95	N/A	N/A	100	N/A	N/A	93	N/A	N/A	5203646
13C4-Perfluorooctanoic acid	%	103	N/A	N/A	96	N/A	N/A	102	N/A	N/A	5203646
13C5-Perfluorononanoic acid	%	97	N/A	N/A	95	N/A	N/A	103	N/A	N/A	5203646
13C5-Perfluoropentanoic acid	%	97	N/A	N/A	95	N/A	N/A	99	N/A	N/A	5203646
13C8-Perfluorooctane Sulfonamide	%	110	N/A	N/A	98	N/A	N/A	107	N/A	N/A	5203646
18O2-Perfluorohexanesulfonate	%	103	N/A	N/A	88	N/A	N/A	104	N/A	N/A	5203646

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

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL338	FFL339			FFL340			FFL341			
Sampling Date		2017/09/26 11:40	2017/09/26 11:50			2017/09/26 11:55			2017/09/26 12:05			
COC Number		na	na			na			na			
	UNITS	1709723-14	1709723-15	RDL	MDL	1709723-16	RDL	MDL	1709723-17	RDL	MDL	QC Batch
Inorganics												
Moisture	%	7.4	7.4	1.0	0.50	36	1.0	0.50	7.0	1.0	0.50	5191056
Miscellaneous Parameters												
6:2 Fluorotelomer sulfonate	ug/kg	0.74 J	1.0	1.0	0.23	2.2	1.0	0.23	0.61 J	1.0	0.23	5203646
8:2 Fluorotelomer sulfonate	ug/kg	0.87 J	0.83 J	1.0	0.32	1.7	1.0	0.32	0.50 J	1.0	0.32	5203646
Perfluorobutane Sulfonate (PFBS)	ug/kg	0.17 U	0.17 U	1.0	0.17	0.17 U	1.0	0.17	0.17 U	1.0	0.17	5203646
Perfluorobutanoic acid	ug/kg	1.1	0.23 U	1.0	0.23	0.23 U	1.0	0.23	0.90 J	1.0	0.23	5203646
Perfluorodecane Sulfonate	ug/kg	0.23 U	0.23 U	1.0	0.23	0.23 U	1.0	0.23	0.38 J	1.0	0.23	5203646
Perfluorodecanoic Acid (PFDA)	ug/kg	1.2	0.62 J	1.0	0.13	0.13 U	1.0	0.13	1.6	1.0	0.13	5203646
Perfluorododecanoic Acid (PFDoA)	ug/kg	0.64 J	1.3	1.0	0.22	1.2	1.0	0.22	0.22 U	1.0	0.22	5203646
Perfluoroheptanoic Acid (PFHpA)	ug/kg	1.8	0.66 J	1.0	0.17	0.60 J	1.0	0.17	0.60 J	1.0	0.17	5203646
Perfluorohexane Sulfonate (PFHxS)	ug/kg	0.23 U	0.23 U	1.0	0.23	0.23 U	1.0	0.23	0.64 J	1.0	0.23	5203646
Perfluorohexanoic Acid (PFHxA)	ug/kg	2.2	0.73 J	1.0	0.19	0.53 J	1.0	0.19	0.80 J	1.0	0.19	5203646
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	2.6	0.75 J	1.0	0.26	0.90 J	1.0	0.26	0.78 J	1.0	0.26	5203646
Perfluorononanoic Acid (PFNA)	ug/kg	5.7	1.4	1.0	0.17	0.17 U	1.0	0.17	0.91 J	1.0	0.17	5203646
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	0.26 U	0.26 U	1.0	0.26	0.26 U	1.0	0.26	0.26 U	1.0	0.26	5203646
Perfluorooctane Sulfonate (PFOS)	ug/kg	2.7	1.1	1.0	0.21	1.1	1.0	0.21	4.4	1.0	0.21	5203646
Perfluoropentanoic Acid (PFPeA)	ug/kg	3.4	0.97 J	1.0	0.18	0.18 U	1.0	0.18	1.3	1.0	0.18	5203646
Perfluorotetradecanoic Acid	ug/kg	0.11 U	0.49 J	1.0	0.11	2.6	1.0	0.11	0.11 U	1.0	0.11	5203646
Perfluorotridecanoic Acid	ug/kg	6.8	22	1.0	0.12	80 (1)	10	1.2	2.2	1.0	0.12	5203646
Perfluoroundecanoic Acid (PFUnA)	ug/kg	12	15	1.0	0.18	4.6	1.0	0.18	8.1	1.0	0.18	5203646
Surrogate Recovery (%)												
13C2-6:2 Fluorotelomer sulfonate	%	95	97	N/A	N/A	76	N/A	N/A	108	N/A	N/A	5203646
13C2-8:2 Fluorotelomer sulfonate	%	76	94	N/A	N/A	75	N/A	N/A	92	N/A	N/A	5203646
13C2-Perfluorodecanoic acid	%	102	101	N/A	N/A	84	N/A	N/A	108	N/A	N/A	5203646
13C2-Perfluorododecanoic acid	%	93	90	N/A	N/A	76	N/A	N/A	105	N/A	N/A	5203646
13C2-Perfluorohexanoic acid	%	87	97	N/A	N/A	84	N/A	N/A	111	N/A	N/A	5203646
13C2-perfluorotetradecanoic acid	%	91	88	N/A	N/A	99	N/A	N/A	102	N/A	N/A	5203646
13C2-Perfluoroundecanoic acid	%	98	91	N/A	N/A	82	N/A	N/A	102	N/A	N/A	5203646
13C4-Perfluorobutanoic acid	%	92	101	N/A	N/A	85	N/A	N/A	107	N/A	N/A	5203646
13C4-Perfluoroheptanoic acid	%	90	102	N/A	N/A	85	N/A	N/A	110	N/A	N/A	5203646
13C4-Perfluorooctanesulfonate	%	83	96	N/A	N/A	79	N/A	N/A	114	N/A	N/A	5203646
13C4-Perfluorooctanoic acid	%	95	98	N/A	N/A	90	N/A	N/A	111	N/A	N/A	5203646
13C5-Perfluorononanoic acid	%	96	93	N/A	N/A	86	N/A	N/A	96	N/A	N/A	5203646

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.

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL338	FFL339			FFL340			FFL341			
Sampling Date		2017/09/26 11:40	2017/09/26 11:50			2017/09/26 11:55			2017/09/26 12:05			
COC Number		na	na			na			na			
	UNITS	1709723-14	1709723-15	RDL	MDL	1709723-16	RDL	MDL	1709723-17	RDL	MDL	QC Batch
13C5-Perfluoropentanoic acid	%	94	101	N/A	N/A	82	N/A	N/A	103	N/A	N/A	5203646
13C8-Perfluorooctane Sulfonamide	%	102	102	N/A	N/A	78	N/A	N/A	111	N/A	N/A	5203646
18O2-Perfluorohexanesulfonate	%	90	87	N/A	N/A	86	N/A	N/A	102	N/A	N/A	5203646

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

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

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL342	FFL342			
Sampling Date		2017/09/26 12:10	2017/09/26 12:10			
COC Number		na	na			
	UNITS	1709723-18	1709723-18 Lab-Dup	RDL	MDL	QC Batch
Inorganics						
Moisture	%	13	13	1.0	0.50	5191056
Miscellaneous Parameters						
6:2 Fluorotelomer sulfonate	ug/kg	0.65 J	N/A	1.0	0.23	5203646
8:2 Fluorotelomer sulfonate	ug/kg	0.32 U	N/A	1.0	0.32	5203646
Perfluorobutane Sulfonate (PFBS)	ug/kg	0.17 U	N/A	1.0	0.17	5203646
Perfluorobutanoic acid	ug/kg	1.1	N/A	1.0	0.23	5203646
Perfluorodecane Sulfonate	ug/kg	0.23 U	N/A	1.0	0.23	5203646
Perfluorodecanoic Acid (PFDA)	ug/kg	0.85 J	N/A	1.0	0.13	5203646
Perfluorododecanoic Acid (PFDoA)	ug/kg	0.22 U	N/A	1.0	0.22	5203646
Perfluoroheptanoic Acid (PFHpA)	ug/kg	0.75 J	N/A	1.0	0.17	5203646
Perfluorohexane Sulfonate (PFHxS)	ug/kg	0.23 U	N/A	1.0	0.23	5203646
Perfluorohexanoic Acid (PFHxA)	ug/kg	0.89 J	N/A	1.0	0.19	5203646
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	0.97 J	N/A	1.0	0.26	5203646
Perfluorononanoic Acid (PFNA)	ug/kg	2.9	N/A	1.0	0.17	5203646
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	0.26 U	N/A	1.0	0.26	5203646
Perfluorooctane Sulfonate (PFOS)	ug/kg	1.0	N/A	1.0	0.21	5203646
Perfluoropentanoic Acid (PFPeA)	ug/kg	1.6	N/A	1.0	0.18	5203646
Perfluorotetradecanoic Acid	ug/kg	0.11 U	N/A	1.0	0.11	5203646
Perfluorotridecanoic Acid	ug/kg	0.25 J	N/A	1.0	0.12	5203646
Perfluoroundecanoic Acid (PFUnA)	ug/kg	0.89 J	N/A	1.0	0.18	5203646
Surrogate Recovery (%)						
13C2-6:2 Fluorotelomer sulfonate	%	90	N/A	N/A	N/A	5203646
13C2-8:2 Fluorotelomer sulfonate	%	92	N/A	N/A	N/A	5203646
13C2-Perfluorodecanoic acid	%	101	N/A	N/A	N/A	5203646
13C2-Perfluorododecanoic acid	%	98	N/A	N/A	N/A	5203646
13C2-Perfluorohexanoic acid	%	100	N/A	N/A	N/A	5203646
13C2-perfluorotetradecanoic acid	%	103	N/A	N/A	N/A	5203646
13C2-Perfluoroundecanoic acid	%	101	N/A	N/A	N/A	5203646
13C4-Perfluorobutanoic acid	%	101	N/A	N/A	N/A	5203646
13C4-Perfluoroheptanoic acid	%	108	N/A	N/A	N/A	5203646
13C4-Perfluorooctanesulfonate	%	91	N/A	N/A	N/A	5203646
13C4-Perfluorooctanoic acid	%	102	N/A	N/A	N/A	5203646
13C5-Perfluorononanoic acid	%	100	N/A	N/A	N/A	5203646

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FFL342	FFL342			
Sampling Date		2017/09/26 12:10	2017/09/26 12:10			
COC Number		na	na			
	UNITS	**1709723-18**	**1709723-18 Lab-Dup**	**RDL**	**MDL**	**QC Batch**
13C5-Perfluoropentanoic acid	%	103	N/A	N/A	N/A	5203646
13C8-Perfluorooctane Sulfonamide	%	110	N/A	N/A	N/A	5203646
18O2-Perfluorohexanesulfonate	%	102	N/A	N/A	N/A	5203646

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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

TEST SUMMARY

Maxxam ID: FFL325 **Collected:** 2017/09/26
Sample ID: 1709723-01 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/17	Anjan Desai

Maxxam ID: FFL326 **Collected:** 2017/09/26
Sample ID: 1709723-02 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/17	Anjan Desai

Maxxam ID: FFL327 **Collected:** 2017/09/26
Sample ID: 1709723-03 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/17	Anjan Desai

Maxxam ID: FFL328 **Collected:** 2017/09/26
Sample ID: 1709723-04 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL329 **Collected:** 2017/09/26
Sample ID: 1709723-05 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL330 **Collected:** 2017/09/26
Sample ID: 1709723-06 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

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

TEST SUMMARY

Maxxam ID: FFL331 **Collected:** 2017/09/26
Sample ID: 1709723-07 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL332 **Collected:** 2017/09/26
Sample ID: 1709723-08 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL333 **Collected:** 2017/09/26
Sample ID: 1709723-09 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL334 **Collected:** 2017/09/26
Sample ID: 1709723-10 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL335 **Collected:** 2017/09/26
Sample ID: 1709723-11 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL336 **Collected:** 2017/09/26
Sample ID: 1709723-12 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

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

TEST SUMMARY

Maxxam ID: FFL337 **Collected:** 2017/09/26
Sample ID: 1709723-13 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL338 **Collected:** 2017/09/26
Sample ID: 1709723-14 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL339 **Collected:** 2017/09/26
Sample ID: 1709723-15 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL340 **Collected:** 2017/09/26
Sample ID: 1709723-16 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL341 **Collected:** 2017/09/26
Sample ID: 1709723-17 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

Maxxam ID: FFL342 **Collected:** 2017/09/26
Sample ID: 1709723-18 **Shipped:**
Matrix: Soil **Received:** 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5203646	2017/10/10	2017/10/18	Anjan Desai

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

TEST SUMMARY

Maxxam ID: FFL342 Dup
Sample ID: 1709723-18
Matrix: Soil

Collected: 2017/09/26
Shipped:
Received: 2017/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5191056	N/A	2017/09/30	Min Yang

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

GENERAL COMMENTS

Results relate only to the items tested.

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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5191056	CYN	RPD - Sample/Sample Dup	Moisture	2017/09/30	0.76		%	20
5203646	AD9	Matrix Spike(FFL335)	6:2 Fluorotelomer sulfonate	2017/10/17		NC	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/10/17		NC	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/10/17		NC	%	70 - 130
			Perfluorobutanoic acid	2017/10/17		NC	%	70 - 130
			Perfluorodecane Sulfonate	2017/10/17		NC	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/10/17		NC	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/10/17		NC	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/10/17		NC	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/17		NC	%	70 - 130
			Perfluorotetradecanoic Acid	2017/10/17		NC	%	70 - 130
			Perfluorotridecanoic Acid	2017/10/17		NC	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/10/17		NC	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/10/17		NC	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/10/17		NC	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/10/17		NC	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/17		NC	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/10/17		NC	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/10/17		NC	%	70 - 130
5203646	AD9	Matrix Spike DUP(FFL335)	6:2 Fluorotelomer sulfonate	2017/10/17		NC	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/10/17		NC	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/10/17		NC	%	70 - 130
			Perfluorobutanoic acid	2017/10/17		NC	%	70 - 130
			Perfluorodecane Sulfonate	2017/10/17		NC	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/10/17		NC	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/10/17		NC	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/10/17		NC	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/17		NC	%	70 - 130
			Perfluorotetradecanoic Acid	2017/10/17		NC	%	70 - 130
			Perfluorotridecanoic Acid	2017/10/17		NC	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/10/17		NC	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/10/17		NC	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/10/17		NC	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/10/17		NC	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/17		NC	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/10/17		NC	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/10/17		NC	%	70 - 130
5203646	AD9	MS/MSD RPD	6:2 Fluorotelomer sulfonate	2017/10/17	NC		%	30
			8:2 Fluorotelomer sulfonate	2017/10/17	NC		%	30
			Perfluorobutane Sulfonate (PFBS)	2017/10/17	NC		%	30
			Perfluorobutanoic acid	2017/10/17	NC		%	30
			Perfluorodecane Sulfonate	2017/10/17	NC		%	30
			Perfluorodecanoic Acid (PFDA)	2017/10/17	NC		%	30
			Perfluorododecanoic Acid (PFDoA)	2017/10/17	NC		%	30
			Perfluorononanoic Acid (PFNA)	2017/10/17	NC		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/17	NC		%	25
			Perfluorotetradecanoic Acid	2017/10/17	NC		%	30
			Perfluorotridecanoic Acid	2017/10/17	NC		%	30
			Perfluoroundecanoic Acid (PFUnA)	2017/10/17	NC		%	30
			Perfluoroheptanoic Acid (PFHpA)	2017/10/17	NC		%	30
			Perfluorohexane Sulfonate (PFHxS)	2017/10/17	NC		%	30
			Perfluorohexanoic Acid (PFHxA)	2017/10/17	NC		%	30
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/17	NC		%	30
			Perfluorooctane Sulfonate (PFOS)	2017/10/17	NC		%	30

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluoropentanoic Acid (PFPeA)	2017/10/17	NC		%	30
5203646	AD9	Spiked Blank	13C2-6:2 Fluorotelomer sulfonate	2017/10/17		96	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/10/17		101	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/10/17		113	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/10/17		100	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/10/17		102	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/10/17		101	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/10/17		104	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/10/17		100	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/10/17		107	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/10/17		104	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/10/17		112	%	50 - 150
			13C5-Perfluorononanoic acid	2017/10/17		102	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/10/17		107	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/10/17		104	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/10/17		101	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/10/17		106	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/10/17		106	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/10/17		104	%	70 - 130
			Perfluorobutanoic acid	2017/10/17		104	%	70 - 130
			Perfluorodecane Sulfonate	2017/10/17		88	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/10/17		100	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/10/17		106	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/10/17		102	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/17		98	%	70 - 130
			Perfluorotetradecanoic Acid	2017/10/17		107	%	70 - 130
			Perfluorotridecanoic Acid	2017/10/17		104	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/10/17		100	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/10/17		98	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/10/17		96	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/10/17		101	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/17		94	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/10/17		94	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/10/17		99	%	70 - 130
5203646	AD9	Method Blank	13C2-6:2 Fluorotelomer sulfonate	2017/10/17		106	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/10/17		98	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/10/17		106	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/10/17		88	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/10/17		95	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/10/17		94	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/10/17		96	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/10/17		102	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/10/17		102	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/10/17		97	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/10/17		113	%	50 - 150
			13C5-Perfluorononanoic acid	2017/10/17		98	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/10/17		106	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/10/17		92	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/10/17		105	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/10/17	0.23 U, MDL=0.23		ug/kg	
			8:2 Fluorotelomer sulfonate	2017/10/17	0.32 U, MDL=0.32		ug/kg	

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorobutane Sulfonate (PFBS)	2017/10/17	0.17 U, MDL=0.17		ug/kg	
			Perfluorobutanoic acid	2017/10/17	0.23 U, MDL=0.23		ug/kg	
			Perfluorodecane Sulfonate	2017/10/17	0.23 U, MDL=0.23		ug/kg	
			Perfluorodecanoic Acid (PFDA)	2017/10/17	0.13 U, MDL=0.13		ug/kg	
			Perfluorododecanoic Acid (PFDoA)	2017/10/17	0.22 U, MDL=0.22		ug/kg	
			Perfluorononanoic Acid (PFNA)	2017/10/17	0.17 U, MDL=0.17		ug/kg	
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/17	0.26 U, MDL=0.26		ug/kg	
			Perfluorotetradecanoic Acid	2017/10/17	0.11 U, MDL=0.11		ug/kg	
			Perfluorotridecanoic Acid	2017/10/17	0.12 U, MDL=0.12		ug/kg	
			Perfluoroundecanoic Acid (PFUnA)	2017/10/17	0.18 U, MDL=0.18		ug/kg	
			Perfluoroheptanoic Acid (PFHpA)	2017/10/17	0.17 U, MDL=0.17		ug/kg	
			Perfluorohexane Sulfonate (PFHxS)	2017/10/17	0.23 U, MDL=0.23		ug/kg	
			Perfluorohexanoic Acid (PFHxA)	2017/10/17	0.19 U, MDL=0.19		ug/kg	
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/17	0.26 U, MDL=0.26		ug/kg	
			Perfluorooctane Sulfonate (PFOS)	2017/10/17	0.21 U, MDL=0.21		ug/kg	
			Perfluoropentanoic Acid (PFPeA)	2017/10/17	0.18 U, MDL=0.18		ug/kg	

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 spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 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

Maxxam Job #: B7L3940
Report Date: 2017/10/18

ESS Laboratory
Client Project #: 1709723
Your P.O. #: B02623

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

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.

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

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

ESS Lab # 1709723

Turn Time X Standard Other_____

Regulatory State (MA) RI CT NH NJ NY ME Other_____

Reporting Limits - S-1/GW-1

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

Electonic Deliverables (Excel) Access (PDF)

Co. Name: HORSLEY WITTEN GROUP	Project #: 17027	Project Name: BARN ON CAPE #4	
Contact Person: J Bean	Address: 90 RT 6A		
City: SANDWICH	State: MA	Zip: 02563	PO #
Tel: 508 8336600	Fax: 508 933 3150	email: jbean@horsleywitten.com	

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis: PFOSALCM-S
1	9/26/17	0810	G	S	DL-2 2'	i	1	P	250ml	X
2		0815			DL-2 4'					
3		0850			DL-3 2'					
4		0900			DL-3 4'					
5		0915			DL-11 0-1'					
6		0925			DL-4 2'					
7		0935			DL-4 4'					
8		0945			DL-12 0-1'					
9		0955			DL-5 2'					
10		1005			DL-5 4'					

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: 4.9 Ice mc

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 : HW

Comments:

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
9/26/17 1530	9/26/17 15 30	9/26/17 17 36	9/26/17 1835
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 VIIA

Please fax to the laboratory all changes to Chain of Custody

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

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

ESS Lab # 1709723

Turn Time 10 Standard Other_____

Regulatory State: (MA) RI CT NH NJ NY ME Other_____

Reporting Limits - S-1 / GW-1

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

Electonic Deliverables (Excel) Access (PDF)

Co. Name: HORSLEY WITTEN GROUP	Project #: 17027	Project Name: BARN. ON CAM #4	Analysis: PFAS (CAM-5)
Contact Person: J Bean	Address: 90 RT 6A		
City: SANDWICH	State: MA	Zip: 02563	PO #
Tel: 508 833 6600	Fax: 508 833 3150	email: jbean@horsleywitten.com	

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	PFAS (CAM-5)
11	9/26/17	1035	G	S	DL-8 4'	1	1	P	250ml	X
12		1100			DL-13 0-1'					
13		1110			DL-14 0-1'					
14		1140			ARFF-1 2'					
15		1150			ARFF-1 4'					
16		1155			ARFF-CB 0-1'					
17		1205			ARFF-3 0-1'					
18	X	1210	X	X	ARFF-4 0-1'	X	X	X	X	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: 4.9 ICE

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 : KW

Comments:

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
9/26/17 1530	9/26/17 1530	9/26/17 1736	9/26/17 1835
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 VIIA

Please fax to the laboratory all changes to Chain of Custody

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

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

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.

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.

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

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
==========
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.

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

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.

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

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.

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

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

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

TEST SUMMARY

Maxxam ID: DPU291 **Collected:** 2016/12/09
Sample ID: 1612316-01 **Shipped:**
Matrix: Soil **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 **Collected:** 2016/12/09
Sample ID: 1612316-02 **Shipped:**
Matrix: Soil **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 **Collected:** 2016/12/09
Sample ID: 1612316-03 **Shipped:**
Matrix: Soil **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 **Collected:** 2016/12/09
Sample ID: 1612316-04 **Shipped:**
Matrix: Water **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

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

GENERAL COMMENTS

Results relate only to the items tested.

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

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

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

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

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

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

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

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 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

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

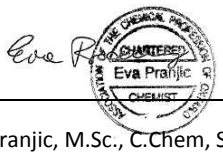
Maxxam Job #: B6R1181
Report Date: 2016/12/29

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

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.

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

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_____

Reporting Limits - _____

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

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		

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis		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)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
12/12/16 1635	FedEx		
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 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: 161236

Electronic Deliverable: Yes ✓ No ___
Format: Excel ✓ Access ___ PDF ___ Other _____

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

Contact Person	Address
Joe Longo	

City	State	Zip	PO#
Sandwich	MA	02563	

Telephone #	Fax #	Email Address
508 833 6600		jlongo@horsleywitten.com

ESS LAB Sample #	Date	Collection Time	COMP	GRAB	MATRIX	Sample Identification (20 Char. or less)	Pres Code	Number of Containers	Type of Containers	Write Required Analysis: PFOS / PFOA	Write Required Analysis: EPA 537
1	12/9/16	11:30	X		S	MCL DRILL/[illegible]		1	P	X	
2	12/9/16	11:00	X		S	1991 SITE 2 ALPHA-1		1	P	X	
3	12/9/16	12:00	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 | Internal Use Only
Seals Intact ___ Yes ___ No NA: ___ | [ ] Pickup
Cooler Temp: ice temp 1.4 | [ ] Technicians ____

Preservation Code: 1- NP, 2- HCl, 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	[signature]	12/12/16 1209	[signature]	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

CERTIFICATE OF ANALYSIS

Jesse Bean
Horsley & Witten
90 Route 6A
Sandwich, MA 02563

RE: Barn. On-Call #4 (17027)
ESS Laboratory Work Order Number: 1706533

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 10:59 am, Jul 18, 2017

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 standards, 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 PFOS

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1706533

SAMPLE RECEIPT

The following samples were received on June 20, 2017 for the analyses specified on the enclosed Chain of Custody Record.

Lab Number	Sample Name	Matrix	Analysis
1706533-01	KMART SW	Surface Water	$
1706533-02	HW-1	Ground Water	$
1706533-03	HW-23	Ground Water	$
1706533-04	HW-19D	Ground Water	$

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1706533

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

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: Barn. On-Call #4

ESS Laboratory Work Order: 1706533

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: Barn. On-Call #4

ESS Laboratory Work Order: 1706533

Subcontracted Analysis

Client Sample ID: KMART SW
Date Sampled: 06/20/17 08:15

ESS Laboratory Sample ID: 1706533-01
Sample Matrix: Surface Water

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

Client Sample ID: HW-1
Date Sampled: 06/20/17 11:50

ESS Laboratory Sample ID: 1706533-02
Sample Matrix: Ground Water

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

Client Sample ID: HW-23
Date Sampled: 06/20/17 13:10

ESS Laboratory Sample ID: 1706533-03
Sample Matrix: Ground Water

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

Client Sample ID: HW-19D
Date Sampled: 06/20/17 13:35

ESS Laboratory Sample ID: 1706533-04
Sample Matrix: Ground Water

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

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1706533

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4 ESS Laboratory Work Order: 1706533

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
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1706533

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/dwp/partners/labCert.shtml

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.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Your P.O. #: B02623
Your Project #: 1706533
Your C.O.C. #: 1706533

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/07/17
Report #: R4601135
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7D5769
Received: 2017/06/28, 14:30

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PFOS and PFOA in water by SPE/LCMS (1)	4	2017/07/04	2017/07/06	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.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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.

U = Undetected at the limit of quantitation.
J = Estimated concentration between the EDL & RDL.
B = Blank Contamination.
Q = One or more quality control criteria failed.
E = Analyte concentration exceeds the maximum concentration level.
K = Estimated maximum possible concentration due to ion abundance ratio failure.

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

Your P.O. #: B02623
Your Project #: 1706533
Your C.O.C. #: 1706533

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/07/17
Report #: R4601135
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7D5769
Received: 2017/06/28, 14:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Stephanie Pollen, Project Manager
Email: SPollen@maxxam.ca
Phone# (905) 817-5700
==========
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.

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

Maxxam Job #: B7D5769
Report Date: 2017/07/17

ESS Laboratory
Client Project #: 1706533
Your P.O. #: B02623

RESULTS OF ANALYSES OF WATER

Maxxam ID		EQO625	EQO626		EQO627	EQO628			
Sampling Date		2017/06/20 08:15	2017/06/20 11:50		2017/06/20 13:10	2017/06/20 13:35			
COC Number		1706533	1706533		1706533	1706533			
	UNITS	1706533-01	1706533-02	QC Batch	1706533-03	1706533-04	RDL	MDL	QC Batch
Miscellaneous Parameters									
6:2 Fluorotelomer sulfonate	ug/L	0.0032 U	0.0032 U	5056109	0.0032 U	0.0032 U	0.020	0.0032	5056109
8:2 Fluorotelomer sulfonate	ug/L	0.0036 U	0.0036 U	5056109	0.0036 U	0.0036 U	0.020	0.0036	5056109
Perfluorobutane Sulfonate (PFBS)	ug/L	0.0048 U	0.020	5056109	0.0051 J	0.0081 J	0.020	0.0048	5056109
Perfluorobutanoic acid	ug/L	0.0043 U	0.0088 J	5056109	0.0043 U	0.0043 U	0.020	0.0043	5056109
Perfluorodecane Sulfonate	ug/L	0.0046 U	0.0046 U	5056109	0.0046 U	0.0046 U	0.020	0.0046	5056109
Perfluorodecanoic Acid (PFDA)	ug/L	0.0040 U	0.0040 U	5056109	0.0040 U	0.0040 U	0.020	0.0040	5056109
Perfluorododecanoic Acid (PFDoA)	ug/L	0.0028 U	0.0028 U	5067867	0.0028 U	0.0028 U	0.020	0.0028	5056109
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.0033 U	0.0042 J	5056109	0.0045 J	0.0052 J	0.020	0.0033	5056109
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.0034 U	0.065	5056109	0.021	0.046	0.020	0.0034	5056109
Perfluorohexanoic Acid (PFHxA)	ug/L	0.0070 J	0.030	5056109	0.015 J	0.017 J	0.020	0.0029	5056109
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.0046 U	0.022	5056109	0.0046 U	0.017 J	0.020	0.0046	5056109
Perfluorononanoic Acid (PFNA)	ug/L	0.0043 J	0.0057 J	5056109	0.0038 U	0.0065 J	0.020	0.0038	5056109
Perfluorooctane Sulfonamide (PFOSA)	ug/L	0.0036 U	0.0036 U	5067867	0.0036 U	0.0036 U	0.020	0.0036	5056109
Perfluorooctane Sulfonate (PFOS)	ug/L	0.0026 U	0.24	5056109	0.0079 J	0.061	0.020	0.0026	5056109
Perfluoropentanoic Acid (PFPeA)	ug/L	0.0061 J	0.029	5056109	0.021	0.015 J	0.020	0.0027	5056109
Perfluorotetradecanoic Acid	ug/L	0.0038 U	0.0038 U	5067867	0.0038 U	0.0038 U	0.020	0.0038	5067867
Perfluorotridecanoic Acid	ug/L	0.0033 U	0.0033 U	5067867	0.0033 U	0.0033 U	0.020	0.0033	5067867
Perfluoroundecanoic Acid (PFUnA)	ug/L	0.0043 U	0.0043 U	5056109	0.0043 U	0.0043 U	0.020	0.0043	5056109
Surrogate Recovery (%)									
13C2-6:2 Fluorotelomer sulfonate	%	64	72	5056109	91	78	N/A	N/A	5056109
13C2-8:2 Fluorotelomer sulfonate	%	62	71	5056109	71	73	N/A	N/A	5056109
13C2-Perfluorodecanoic acid	%	63	55	5056109	61	67	N/A	N/A	5056109
13C2-Perfluorododecanoic acid	%	67	48 (1)	5067867	50	59	N/A	N/A	5056109
13C2-Perfluorohexanoic acid	%	70	77	5056109	66	75	N/A	N/A	5056109
13C2-perfluorotetradecanoic acid	%	71	36 (1)	5067867	30 (1)	63	N/A	N/A	5067867
13C2-Perfluoroundecanoic acid	%	51	50	5056109	56	61	N/A	N/A	5056109
13C4-Perfluorobutanoic acid	%	74	75	5056109	75	77	N/A	N/A	5056109
13C4-Perfluoroheptanoic acid	%	66	80	5056109	84	83	N/A	N/A	5056109

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

N/A = Not Applicable

(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the extracted internal standard analyte. When considered together, these QC data suggest that matrix interferences may be biasing the data low. Because quantitation is performed using isotope dilution techniques, any losses of the native compound that may occur during any of the sample preparation, extraction, cleanup or determinative steps will be mirrored by a similar loss of the labeled standard, and as such can be accounted for and corrected. Therefore, the quantification of these target compounds is not affected by the low extracted internal standard analyte recovery.

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

Maxxam Job #: B7D5769
Report Date: 2017/07/17

ESS Laboratory
Client Project #: 1706533
Your P.O. #: B02623

RESULTS OF ANALYSES OF WATER

Maxxam ID		EQO625	EQO626		EQO627	EQO628			
Sampling Date		2017/06/20 08:15	2017/06/20 11:50		2017/06/20 13:10	2017/06/20 13:35			
COC Number		1706533	1706533		1706533	1706533			
	UNITS	**1706533-01**	**1706533-02**	**QC Batch**	**1706533-03**	**1706533-04**	**RDL**	**MDL**	**QC Batch**
13C4-Perfluorooctanesulfonate	%	69	76	5056109	75	75	N/A	N/A	5056109
13C4-Perfluorooctanoic acid	%	64	81	5056109	76	75	N/A	N/A	5056109
13C5-Perfluorononanoic acid	%	69	69	5056109	80	76	N/A	N/A	5056109
13C5-Perfluoropentanoic acid	%	71	84	5056109	77	76	N/A	N/A	5056109
13C8-Perfluorooctane Sulfonamide	%	73	64	5067867	65	52	N/A	N/A	5056109
18O2-Perfluorohexanesulfonate	%	69	73	5056109	76	70	N/A	N/A	5056109

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

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

Maxxam Job #: B7D5769
Report Date: 2017/07/17

ESS Laboratory
Client Project #: 1706533
Your P.O. #: B02623

TEST SUMMARY

Maxxam ID: EQO625 **Collected:** 2017/06/20
Sample ID: 1706533-01 **Shipped:**
Matrix: Water **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water by SPE/LCMS	LCMS	5056109	2017/07/04	2017/07/06	Daniela Zupu

Maxxam ID: EQO626 **Collected:** 2017/06/20
Sample ID: 1706533-02 **Shipped:**
Matrix: Water **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water by SPE/LCMS	LCMS	5056109	2017/07/04	2017/07/06	Daniela Zupu

Maxxam ID: EQO627 **Collected:** 2017/06/20
Sample ID: 1706533-03 **Shipped:**
Matrix: Water **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water by SPE/LCMS	LCMS	5056109	2017/07/04	2017/07/06	Daniela Zupu

Maxxam ID: EQO628 **Collected:** 2017/06/20
Sample ID: 1706533-04 **Shipped:**
Matrix: Water **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in water by SPE/LCMS	LCMS	5056109	2017/07/04	2017/07/06	Daniela Zupu

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

Maxxam Job #: B7D5769
Report Date: 2017/07/17

ESS Laboratory
Client Project #: 1706533
Your P.O. #: B02623

GENERAL COMMENTS

Sample EQO625, PFOS and PFOA in water by SPE/LCMS: Test repeated.
Sample EQO626, PFOS and PFOA in water by SPE/LCMS: Test repeated.
Sample EQO627, PFOS and PFOA in water by SPE/LCMS: Test repeated.
Sample EQO628, PFOS and PFOA in water by SPE/LCMS: Test repeated.

Results relate only to the items tested.

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

Maxxam Job #: B7D5769
Report Date: 2017/07/17

ESS Laboratory
Client Project #: 1706533
Your P.O. #: B02623

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5056109	DZU	Spiked Blank	13C2-6:2 Fluorotelomer sulfonate	2017/07/06		110	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/07/06		86	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/07/06		95	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/07/06		88	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/07/06		110	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/07/06		85	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/07/06		95	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/07/06		93	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/07/06		95	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/07/06		107	%	50 - 150
			13C5-Perfluorononanoic acid	2017/07/06		105	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/07/06		102	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/07/06		81	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/07/06		97	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/07/06		97	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/07/06		118	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/07/06		98	%	70 - 130
			Perfluorobutanoic acid	2017/07/06		107	%	70 - 130
			Perfluorodecane Sulfonate	2017/07/06		85	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/07/06		109	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/07/06		99	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/07/06		102	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/07/06		88	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/06		97	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/07/06		88	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/07/06		96	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/07/06		107	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/07/06		87	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/07/06		83	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/07/06		105	%	70 - 130
5056109	DZU	Spiked Blank DUP	13C2-6:2 Fluorotelomer sulfonate	2017/07/06		83	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/07/06		92	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/07/06		84	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/07/06		71	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/07/06		87	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/07/06		71	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/07/06		91	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/07/06		90	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/07/06		82	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/07/06		103	%	50 - 150
			13C5-Perfluorononanoic acid	2017/07/06		94	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/07/06		93	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/07/06		69	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/07/06		97	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/07/06		98	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/07/06		94	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/07/06		85	%	70 - 130
			Perfluorobutanoic acid	2017/07/06		95	%	70 - 130
			Perfluorodecane Sulfonate	2017/07/06		77	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/07/06		105	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/07/06		98	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/07/06		109	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/07/06		90	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/06		100	%	70 - 130

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluoropentanoic Acid (PFPeA)	2017/07/06		88	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/07/06		108	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/07/06		113	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/07/06		84	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/07/06		83	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/07/06		99	%	70 - 130
5056109	DZU	RPD	6:2 Fluorotelomer sulfonate	2017/07/06	1.8		%	30
			8:2 Fluorotelomer sulfonate	2017/07/06	22		%	30
			Perfluorobutane Sulfonate (PFBS)	2017/07/06	14		%	30
			Perfluorobutanoic acid	2017/07/06	12		%	30
			Perfluorodecane Sulfonate	2017/07/06	9.9		%	30
			Perfluoroheptanoic Acid (PFHpA)	2017/07/06	3.4		%	30
			Perfluorohexane Sulfonate (PFHxS)	2017/07/06	0.61		%	30
			Perfluorohexanoic Acid (PFHxA)	2017/07/06	6.6		%	30
			Perfluorononanoic Acid (PFNA)	2017/07/06	2.3		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/06	3.1		%	30
			Perfluoropentanoic Acid (PFPeA)	2017/07/06	0.23		%	30
			Perfluoroundecanoic Acid (PFUnA)	2017/07/06	11		%	30
			Perfluorodecanoic Acid (PFDA)	2017/07/06	5.5		%	30
			Perfluorododecanoic Acid (PFDoA)	2017/07/06	3.0		%	30
			Perfluoro-n-Octanoic Acid (PFOA)	2017/07/06	0.24		%	30
			Perfluorooctane Sulfonate (PFOS)	2017/07/06	5.5		%	30
5056109	DZU	Method Blank	13C2-6:2 Fluorotelomer sulfonate	2017/07/06		96	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/07/06		103	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/07/06		78	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/07/06		69	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/07/06		103	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/07/06		74	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/07/06		96	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/07/06		102	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/07/06		92	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/07/06		103	%	50 - 150
			13C5-Perfluorononanoic acid	2017/07/06		102	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/07/06		107	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/07/06		62	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/07/06		100	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/07/06	0.0032 U, MDL=0.0032		ug/L	
			8:2 Fluorotelomer sulfonate	2017/07/06	0.0036 U, MDL=0.0036		ug/L	
			Perfluorobutane Sulfonate (PFBS)	2017/07/06	0.0048 U, MDL=0.0048		ug/L	
			Perfluorobutanoic acid	2017/07/06	0.0043 U, MDL=0.0043		ug/L	
			Perfluorodecane Sulfonate	2017/07/06	0.0046 U, MDL=0.0046		ug/L	
			Perfluoroheptanoic Acid (PFHpA)	2017/07/06	0.0033 U, MDL=0.0033		ug/L	
			Perfluorohexane Sulfonate (PFHxS)	2017/07/06	0.0034 U, MDL=0.0034		ug/L	
			Perfluorohexanoic Acid (PFHxA)	2017/07/06	0.0029 U, MDL=0.0029		ug/L	
			Perfluorononanoic Acid (PFNA)	2017/07/06	0.0038 U, MDL=0.0038		ug/L	

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/06	0.0036 U, MDL=0.0036		ug/L	
			Perfluoropentanoic Acid (PFPeA)	2017/07/06	0.0027 U, MDL=0.0027		ug/L	
			Perfluoroundecanoic Acid (PFUnA)	2017/07/06	0.0043 U, MDL=0.0043		ug/L	
			Perfluorodecanoic Acid (PFDA)	2017/07/06	0.0040 U, MDL=0.0040		ug/L	
			Perfluorododecanoic Acid (PFDoA)	2017/07/06	0.0028 U, MDL=0.0028		ug/L	
			Perfluoro-n-Octanoic Acid (PFOA)	2017/07/06	0.0046 U, MDL=0.0046		ug/L	
			Perfluorooctane Sulfonate (PFOS)	2017/07/06	0.0026 U, MDL=0.0026		ug/L	
5067867	DZU	Spiked Blank	13C2-Perfluorododecanoic acid	2017/07/12		66	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/07/12		72	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/07/12		79	%	50 - 150
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/12		101	%	70 - 130
			Perfluorotetradecanoic Acid	2017/07/12		96	%	70 - 130
			Perfluorotridecanoic Acid	2017/07/12		93	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/07/12		108	%	70 - 130
5067867	DZU	Spiked Blank DUP	13C2-Perfluorododecanoic acid	2017/07/12		55	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/07/12		54	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/07/12		65	%	50 - 150
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/12		110	%	70 - 130
			Perfluorotetradecanoic Acid	2017/07/12		119	%	70 - 130
			Perfluorotridecanoic Acid	2017/07/12		113	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/07/12		102	%	70 - 130
5067867	DZU	RPD	Perfluorooctane Sulfonamide (PFOSA)	2017/07/12	8.9		%	30
			Perfluorotetradecanoic Acid	2017/07/12	22		%	30
			Perfluorotridecanoic Acid	2017/07/12	20		%	30
			Perfluorododecanoic Acid (PFDoA)	2017/07/12	6.3		%	30
5067867	DZU	Method Blank	13C2-Perfluorododecanoic acid	2017/07/12		54	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/07/12		63	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/07/12		68	%	50 - 150
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/12	0.0036 U, MDL=0.0036		ug/L	
			Perfluorotetradecanoic Acid	2017/07/12	0.0038 U, MDL=0.0038		ug/L	
			Perfluorotridecanoic Acid	2017/07/12	0.0033 U, MDL=0.0033		ug/L	
			Perfluorododecanoic Acid (PFDoA)	2017/07/12	0.0028 U, MDL=0.0028		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.

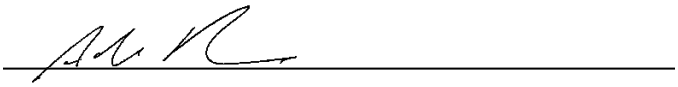
Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7D5769
Report Date: 2017/07/17

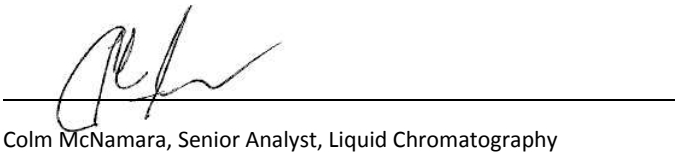
ESS Laboratory
Client Project #: 1706533
Your P.O. #: B02623

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



Colm McNamara, Senior Analyst, Liquid Chromatography

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.

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

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

ESS Lab # 1706533

Turn Time X Standard Other_____

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 - GW-1

Electonic Deliverables (Excel) Access (PDF)

Co. Name: HORSLEY WITTEN GROUP
Project #: 17027
Project Name: BAM. on-Call #4
Contact Person: JESSE BEAM
Address: 90 Rt 6A
City: SANDWICH
State: MA
Zip: 02563
PO #:
Tel: 508 833 6600
Fax: 508 833 8150
email: jbeam@horsleywitten.com

Analysis: PFOSALCM-5, PFOS

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	PFOSALCM-5	PFOS
	6/20/17	1030	G	S	ARFF BLDG 1	NP	1	P	250	X	
		1035	G	S	ARFF BLDG 2	NP	1	P	250	X	
1		0815	G	SW	KMART SW		2	P	125ml		X
2		1150	G	GW	HW-1		2	P	125		X
3		1310	G	GW	HW-23		2	P	125		X
4		1335	G	GW	HW-19D		2	P	125		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: 2-3 ice mix

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:

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
6/20/17 1445	6/20/17 1520	6/20/17 1650	6/20/17 1907
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 VIIA

Please fax to the laboratory all changes to Chain of Custody

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

CERTIFICATE OF ANALYSIS

Jesse Bean
Horsley & Witten
90 Route 6A
Sandwich, MA 02563

RE: Barn. On-Call #4 (17027)
ESS Laboratory Work Order Number: 1706532

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 11:50 am, Jul 20, 2017

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 standards, 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

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1706532

SAMPLE RECEIPT

The following samples were received on June 20, 2017 for the analyses specified on the enclosed Chain of Custody Record.

Lab Number	Sample Name	Matrix	Analysis
1706532-01	DL-1	Soil	§
1706532-02	DL-2	Soil	§
1706532-03	DL-3	Soil	§
1706532-04	DL-4	Soil	§
1706532-05	DL-5	Soil	§
1706532-06	DL-6	Soil	§
1706532-07	DL-7	Soil	§
1706532-08	DL-8-2'	Soil	§
1706532-09	DL-9	Soil	§
1706532-10	DL-10	Soil	§
1706532-11	ARFF BLDG 1	Soil	§
1706532-12	ARFF BLDG 2	Soil	§

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1706532

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

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: Barn. On-Call #4

ESS Laboratory Work Order: 1706532

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: Barn. On-Call #4

ESS Laboratory Work Order: 1706532

Subcontracted Analysis

Client Sample ID: DL-1
Date Sampled: 06/20/17 09:00

ESS Laboratory Sample ID: 1706532-01
Sample Matrix: Soil

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

Client Sample ID: DL-2
Date Sampled: 06/20/17 09:15

ESS Laboratory Sample ID: 1706532-02
Sample Matrix: Soil

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

Client Sample ID: DL-3
Date Sampled: 06/20/17 09:30

ESS Laboratory Sample ID: 1706532-03
Sample Matrix: Soil

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

Client Sample ID: DL-4
Date Sampled: 06/20/17 09:45

ESS Laboratory Sample ID: 1706532-04
Sample Matrix: Soil

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

Client Sample ID: DL-5
Date Sampled: 06/20/17 09:45

ESS Laboratory Sample ID: 1706532-05
Sample Matrix: Soil

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: Barn. On-Call #4

ESS Laboratory Work Order: 1706532

Subcontracted Analysis

Client Sample ID: DL-6
Date Sampled: 06/20/17 09:50

ESS Laboratory Sample ID: 1706532-06
Sample Matrix: Soil

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

Client Sample ID: DL-7
Date Sampled: 06/20/17 10:00

ESS Laboratory Sample ID: 1706532-07
Sample Matrix: Soil

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

Client Sample ID: DL-8-2'
Date Sampled: 06/20/17 10:05

ESS Laboratory Sample ID: 1706532-08
Sample Matrix: Soil

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

Client Sample ID: DL-9
Date Sampled: 06/20/17 10:15

ESS Laboratory Sample ID: 1706532-09
Sample Matrix: Soil

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

Client Sample ID: DL-10
Date Sampled: 06/20/17 10:20

ESS Laboratory Sample ID: 1706532-10
Sample Matrix: Soil

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: Barn. On-Call #4

ESS Laboratory Work Order: 1706532

Subcontracted Analysis

Client Sample ID: ARFF BLDG 1
Date Sampled: 06/20/17 10:30

ESS Laboratory Sample ID: 1706532-11
Sample Matrix: Soil

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

Client Sample ID: ARFF BLDG 2
Date Sampled: 06/20/17 10:35

ESS Laboratory Sample ID: 1706532-12
Sample Matrix: Soil

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: Barn. On-Call #4

ESS Laboratory Work Order: 1706532

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1706532

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
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1706532

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/dwp/partners/labCert.shtml

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.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Your P.O. #: B02623
Your Project #: 1706532
Your C.O.C. #: 1706532

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/07/19
Report #: R4604701
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7D5743
Received: 2017/06/28, 14:30

Sample Matrix: Soil
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Moisture	12	N/A	2017/06/30	CAM SOP-00445	Carter 2nd ed 51.2 m
PFOS and PFOA in soil by SPE/LCMS (1)	12	2017/07/04	2017/07/10	CAM SOP-00894	EPA537 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.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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.

U = Undetected at the limit of quantitation.
J = Estimated concentration between the EDL & RDL.
B = Blank Contamination.
Q = One or more quality control criteria failed.
E = Analyte concentration exceeds the maximum concentration level.
K = Estimated maximum possible concentration due to ion abundance ratio failure.

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

Your P.O. #: B02623
Your Project #: 1706532
Your C.O.C. #: 1706532

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/07/19
Report #: R4604701
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7D5743
Received: 2017/06/28, 14:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Stephanie Pollen, Project Manager
Email: SPollen@maxxam.ca
Phone# (905) 817-5700
==========
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.

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

Maxxam Job #: B7D5743
Report Date: 2017/07/19

ESS Laboratory
Client Project #: 1706532
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EQO499	EQO500				EQO501	EQO501			
Sampling Date		2017/06/20 09:00	2017/06/20 09:15				2017/06/20 09:30	2017/06/20 09:30			
COC Number		1706532	1706532				1706532	1706532			
	UNITS	1706532-01	1706532-02	RDL	MDL	QC Batch	1706532-03	1706532-03 Lab-Dup	RDL	MDL	QC Batch
Inorganics											
Moisture	%	3.1	9.1	1.0	0.50	5053470	6.2	N/A	1.0	0.50	5053470
Miscellaneous Parameters											
6:2 Fluorotelomer sulfonate	ug/kg	0.39 J	0.23 U	1.0	0.23	5056239	3.1	3.1	1.0	0.23	5056239
8:2 Fluorotelomer sulfonate	ug/kg	2.2	0.32 U	1.0	0.32	5056239	18	13 (1)	1.0	0.32	5056239
Perfluorobutane Sulfonate (PFBS)	ug/kg	0.17 U	0.17 U	1.0	0.17	5056239	0.17 U	0.17 U	1.0	0.17	5056239
Perfluorobutanoic acid	ug/kg	0.23 U	1.4	1.0	0.23	5056239	0.33 J	0.27 J	1.0	0.23	5056239
Perfluorodecane Sulfonate	ug/kg	0.65 J	0.23 U	1.0	0.23	5056239	0.74 J	0.73 J	1.0	0.23	5056239
Perfluorodecanoic Acid (PFDA)	ug/kg	0.63 J	0.13 U	1.0	0.13	5056239	1.4	1.3	1.0	0.13	5056239
Perfluorododecanoic Acid (PFDoA)	ug/kg	0.37 J	0.22 U	1.0	0.22	5056239	4.1	3.4	1.0	0.22	5056239
Perfluoroheptanoic Acid (PFHpA)	ug/kg	0.30 J	1.9	1.0	0.17	5056239	0.84 J	0.79 J	1.0	0.17	5056239
Perfluorohexane Sulfonate (PFHxS)	ug/kg	0.23 U	1.8	1.0	0.23	5056239	0.34 J	0.34 J	1.0	0.23	5056239
Perfluorohexanoic Acid (PFHxA)	ug/kg	0.19 U	2.2	1.0	0.19	5056239	0.38 J	0.29 J	1.0	0.19	5056239
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	0.26 U	1.6	1.0	0.26	5056239	0.80 J	0.63 J	1.0	0.26	5056239
Perfluorononanoic Acid (PFNA)	ug/kg	0.17 U	0.81 J	1.0	0.17	5056239	0.55 J	0.51 J	1.0	0.17	5056239
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	0.26 U	0.26 U	1.0	0.26	5056239	3.5	2.7	1.0	0.26	5056239
Perfluorooctane Sulfonate (PFOS)	ug/kg	0.40 J	12	1.0	0.21	5056239	0.51 J	0.45 J	1.0	0.21	5056239
Perfluoropentanoic Acid (PFPeA)	ug/kg	0.18 U	2.7	1.0	0.18	5056239	1.4	0.97 J	1.0	0.18	5056239
Perfluorotetradecanoic Acid	ug/kg	0.11 U	0.11 U	1.0	0.11	5056239	0.97 J	0.87 J	1.0	0.11	5056239
Perfluorotridecanoic Acid	ug/kg	2.6	0.12 U	1.0	0.12	5056239	43 (2)	N/A	10	1.2	5071737
Perfluoroundecanoic Acid (PFUnA)	ug/kg	3.6	0.18 U	1.0	0.18	5056239	4.9	4.2	1.0	0.18	5056239
Surrogate Recovery (%)											
13C2-6:2 Fluorotelomer sulfonate	%	101	83	N/A	N/A	5056239	92	92	N/A	N/A	5056239
13C2-8:2 Fluorotelomer sulfonate	%	80	75	N/A	N/A	5056239	91	97	N/A	N/A	5056239
13C2-Perfluorodecanoic acid	%	80	64	N/A	N/A	5056239	68	63	N/A	N/A	5056239
13C2-Perfluorododecanoic acid	%	80	57	N/A	N/A	5056239	61	70	N/A	N/A	5056239
13C2-Perfluorohexanoic acid	%	88	76	N/A	N/A	5056239	79	81	N/A	N/A	5056239
13C2-perfluorotetradecanoic acid	%	72	54	N/A	N/A	5056239	55	58	N/A	N/A	5056239
13C2-Perfluoroundecanoic acid	%	79	68	N/A	N/A	5056239	70	71	N/A	N/A	5056239
13C4-Perfluorobutanoic acid	%	115	84	N/A	N/A	5056239	97	95	N/A	N/A	5056239
13C4-Perfluoroheptanoic acid	%	93	81	N/A	N/A	5056239	75	84	N/A	N/A	5056239
13C4-Perfluorooctanesulfonate	%	83	69	N/A	N/A	5056239	76	82	N/A	N/A	5056239

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Duplicate results exceeded RPD acceptance criteria. This may be due to sample heterogeneity.
(2) Due to high concentration of the target analyte, sample required 10x dilution. Detection limit was adjusted accordingly.

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

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EQO499	EQO500				EQO501	EQO501			
Sampling Date		2017/06/20 09:00	2017/06/20 09:15				2017/06/20 09:30	2017/06/20 09:30			
COC Number		1706532	1706532				1706532	1706532			
	UNITS	**1706532-01**	**1706532-02**	**RDL**	**MDL**	**QC Batch**	**1706532-03**	**1706532-03 Lab-Dup**	**RDL**	**MDL**	**QC Batch**
13C4-Perfluorooctanoic acid	%	89	83	N/A	N/A	5056239	81	87	N/A	N/A	5056239
13C5-Perfluorononanoic acid	%	86	71	N/A	N/A	5056239	78	74	N/A	N/A	5056239
13C5-Perfluoropentanoic acid	%	95	95	N/A	N/A	5056239	78	81	N/A	N/A	5056239
13C8-Perfluorooctane Sulfonamide	%	72	67	N/A	N/A	5056239	63	69	N/A	N/A	5056239
18O2-Perfluorohexanesulfonate	%	106	76	N/A	N/A	5056239	72	76	N/A	N/A	5056239

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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

Maxxam Job #: B7D5743
Report Date: 2017/07/19

ESS Laboratory
Client Project #: 1706532
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EQO502	EQO503		EQO504			EQO505			
Sampling Date		2017/06/20 09:45	2017/06/20 09:45		2017/06/20 09:50			2017/06/20 10:00			
COC Number		1706532	1706532		1706532			1706532			
	UNITS	1706532-04	1706532-05	QC Batch	1706532-06	RDL	MDL	1706532-07	RDL	MDL	QC Batch
Inorganics											
Moisture	%	3.0	9.5	5053470	11	1.0	0.50	6.4	1.0	0.50	5053470
Miscellaneous Parameters											
6:2 Fluorotelomer sulfonate	ug/kg	0.24 J	0.23 U	5056239	2.0	1.0	0.23	290 (1)	10	2.3	5056239
8:2 Fluorotelomer sulfonate	ug/kg	0.62 J	0.32 U	5056239	0.32 U	1.0	0.32	87 (1)	10	3.2	5056239
Perfluorobutane Sulfonate (PFBS)	ug/kg	0.17 U	0.17 U	5056239	0.17 U	1.0	0.17	1.7 U (1)	10	1.7	5056239
Perfluorobutanoic acid	ug/kg	0.34 J	0.85 J	5056239	2.0	1.0	0.23	2.3 U (1)	10	2.3	5056239
Perfluorodecane Sulfonate	ug/kg	0.23 U	0.23 U	5056239	0.23 U	1.0	0.23	2.3 U (1)	10	2.3	5056239
Perfluorodecanoic Acid (PFDA)	ug/kg	1.3	0.13 U	5056239	0.13 U	1.0	0.13	1.3 U (1)	10	1.3	5056239
Perfluorododecanoic Acid (PFDoA)	ug/kg	0.22 U	0.22 U	5056239	0.22 U	1.0	0.22	2.2 U (1)	10	2.2	5056239
Perfluoroheptanoic Acid (PFHpA)	ug/kg	0.31 J	2.5	5056239	5.0	1.0	0.17	2.5 J (1)	10	1.7	5056239
Perfluorohexane Sulfonate (PFHxS)	ug/kg	0.23 U	0.49 J	5056239	0.23 U	1.0	0.23	2.3 U (1)	10	2.3	5056239
Perfluorohexanoic Acid (PFHxA)	ug/kg	0.19 U	1.2	5056239	4.8	1.0	0.19	2.3 J (1)	10	1.9	5056239
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	0.83 J	3.7	5056239	0.26 U	1.0	0.26	4.2 J (1)	10	2.6	5056239
Perfluorononanoic Acid (PFNA)	ug/kg	2.7	0.19 J	5056239	0.19 J	1.0	0.17	9.6 J (1)	10	1.7	5056239
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	0.26 U	0.26 U	5056239	0.26 U	1.0	0.26	2.6 U (1)	10	2.6	5056239
Perfluorooctane Sulfonate (PFOS)	ug/kg	2.0	0.21 U	5056239	0.21 U	1.0	0.21	3.9 J (1)	10	2.1	5056239
Perfluoropentanoic Acid (PFPeA)	ug/kg	0.56 J	2.1	5056239	4.6	1.0	0.18	4.9 J (1)	10	1.8	5056239
Perfluorotetradecanoic Acid	ug/kg	0.11 U	0.11 U	5073733	0.11 U	1.0	0.11	1.1 U (1)	10	1.1	5056239
Perfluorotridecanoic Acid	ug/kg	0.12 U	0.12 U	5073733	0.12 U	1.0	0.12	1.2 U (1)	10	1.2	5056239
Perfluoroundecanoic Acid (PFUnA)	ug/kg	0.72 J	0.18 U	5056239	0.18 U	1.0	0.18	1.8 U (1)	10	1.8	5056239
Surrogate Recovery (%)											
13C2-6:2 Fluorotelomer sulfonate	%	119	80	5056239	94	N/A	N/A	86	N/A	N/A	5056239
13C2-8:2 Fluorotelomer sulfonate	%	89	63	5056239	100	N/A	N/A	79	N/A	N/A	5056239
13C2-Perfluorodecanoic acid	%	82	74	5056239	87	N/A	N/A	95	N/A	N/A	5056239
13C2-Perfluorododecanoic acid	%	77	71	5056239	71	N/A	N/A	72	N/A	N/A	5056239
13C2-Perfluorohexanoic acid	%	85	68	5056239	86	N/A	N/A	88	N/A	N/A	5056239
13C2-perfluorotetradecanoic acid	%	72	80	5073733	61	N/A	N/A	71	N/A	N/A	5056239
13C2-Perfluoroundecanoic acid	%	90	77	5056239	82	N/A	N/A	98	N/A	N/A	5056239
13C4-Perfluorobutanoic acid	%	106	77	5056239	94	N/A	N/A	106	N/A	N/A	5056239
13C4-Perfluoroheptanoic acid	%	87	70	5056239	83	N/A	N/A	82	N/A	N/A	5056239
13C4-Perfluorooctanesulfonate	%	87	62	5056239	81	N/A	N/A	87	N/A	N/A	5056239
13C4-Perfluorooctanoic acid	%	99	73	5056239	93	N/A	N/A	95	N/A	N/A	5056239

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limit was adjusted accordingly (10x).

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

Maxxam Job #: B7D5743
Report Date: 2017/07/19

ESS Laboratory
Client Project #: 1706532
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EQO502	EQO503		EQO504			EQO505			
Sampling Date		2017/06/20 09:45	2017/06/20 09:45		2017/06/20 09:50			2017/06/20 10:00			
COC Number		1706532	1706532		1706532			1706532			
	UNITS	**1706532-04**	**1706532-05**	**QC Batch**	**1706532-06**	**RDL**	**MDL**	**1706532-07**	**RDL**	**MDL**	**QC Batch**
13C5-Perfluorononanoic acid	%	84	61	5056239	84	N/A	N/A	72	N/A	N/A	5056239
13C5-Perfluoropentanoic acid	%	90	70	5056239	93	N/A	N/A	90	N/A	N/A	5056239
13C8-Perfluorooctane Sulfonamide	%	92	70	5056239	85	N/A	N/A	99	N/A	N/A	5056239
18O2-Perfluorohexanesulfonate	%	95	81	5056239	79	N/A	N/A	86	N/A	N/A	5056239

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

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

Maxxam Job #: B7D5743
Report Date: 2017/07/19

ESS Laboratory
Client Project #: 1706532
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EQO506			EQO507	EQO508			
Sampling Date		2017/06/20 10:05			2017/06/20 10:15	2017/06/20 10:20			
COC Number		1706532			1706532	1706532			
	UNITS	1706532-08	RDL	MDL	1706532-09	1706532-10	RDL	MDL	QC Batch
Inorganics									
Moisture	%	3.5	1.0	0.50	10	11	1.0	0.50	5053470
Miscellaneous Parameters									
6:2 Fluorotelomer sulfonate	ug/kg	1600 (1)	100	23	0.23 U	0.23 U	1.0	0.23	5056239
8:2 Fluorotelomer sulfonate	ug/kg	28 (2)	10	3.2	0.32 U	0.32 U	1.0	0.32	5056239
Perfluorobutane Sulfonate (PFBS)	ug/kg	1.7 U (2)	10	1.7	0.17 U	0.17 U	1.0	0.17	5056239
Perfluorobutanoic acid	ug/kg	2.3 U (2)	10	2.3	1.1	1.2	1.0	0.23	5056239
Perfluorodecane Sulfonate	ug/kg	2.3 U (2)	10	2.3	0.23 U	0.23 U	1.0	0.23	5056239
Perfluorodecanoic Acid (PFDA)	ug/kg	1.3 U (2)	10	1.3	0.13 U	0.13 U	1.0	0.13	5056239
Perfluorododecanoic Acid (PFDoA)	ug/kg	2.2 U (2)	10	2.2	0.22 U	0.22 U	1.0	0.22	5056239
Perfluoroheptanoic Acid (PFHpA)	ug/kg	2.9 J (2)	10	1.7	0.66 J	1.3	1.0	0.17	5056239
Perfluorohexane Sulfonate (PFHxS)	ug/kg	2.3 U (2)	10	2.3	0.35 J	0.94 J	1.0	0.23	5056239
Perfluorohexanoic Acid (PFHxA)	ug/kg	8.2 J (2)	10	1.9	0.99 J	1.6	1.0	0.19	5056239
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	25 (2)	10	2.6	0.68 J	1.7	1.0	0.26	5056239
Perfluorononanoic Acid (PFNA)	ug/kg	46 (2)	10	1.7	0.22 J	0.17 U	1.0	0.17	5056239
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	2.6 U (2)	10	2.6	0.26 U	0.26 U	1.0	0.26	5056239
Perfluorooctane Sulfonate (PFOS)	ug/kg	14 (2)	10	2.1	0.38 J	0.26 J	1.0	0.21	5056239
Perfluoropentanoic Acid (PFPeA)	ug/kg	3.1 J (2)	10	1.8	2.0	2.1	1.0	0.18	5056239
Perfluorotetradecanoic Acid	ug/kg	1.1 U (2)	10	1.1	0.11 U	0.11 U	1.0	0.11	5056239
Perfluorotridecanoic Acid	ug/kg	1.2 U (2)	10	1.2	0.12 U	0.12 U	1.0	0.12	5056239
Perfluoroundecanoic Acid (PFUnA)	ug/kg	1.8 U (2)	10	1.8	0.18 U	0.18 U	1.0	0.18	5056239
Surrogate Recovery (%)									
13C2-6:2 Fluorotelomer sulfonate	%	94	N/A	N/A	92	80	N/A	N/A	5056239
13C2-8:2 Fluorotelomer sulfonate	%	108	N/A	N/A	86	69	N/A	N/A	5056239
13C2-Perfluorodecanoic acid	%	104	N/A	N/A	72	67	N/A	N/A	5056239
13C2-Perfluorododecanoic acid	%	109	N/A	N/A	66	65	N/A	N/A	5056239
13C2-Perfluorohexanoic acid	%	112	N/A	N/A	87	73	N/A	N/A	5056239
13C2-perfluorotetradecanoic acid	%	100	N/A	N/A	60	66	N/A	N/A	5056239
13C2-Perfluoroundecanoic acid	%	118	N/A	N/A	77	80	N/A	N/A	5056239
13C4-Perfluorobutanoic acid	%	127	N/A	N/A	108	98	N/A	N/A	5056239
13C4-Perfluoroheptanoic acid	%	105	N/A	N/A	88	82	N/A	N/A	5056239

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

N/A = Not Applicable

(1) Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limit was adjusted accordingly (100x).

(2) Due to high concentrations of the target analytes, a reduced sample volume was extracted and analyzed. Detection limit was adjusted accordingly (10x).

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

Maxxam Job #: B7D5743
Report Date: 2017/07/19

ESS Laboratory
Client Project #: 1706532
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EQO506			EQO507	EQO508			
Sampling Date		2017/06/20 10:05			2017/06/20 10:15	2017/06/20 10:20			
COC Number		1706532			1706532	1706532			
	UNITS	**1706532-08**	**RDL**	**MDL**	**1706532-09**	**1706532-10**	**RDL**	**MDL**	**QC Batch**
13C4-Perfluorooctanesulfonate	%	110	N/A	N/A	75	75	N/A	N/A	5056239
13C4-Perfluorooctanoic acid	%	107	N/A	N/A	89	85	N/A	N/A	5056239
13C5-Perfluorononanoic acid	%	113	N/A	N/A	84	74	N/A	N/A	5056239
13C5-Perfluoropentanoic acid	%	103	N/A	N/A	80	79	N/A	N/A	5056239
13C8-Perfluorooctane Sulfonamide	%	95	N/A	N/A	66	71	N/A	N/A	5056239
18O2-Perfluorohexanesulfonate	%	114	N/A	N/A	72	74	N/A	N/A	5056239

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

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

Maxxam Job #: B7D5743
Report Date: 2017/07/19

ESS Laboratory
Client Project #: 1706532
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EQO509				EQO510			
Sampling Date		2017/06/20 10:30				2017/06/20 10:35			
COC Number		1706532				1706532			
	UNITS	1706532-11	RDL	MDL	QC Batch	1706532-12	RDL	MDL	QC Batch
Inorganics									
Moisture	%	7.9	1.0	0.50	5053470	7.3	1.0	0.50	5053470
Miscellaneous Parameters									
6:2 Fluorotelomer sulfonate	ug/kg	0.93 J	1.0	0.23	5056239	0.23 U	1.0	0.23	5056239
8:2 Fluorotelomer sulfonate	ug/kg	2.0	1.0	0.32	5056239	0.32 U	1.0	0.32	5056239
Perfluorobutane Sulfonate (PFBS)	ug/kg	0.17 U	1.0	0.17	5056239	0.17 U	1.0	0.17	5056239
Perfluorobutanoic acid	ug/kg	0.84 J	1.0	0.23	5056239	0.23 U	1.0	0.23	5056239
Perfluorodecane Sulfonate	ug/kg	0.23 U	1.0	0.23	5056239	0.23 U	1.0	0.23	5056239
Perfluorodecanoic Acid (PFDA)	ug/kg	4.4	1.0	0.13	5056239	0.13 U	1.0	0.13	5056239
Perfluorododecanoic Acid (PFDoA)	ug/kg	2.6	1.0	0.22	5056239	0.22 U	1.0	0.22	5056239
Perfluoroheptanoic Acid (PFHpA)	ug/kg	0.82 J	1.0	0.17	5056239	0.17 U	1.0	0.17	5056239
Perfluorohexane Sulfonate (PFHxS)	ug/kg	0.23 U	1.0	0.23	5056239	0.23 U	1.0	0.23	5056239
Perfluorohexanoic Acid (PFHxA)	ug/kg	0.61 J	1.0	0.19	5056239	0.19 U	1.0	0.19	5056239
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	0.75 J	1.0	0.26	5056239	0.26 U	1.0	0.26	5056239
Perfluorononanoic Acid (PFNA)	ug/kg	2.5	1.0	0.17	5056239	0.20 J	1.0	0.17	5056239
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	0.26 U	1.0	0.26	5056239	0.26 U	1.0	0.26	5056239
Perfluorooctane Sulfonate (PFOS)	ug/kg	4.5	1.0	0.21	5056239	0.29 J	1.0	0.21	5056239
Perfluoropentanoic Acid (PFPeA)	ug/kg	1.5	1.0	0.18	5056239	0.25 J	1.0	0.18	5056239
Perfluorotetradecanoic Acid	ug/kg	0.61 J	1.0	0.11	5056239	0.11 U	1.0	0.11	5056239
Perfluorotridecanoic Acid	ug/kg	42	1.0	0.12	5071737	0.20 J	1.0	0.12	5056239
Perfluoroundecanoic Acid (PFUnA)	ug/kg	55 (1)	10	1.8	5071737	0.22 J	1.0	0.18	5056239
Surrogate Recovery (%)									
13C2-6:2 Fluorotelomer sulfonate	%	84	N/A	N/A	5056239	77	N/A	N/A	5056239
13C2-8:2 Fluorotelomer sulfonate	%	76	N/A	N/A	5056239	78	N/A	N/A	5056239
13C2-Perfluorodecanoic acid	%	57	N/A	N/A	5056239	74	N/A	N/A	5056239
13C2-Perfluorododecanoic acid	%	62	N/A	N/A	5056239	67	N/A	N/A	5056239
13C2-Perfluorohexanoic acid	%	67	N/A	N/A	5056239	76	N/A	N/A	5056239
13C2-perfluorotetradecanoic acid	%	53	N/A	N/A	5056239	60	N/A	N/A	5056239
13C2-Perfluoroundecanoic acid	%	90	N/A	N/A	5071737	72	N/A	N/A	5056239
13C4-Perfluorobutanoic acid	%	76	N/A	N/A	5056239	82	N/A	N/A	5056239
13C4-Perfluoroheptanoic acid	%	72	N/A	N/A	5056239	73	N/A	N/A	5056239
13C4-Perfluorooctanesulfonate	%	63	N/A	N/A	5056239	72	N/A	N/A	5056239
13C4-Perfluorooctanoic acid	%	68	N/A	N/A	5056239	82	N/A	N/A	5056239

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.

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

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EQO509				EQO510			
Sampling Date		2017/06/20 10:30				2017/06/20 10:35			
COC Number		1706532				1706532			
	UNITS	1706532-11	RDL	MDL	QC Batch	1706532-12	RDL	MDL	QC Batch
13C5-Perfluorononanoic acid	%	61	N/A	N/A	5056239	76	N/A	N/A	5056239
13C5-Perfluoropentanoic acid	%	86	N/A	N/A	5056239	77	N/A	N/A	5056239
13C8-Perfluorooctane Sulfonamide	%	60	N/A	N/A	5056239	63	N/A	N/A	5056239
18O2-Perfluorohexanesulfonate	%	68	N/A	N/A	5056239	78	N/A	N/A	5056239

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

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

TEST SUMMARY

Maxxam ID: EQO499 **Collected:** 2017/06/20
Sample ID: 1706532-01 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO500 **Collected:** 2017/06/20
Sample ID: 1706532-02 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO501 **Collected:** 2017/06/20
Sample ID: 1706532-03 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO501 Dup **Collected:** 2017/06/20
Sample ID: 1706532-03 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO502 **Collected:** 2017/06/20
Sample ID: 1706532-04 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO503 **Collected:** 2017/06/20
Sample ID: 1706532-05 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

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

TEST SUMMARY

Maxxam ID: EQO504 **Collected:** 2017/06/20
Sample ID: 1706532-06 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO505 **Collected:** 2017/06/20
Sample ID: 1706532-07 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO506 **Collected:** 2017/06/20
Sample ID: 1706532-08 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO507 **Collected:** 2017/06/20
Sample ID: 1706532-09 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO508 **Collected:** 2017/06/20
Sample ID: 1706532-10 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

Maxxam ID: EQO509 **Collected:** 2017/06/20
Sample ID: 1706532-11 **Shipped:**
Matrix: Soil **Received:** 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

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

Maxxam Job #: B7D5743
Report Date: 2017/07/19

ESS Laboratory
Client Project #: 1706532
Your P.O. #: B02623

TEST SUMMARY

Maxxam ID: EQO510
Sample ID: 1706532-12
Matrix: Soil

Collected: 2017/06/20
Shipped:
Received: 2017/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5053470	N/A	2017/06/30	Min Yang
PFOS and PFOA in soil by SPE/LCMS	LCMS	5056239	2017/07/04	2017/07/10	Daniela Zupu

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

Maxxam Job #: B7D5743
Report Date: 2017/07/19

ESS Laboratory
Client Project #: 1706532
Your P.O. #: B02623

GENERAL COMMENTS

Sample EQO501, PFOS and PFOA in soil by SPE/LCMS: Test repeated.
Sample EQO502, PFOS and PFOA in soil by SPE/LCMS: Test repeated.
Sample EQO503, PFOS and PFOA in soil by SPE/LCMS: Test repeated.
Sample EQO509, PFOS and PFOA in soil by SPE/LCMS: Test repeated.

Results relate only to the items tested.

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

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5053470	NS3	RPD - Sample/Sample Dup	Moisture	2017/06/30	7.5		%	20
5056239	DZU	Matrix Spike(EQO501)	13C2-6:2 Fluorotelomer sulfonate	2017/07/10		106	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/07/10		106	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/07/10		91	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/07/10		106	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/07/10		96	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/07/10		81	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/07/10		99	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/07/10		104	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/07/10		97	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/07/10		90	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/07/10		104	%	50 - 150
			13C5-Perfluorononanoic acid	2017/07/10		91	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/07/10		103	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/07/10		86	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/07/10		104	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/07/10		106	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/07/10		73	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/07/10		102	%	70 - 130
			Perfluorobutanoic acid	2017/07/10		105	%	70 - 130
			Perfluorodecane Sulfonate	2017/07/10		102	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/07/10		104	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/07/10		91	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/07/10		103	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/10		111	%	70 - 130
			Perfluorotetradecanoic Acid	2017/07/10		95	%	70 - 130
			Perfluorotridecanoic Acid	2017/07/10		52 (1)	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/07/10		95	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/07/10		94	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/07/10		91	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/07/10		99	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/07/10		102	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/07/10		95	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/07/10		101	%	70 - 130
5056239	DZU	Spiked Blank	13C2-6:2 Fluorotelomer sulfonate	2017/07/10		120	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/07/10		97	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/07/10		91	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/07/10		84	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/07/10		96	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/07/10		83	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/07/10		84	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/07/10		107	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/07/10		103	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/07/10		96	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/07/10		101	%	50 - 150
			13C5-Perfluorononanoic acid	2017/07/10		97	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/07/10		103	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/07/10		72	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/07/10		102	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/07/10		106	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/07/10		98	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/07/10		96	%	70 - 130
			Perfluorobutanoic acid	2017/07/10		87	%	70 - 130
			Perfluorodecane Sulfonate	2017/07/10		87	%	70 - 130

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorodecanoic Acid (PFDA)	2017/07/10		90	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/07/10		101	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/07/10		94	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/10		116	%	70 - 130
			Perfluorotetradecanoic Acid	2017/07/10		90	%	70 - 130
			Perfluorotridecanoic Acid	2017/07/10		83	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/07/10		104	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/07/10		88	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/07/10		96	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/07/10		97	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/07/10		98	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/07/10		98	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/07/10		107	%	70 - 130
5056239	DZU	Method Blank	13C2-6:2 Fluorotelomer sulfonate	2017/07/10		104	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/07/10		83	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/07/10		83	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/07/10		80	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/07/10		97	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/07/10		73	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/07/10		66	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/07/10		107	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/07/10		102	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/07/10		97	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/07/10		109	%	50 - 150
			13C5-Perfluorononanoic acid	2017/07/10		97	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/07/10		91	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/07/10		75	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/07/10		106	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/07/10	0.23 U, MDL=0.23		ug/kg	
			8:2 Fluorotelomer sulfonate	2017/07/10	0.32 U, MDL=0.32		ug/kg	
			Perfluorobutane Sulfonate (PFBS)	2017/07/10	0.17 U, MDL=0.17		ug/kg	
			Perfluorobutanoic acid	2017/07/10	0.23 U, MDL=0.23		ug/kg	
			Perfluorodecane Sulfonate	2017/07/10	0.23 U, MDL=0.23		ug/kg	
			Perfluorodecanoic Acid (PFDA)	2017/07/10	0.13 U, MDL=0.13		ug/kg	
			Perfluorododecanoic Acid (PFDoA)	2017/07/10	0.22 U, MDL=0.22		ug/kg	
			Perfluorononanoic Acid (PFNA)	2017/07/10	0.17 U, MDL=0.17		ug/kg	
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/10	0.26 U, MDL=0.26		ug/kg	
			Perfluorotetradecanoic Acid	2017/07/10	0.11 U, MDL=0.11		ug/kg	
			Perfluorotridecanoic Acid	2017/07/10	0.12 U, MDL=0.12		ug/kg	
			Perfluoroundecanoic Acid (PFUnA)	2017/07/10	0.18 U, MDL=0.18		ug/kg	
			Perfluoroheptanoic Acid (PFHpA)	2017/07/10	0.17 U, MDL=0.17		ug/kg	

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorohexane Sulfonate (PFHxS)	2017/07/10	0.23 U, MDL=0.23		ug/kg	
			Perfluorohexanoic Acid (PFHxA)	2017/07/10	0.19 U, MDL=0.19		ug/kg	
			Perfluoro-n-Octanoic Acid (PFOA)	2017/07/10	0.26 U, MDL=0.26		ug/kg	
			Perfluorooctane Sulfonate (PFOS)	2017/07/10	0.21 U, MDL=0.21		ug/kg	
			Perfluoropentanoic Acid (PFPeA)	2017/07/10	0.18 U, MDL=0.18		ug/kg	
5056239	DZU	RPD - Sample/Sample Dup	6:2 Fluorotelomer sulfonate	2017/07/10	1.3		%	30
			8:2 Fluorotelomer sulfonate	2017/07/10	30 (2)		%	30
			Perfluorobutane Sulfonate (PFBS)	2017/07/10	NC		%	30
			Perfluorobutanoic acid	2017/07/10	NC		%	30
			Perfluorodecane Sulfonate	2017/07/10	NC		%	30
			Perfluorodecanoic Acid (PFDA)	2017/07/10	13		%	30
			Perfluorododecanoic Acid (PFDoA)	2017/07/10	19		%	30
			Perfluorononanoic Acid (PFNA)	2017/07/10	NC		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2017/07/10	NC		%	25
			Perfluorotetradecanoic Acid	2017/07/10	NC		%	30
			Perfluoroundecanoic Acid (PFUnA)	2017/07/10	15		%	30
			Perfluoroheptanoic Acid (PFHpA)	2017/07/10	NC		%	30
			Perfluorohexane Sulfonate (PFHxS)	2017/07/10	NC		%	30
			Perfluorohexanoic Acid (PFHxA)	2017/07/10	NC		%	30
			Perfluoro-n-Octanoic Acid (PFOA)	2017/07/10	NC		%	30
			Perfluorooctane Sulfonate (PFOS)	2017/07/10	NC		%	30
			Perfluoropentanoic Acid (PFPeA)	2017/07/10	NC		%	30
5071737	AD9	Matrix Spike	13C2-Perfluoroundecanoic acid	2017/07/18		72	%	50 - 150
			Perfluorotridecanoic Acid	2017/07/18		123	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/07/18		121	%	70 - 130
5071737	AD9	Spiked Blank	13C2-Perfluoroundecanoic acid	2017/07/18		76	%	50 - 150
			Perfluorotridecanoic Acid	2017/07/18		124	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/07/18		114	%	70 - 130
5071737	AD9	Method Blank	13C2-Perfluoroundecanoic acid	2017/07/18		59	%	50 - 150
			Perfluorotridecanoic Acid	2017/07/18	0.12 U, MDL=0.12		ug/kg	
			Perfluoroundecanoic Acid (PFUnA)	2017/07/18	0.18 U, MDL=0.18		ug/kg	
5071737	AD9	RPD - Sample/Sample Dup	Perfluorotridecanoic Acid	2017/07/18	NC		%	30
			Perfluoroundecanoic Acid (PFUnA)	2017/07/18	NC		%	30
5073733	AD9	Matrix Spike	13C2-perfluorotetradecanoic acid	2017/07/19		63	%	50 - 150
			Perfluorotetradecanoic Acid	2017/07/19		120	%	70 - 130
			Perfluorotridecanoic Acid	2017/07/19		125	%	70 - 130
5073733	AD9	Spiked Blank	13C2-perfluorotetradecanoic acid	2017/07/19		64	%	50 - 150
			Perfluorotetradecanoic Acid	2017/07/19		121	%	70 - 130
			Perfluorotridecanoic Acid	2017/07/19		126	%	70 - 130
5073733	AD9	Method Blank	13C2-perfluorotetradecanoic acid	2017/07/19		72	%	50 - 150
			Perfluorotetradecanoic Acid	2017/07/19	0.11 U, MDL=0.11		ug/kg	
			Perfluorotridecanoic Acid	2017/07/19	0.12 U, MDL=0.12		ug/kg	
5073733	AD9	RPD - Sample/Sample Dup	Perfluorotetradecanoic Acid	2017/07/19	NC		%	30

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorotridecanoic Acid	2017/07/19	NC		%	30

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 (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(2) Duplicate results exceeded RPD acceptance criteria. This may be due to sample heterogeneity.

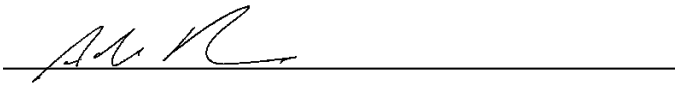
Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7D5743
Report Date: 2017/07/19

ESS Laboratory
Client Project #: 1706532
Your P.O. #: B02623

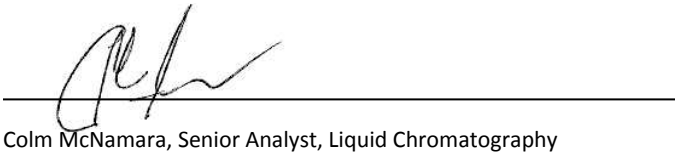
VALIDATION SIGNATURE PAGE

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

Brad Newman, Scientific Specialist



Colm McNamara, Senior Analyst, Liquid Chromatography

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.

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

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

ESS Lab # 106532

Turn Time X Standard Other_____

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 - GW-1

Electonic Deliverables (Excel) Access (PDF)

Co. Name	Project #	Project Name
HORSLEY WITTEN GROUP	17027	BARN. ON-CALL #4

Contact Person	Address
JESSE BEAN	90 RT 6A

City	State	Zip	PO #
SANDWICH	MA	02563	

Tel.	Fax.	email:
508 833 6600	508 833 3150	~~jbean~~ jbean@horsleywitten.com

Analysis: PFOSALGW-S

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	PFOSALGW-S
1	6/20/17	0900	G	S	DL-1	NP	1	P	250	X
2		0915			DL-2					
3		0930			DL-3					
4		0945			DL-4					
5		0945			DL-5					
6		0950			DL-6					
7		1000			DL-7					
8		1005			DL-8-2'					
9		1015			DL-9					
10		1020			DL-10					

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: X

Cooler Temperature: 2.9 Ice

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 : HW

Comments:

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
6/20/17 1445	6/20/17 1530	6/20/17 1652	6/20/17 1907
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 VIIA

Please fax to the laboratory all changes to Chain of Custody

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

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

ESS Lab # 1706532

Turn Time X Standard Other_____

Regulatory State: MA RI CT NH NJ NY ME Other_____

Reporting Limits - GW-1

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

Electonic Deliverables (Excel) Access (PDF)

Co. Name	Project #	Project Name
HORSLEY WITTEN GROUP	17027	BARN. ON-CALL #4

Contact Person	Address
JESSE BEAN	90 RT 6A

City	State	Zip	PO #
SANDWICH	MA	02563	

Tel.	Fax.	email:
508 833 6600	508 833 8150	jbean@horsleywitten.com

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis: PFUSALCM-S	Analysis: PFOS
11	6/20/17	1030	G	S	ARFF BLDG 1	NP	1	P	250	X	
12		1035	G	S	ARFF BLDG 2	NP	1	P	250	X	
		0815	G	SW	KMART SW		2	P	125ml		X
		1150	G	GW	HW-1		2	P	125		X
		1310	G	GW	HW-23		2	P	125		X
		1335	G	GW	HW-190	X	2	P	125		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: X

Cooler Temperature: 2-3 iced

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:

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
6/20/17 1445	6/20/17 1520	6/20/17 1650	6/20/17 1907
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 VIIA

Please fax to the laboratory all changes to Chain of Custody

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

CERTIFICATE OF ANALYSIS

Jesse Bean
Horsley & Witten
90 Route 6A
Sandwich, MA 02563

RE: Barn. On-Call #4 (17027)
ESS Laboratory Work Order Number: 1710271

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 9:20 am, Oct 17, 2017

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 standards, 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

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1710271

SAMPLE RECEIPT

The following samples were received on October 11, 2017 for the analyses specified on the enclosed Chain of Custody Record.

Lab Number	Sample Name	Matrix	Analysis
1710271-01	Stockpile West	Soil	§
1710271-02	Stockpile East	Soil	§
1710271-03	Loam Pile	Soil	§

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1710271

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

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: Barn. On-Call #4

ESS Laboratory Work Order: 1710271

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: Barn. On-Call #4

ESS Laboratory Work Order: 1710271

Subcontracted Analysis

Client Sample ID: Stockpile West
Date Sampled: 10/10/17 16:25

ESS Laboratory Sample ID: 1710271-01
Sample Matrix: Soil

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

Client Sample ID: Stockpile East
Date Sampled: 10/10/17 16:35

ESS Laboratory Sample ID: 1710271-02
Sample Matrix: Soil

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

Client Sample ID: Loam Pile
Date Sampled: 10/10/17 16:40

ESS Laboratory Sample ID: 1710271-03
Sample Matrix: Soil

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: Barn. On-Call #4

ESS Laboratory Work Order: 1710271

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1710271

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
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Horsley & Witten
Client Project ID: Barn. On-Call #4

ESS Laboratory Work Order: 1710271

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/dwp/partners/labCert.shtml

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.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Maxxam
A Bureau Veritas Group Company

Your P.O. #: B02623
Your Project #: 1710271
Your C.O.C. #: na

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/10/16
Report #: R4785798
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7M5459
Received: 2017/10/12, 14:44

Sample Matrix: Soil
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Moisture	3	N/A	2017/10/12	CAM SOP-00445	Carter 2nd ed 51.2 m
PFOS and PFOA in soil by SPE/LCMS (1)	3	2017/10/13	2017/10/16	CAM SOP-00894	EPA537 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.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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.

U = Undetected at the limit of quantitation.
J = Estimated concentration between the EDL & RDL.
B = Blank Contamination.
Q = One or more quality control criteria failed.
E = Analyte concentration exceeds the maximum concentration level.
K = Estimated maximum possible concentration due to ion abundance ratio failure.

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

Your P.O. #: B02623
Your Project #: 1710271
Your C.O.C. #: na

Attention:Shawn Morrell

ESS Laboratory
185 Frances Ave
Cranston, RI
USA 02910

Report Date: 2017/10/16
Report #: R4785798
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7M5459
Received: 2017/10/12, 14:44

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Stephanie Pollen, Project Manager
Email: SPollen@maxxam.ca
Phone# (905) 817-5700
==========
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.

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

Maxxam Job #: B7M5459
Report Date: 2017/10/16

ESS Laboratory
Client Project #: 1710271
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FHS317	FHS318	FHS319			
Sampling Date		2017/10/10 16:25	2017/10/10 16:35	2017/10/10 16:40			
COC Number		na	na	na			
	UNITS	1710271-01	1710271-02	1710271-03	RDL	MDL	QC Batch
Inorganics							
Moisture	%	3.5	4.2	16	1.0	0.50	5209150
Miscellaneous Parameters							
6:2 Fluorotelomer sulfonate	ug/kg	1.4	0.52 J	0.23 U	1.0	0.23	5210438
8:2 Fluorotelomer sulfonate	ug/kg	0.32 U	0.32 U	0.32 U	1.0	0.32	5210438
Perfluorobutane Sulfonate (PFBS)	ug/kg	0.17 U	0.17 U	0.17 U	1.0	0.17	5210438
Perfluorobutanoic acid	ug/kg	0.23 U	0.23 U	0.23 U	1.0	0.23	5210438
Perfluorodecane Sulfonate	ug/kg	0.23 U	0.23 U	0.23 U	1.0	0.23	5210438
Perfluorodecanoic Acid (PFDA)	ug/kg	0.13 U	0.13 U	0.13 U	1.0	0.13	5210438
Perfluorododecanoic Acid (PFDoA)	ug/kg	0.22 U	0.22 U	0.22 U	1.0	0.22	5210438
Perfluoroheptanoic Acid (PFHpA)	ug/kg	0.17 U	0.17 U	0.17 U	1.0	0.17	5210438
Perfluorohexane Sulfonate (PFHxS)	ug/kg	0.23 U	0.23 U	0.23 U	1.0	0.23	5210438
Perfluorohexanoic Acid (PFHxA)	ug/kg	0.19 U	0.19 U	0.19 U	1.0	0.19	5210438
Perfluoro-n-Octanoic Acid (PFOA)	ug/kg	0.26 U	0.26 U	0.26 U	1.0	0.26	5210438
Perfluorononanoic Acid (PFNA)	ug/kg	0.17 U	0.17 U	0.17 U	1.0	0.17	5210438
Perfluorooctane Sulfonamide (PFOSA)	ug/kg	0.26 U	0.26 U	0.26 U	1.0	0.26	5210438
Perfluorooctane Sulfonate (PFOS)	ug/kg	0.38 J	0.39 J	0.81 J	1.0	0.21	5210438
Perfluoropentanoic Acid (PFPeA)	ug/kg	0.18 U	0.18 U	0.18 U	1.0	0.18	5210438
Perfluorotetradecanoic Acid	ug/kg	0.11 U	0.11 U	0.11 U	1.0	0.11	5210438
Perfluorotridecanoic Acid	ug/kg	0.12 U	0.12 U	0.12 U	1.0	0.12	5210438
Perfluoroundecanoic Acid (PFUnA)	ug/kg	0.18 U	0.18 U	0.18 U	1.0	0.18	5210438
Surrogate Recovery (%)							
13C2-6:2 Fluorotelomer sulfonate	%	76	83	77	N/A	N/A	5210438
13C2-8:2 Fluorotelomer sulfonate	%	77	88	77	N/A	N/A	5210438
13C2-Perfluorodecanoic acid	%	67	88	67	N/A	N/A	5210438
13C2-Perfluorododecanoic acid	%	65	80	64	N/A	N/A	5210438
13C2-Perfluorohexanoic acid	%	75	91	69	N/A	N/A	5210438
13C2-perfluorotetradecanoic acid	%	61	68	54	N/A	N/A	5210438
13C2-Perfluoroundecanoic acid	%	65	86	64	N/A	N/A	5210438
13C4-Perfluorobutanoic acid	%	77	90	74	N/A	N/A	5210438
13C4-Perfluoroheptanoic acid	%	78	88	73	N/A	N/A	5210438
13C4-Perfluorooctanesulfonate	%	71	91	62	N/A	N/A	5210438
13C4-Perfluorooctanoic acid	%	78	87	69	N/A	N/A	5210438
13C5-Perfluorononanoic acid	%	71	91	66	N/A	N/A	5210438
13C5-Perfluoropentanoic acid	%	79	92	74	N/A	N/A	5210438

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

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

Maxxam Job #: B7M5459
Report Date: 2017/10/16

ESS Laboratory
Client Project #: 1710271
Your P.O. #: B02623

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FHS317	FHS318	FHS319			
Sampling Date		2017/10/10 16:25	2017/10/10 16:35	2017/10/10 16:40			
COC Number		na	na	na			
	UNITS	**1710271-01**	**1710271-02**	**1710271-03**	**RDL**	**MDL**	**QC Batch**
13C8-Perfluorooctane Sulfonamide	%	65	80	56	N/A	N/A	5210438
18O2-Perfluorohexanesulfonate	%	70	89	70	N/A	N/A	5210438

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

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

Maxxam Job #: B7M5459
Report Date: 2017/10/16

ESS Laboratory
Client Project #: 1710271
Your P.O. #: B02623

TEST SUMMARY

Maxxam ID: FHS317 **Collected:** 2017/10/10
Sample ID: 1710271-01 **Shipped:**
Matrix: Soil **Received:** 2017/10/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5209150	N/A	2017/10/12	Prgya Panchal
PFOS and PFOA in soil by SPE/LCMS	LCMS	5210438	2017/10/13	2017/10/16	Anjan Desai

Maxxam ID: FHS318 **Collected:** 2017/10/10
Sample ID: 1710271-02 **Shipped:**
Matrix: Soil **Received:** 2017/10/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5209150	N/A	2017/10/12	Prgya Panchal
PFOS and PFOA in soil by SPE/LCMS	LCMS	5210438	2017/10/13	2017/10/16	Anjan Desai

Maxxam ID: FHS319 **Collected:** 2017/10/10
Sample ID: 1710271-03 **Shipped:**
Matrix: Soil **Received:** 2017/10/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5209150	N/A	2017/10/12	Prgya Panchal
PFOS and PFOA in soil by SPE/LCMS	LCMS	5210438	2017/10/13	2017/10/16	Anjan Desai

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

GENERAL COMMENTS

Results relate only to the items tested.

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

Maxxam Job #: B7M5459
Report Date: 2017/10/16

ESS Laboratory
Client Project #: 1710271
Your P.O. #: B02623

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5209150	AUP	RPD - Sample/Sample Dup	Moisture	2017/10/12	2.1		%	20
5210438	AD9	Matrix Spike(FHS318)	13C2-6:2 Fluorotelomer sulfonate	2017/10/16		70	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/10/16		81	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/10/16		75	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/10/16		68	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/10/16		78	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/10/16		60	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/10/16		72	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/10/16		83	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/10/16		80	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/10/16		81	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/10/16		80	%	50 - 150
			13C5-Perfluorononanoic acid	2017/10/16		79	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/10/16		87	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/10/16		67	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/10/16		84	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/10/16		112	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/10/16		99	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/10/16		99	%	70 - 130
			Perfluorobutanoic acid	2017/10/16		102	%	70 - 130
			Perfluorodecane Sulfonate	2017/10/16		105	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/10/16		109	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/10/16		106	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/10/16		108	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/16		104	%	70 - 130
			Perfluorotetradecanoic Acid	2017/10/16		92	%	70 - 130
			Perfluorotridecanoic Acid	2017/10/16		113	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/10/16		108	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/10/16		106	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/10/16		94	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/10/16		109	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/16		103	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/10/16		100	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/10/16		96	%	70 - 130
5210438	AD9	Matrix Spike DUP(FHS318)	13C2-6:2 Fluorotelomer sulfonate	2017/10/16		66	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/10/16		71	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/10/16		81	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/10/16		76	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/10/16		81	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/10/16		63	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/10/16		77	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/10/16		82	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/10/16		78	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/10/16		78	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/10/16		83	%	50 - 150
			13C5-Perfluorononanoic acid	2017/10/16		77	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/10/16		82	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/10/16		68	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/10/16		67	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/10/16		108	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/10/16		106	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/10/16		119	%	70 - 130
			Perfluorobutanoic acid	2017/10/16		96	%	70 - 130
			Perfluorodecane Sulfonate	2017/10/16		99	%	70 - 130

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorodecanoic Acid (PFDA)	2017/10/16		96	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/10/16		95	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/10/16		104	%	70 - 130
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/16		98	%	70 - 130
			Perfluorotetradecanoic Acid	2017/10/16		101	%	70 - 130
			Perfluorotridecanoic Acid	2017/10/16		109	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/10/16		100	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/10/16		106	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/10/16		118	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/10/16		99	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/16		95	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/10/16		101	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/10/16		98	%	70 - 130
5210438	AD9	MS/MSD RPD	6:2 Fluorotelomer sulfonate	2017/10/16	4.1		%	30
			8:2 Fluorotelomer sulfonate	2017/10/16	6.4		%	30
			Perfluorobutane Sulfonate (PFBS)	2017/10/16	18		%	30
			Perfluorobutanoic acid	2017/10/16	5.7		%	30
			Perfluorodecane Sulfonate	2017/10/16	5.4		%	30
			Perfluorodecanoic Acid (PFDA)	2017/10/16	13		%	30
			Perfluorododecanoic Acid (PFDoA)	2017/10/16	11		%	30
			Perfluorononanoic Acid (PFNA)	2017/10/16	3.7		%	30
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/16	6.3		%	25
			Perfluorotetradecanoic Acid	2017/10/16	9.8		%	30
			Perfluorotridecanoic Acid	2017/10/16	4.0		%	30
			Perfluoroundecanoic Acid (PFUnA)	2017/10/16	7.0		%	30
			Perfluoroheptanoic Acid (PFHpA)	2017/10/16	0.29		%	30
			Perfluorohexane Sulfonate (PFHxS)	2017/10/16	22		%	30
			Perfluorohexanoic Acid (PFHxA)	2017/10/16	9.8		%	30
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/16	8.2		%	30
			Perfluorooctane Sulfonate (PFOS)	2017/10/16	0.53		%	30
			Perfluoropentanoic Acid (PFPeA)	2017/10/16	2.4		%	30
5210438	AD9	Spiked Blank	13C2-6:2 Fluorotelomer sulfonate	2017/10/16		83	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/10/16		83	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/10/16		76	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/10/16		72	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/10/16		84	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/10/16		62	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/10/16		74	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/10/16		84	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/10/16		85	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/10/16		86	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/10/16		81	%	50 - 150
			13C5-Perfluorononanoic acid	2017/10/16		81	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/10/16		90	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/10/16		69	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/10/16		90	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/10/16		110	%	70 - 130
			8:2 Fluorotelomer sulfonate	2017/10/16		109	%	70 - 130
			Perfluorobutane Sulfonate (PFBS)	2017/10/16		95	%	70 - 130
			Perfluorobutanoic acid	2017/10/16		106	%	70 - 130
			Perfluorodecane Sulfonate	2017/10/16		114	%	70 - 130
			Perfluorodecanoic Acid (PFDA)	2017/10/16		112	%	70 - 130
			Perfluorododecanoic Acid (PFDoA)	2017/10/16		113	%	70 - 130
			Perfluorononanoic Acid (PFNA)	2017/10/16		108	%	70 - 130

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/16		109	%	70 - 130
			Perfluorotetradecanoic Acid	2017/10/16		113	%	70 - 130
			Perfluorotridecanoic Acid	2017/10/16		128	%	70 - 130
			Perfluoroundecanoic Acid (PFUnA)	2017/10/16		112	%	70 - 130
			Perfluoroheptanoic Acid (PFHpA)	2017/10/16		104	%	70 - 130
			Perfluorohexane Sulfonate (PFHxS)	2017/10/16		96	%	70 - 130
			Perfluorohexanoic Acid (PFHxA)	2017/10/16		107	%	70 - 130
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/16		108	%	70 - 130
			Perfluorooctane Sulfonate (PFOS)	2017/10/16		99	%	70 - 130
			Perfluoropentanoic Acid (PFPeA)	2017/10/16		100	%	70 - 130
5210438	AD9	Method Blank	13C2-6:2 Fluorotelomer sulfonate	2017/10/16		88	%	50 - 150
			13C2-8:2 Fluorotelomer sulfonate	2017/10/16		78	%	50 - 150
			13C2-Perfluorodecanoic acid	2017/10/16		77	%	50 - 150
			13C2-Perfluorododecanoic acid	2017/10/16		73	%	50 - 150
			13C2-Perfluorohexanoic acid	2017/10/16		74	%	50 - 150
			13C2-perfluorotetradecanoic acid	2017/10/16		58	%	50 - 150
			13C2-Perfluoroundecanoic acid	2017/10/16		72	%	50 - 150
			13C4-Perfluorobutanoic acid	2017/10/16		78	%	50 - 150
			13C4-Perfluoroheptanoic acid	2017/10/16		80	%	50 - 150
			13C4-Perfluorooctanesulfonate	2017/10/16		71	%	50 - 150
			13C4-Perfluorooctanoic acid	2017/10/16		80	%	50 - 150
			13C5-Perfluorononanoic acid	2017/10/16		77	%	50 - 150
			13C5-Perfluoropentanoic acid	2017/10/16		78	%	50 - 150
			13C8-Perfluorooctane Sulfonamide	2017/10/16		61	%	50 - 150
			18O2-Perfluorohexanesulfonate	2017/10/16		80	%	50 - 150
			6:2 Fluorotelomer sulfonate	2017/10/16	0.23 U, MDL=0.23		ug/kg	
			8:2 Fluorotelomer sulfonate	2017/10/16	0.32 U, MDL=0.32		ug/kg	
			Perfluorobutane Sulfonate (PFBS)	2017/10/16	0.17 U, MDL=0.17		ug/kg	
			Perfluorobutanoic acid	2017/10/16	0.23 U, MDL=0.23		ug/kg	
			Perfluorodecane Sulfonate	2017/10/16	0.23 U, MDL=0.23		ug/kg	
			Perfluorodecanoic Acid (PFDA)	2017/10/16	0.13 U, MDL=0.13		ug/kg	
			Perfluorododecanoic Acid (PFDoA)	2017/10/16	0.22 U, MDL=0.22		ug/kg	
			Perfluorononanoic Acid (PFNA)	2017/10/16	0.17 U, MDL=0.17		ug/kg	
			Perfluorooctane Sulfonamide (PFOSA)	2017/10/16	0.26 U, MDL=0.26		ug/kg	
			Perfluorotetradecanoic Acid	2017/10/16	0.11 U, MDL=0.11		ug/kg	
			Perfluorotridecanoic Acid	2017/10/16	0.12 U, MDL=0.12		ug/kg	
			Perfluoroundecanoic Acid (PFUnA)	2017/10/16	0.18 U, MDL=0.18		ug/kg	
			Perfluoroheptanoic Acid (PFHpA)	2017/10/16	0.17 U, MDL=0.17		ug/kg	
			Perfluorohexane Sulfonate (PFHxS)	2017/10/16	0.23 U, MDL=0.23		ug/kg	

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

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Perfluorohexanoic Acid (PFHxA)	2017/10/16	0.19 U, MDL=0.19		ug/kg	
			Perfluoro-n-Octanoic Acid (PFOA)	2017/10/16	0.26 U, MDL=0.26		ug/kg	
			Perfluorooctane Sulfonate (PFOS)	2017/10/16	0.21 U, MDL=0.21		ug/kg	
			Perfluoropentanoic Acid (PFPeA)	2017/10/16	0.18 U, MDL=0.18		ug/kg	

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.

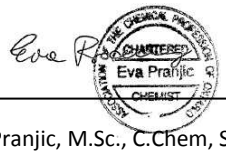
Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7M5459
Report Date: 2017/10/16

ESS Laboratory
Client Project #: 1710271
Your P.O. #: B02623

VALIDATION SIGNATURE PAGE

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



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.

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

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

ESS Lab # 1710271

Turn Time _____ Standard Other RUSH (3 DAY)

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 - LW-1

Electonic Deliverables Excel Access PDF

Co. Name: HORSLEY WITTEN GROUP
Contact Person: J BEAN
Address: 90 RT 6A
City, State: SANDWICH
Zip: 02563 ~~02673~~
PO #: —
Tel: 508 833 6600
email: jbean@horsleywitten.com

Project #: 17027
Project Name: BARN. 01 CAM #4
Proj. Location: BARNSTABLE MUNICIPAL AIRPORT

Analysis: PFOSAA CM-S; PFOS

ESS Lab ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container
1	10/10/17	1625	G	SOIL	STOCKPILE WEST	—	1	P	
2		1635	G	SOIL	STOCKPILE EAST	—	1	P	
3		1640	G	SOIL	LOAM PILE	—	1	P	
	⊗	1645	G	AQUEOUS	AFFF 3%	—	1	P	

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 X Yes ____ No

Seals Intact ____ Yes ____ No NA: ✓

Cooler Temperature: 5.1°C Ice 10/11/17

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: JESSE BEAN

Comments:

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
10/11/17 1245	10/11/17 1245	10/11/17 1400	10/11/17 1444
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 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

AFFF Information

CHEMGUARD C306-MS 3% AFFF Concentrate

Description

CHEMGUARD C306-MS 3% AFFF (Aqueous Film-Forming Foam) Concentrate combines fluoro- and hydrocarbon-surfactant technology to provide superior fire and vapor suppression for Class B hydrocarbon fuel fires. This synthetic foam concentrate is intended for firefighting applications at 3% solution in fresh, salt, or hard water.

CHEMGUARD C306-MS foam solution utilizes three suppression mechanisms for rapid fire knockdown and enhanced burnback resistance:

- The foam blanket blocks oxygen supply to the fuel.
- Liquid drains from the foam blanket and forms an aqueous film that suppresses fuel vapor and seals the fuel surface.
- The water content of the foam solution produces a cooling effect for additional fire suppression.

TYPICAL PHYSIOCHEMICAL PROPERTIES AT 77 °F (25 °C)

Appearance	Pale yellow liquid
Density	1.02 ± 0.02 g/ml
pH	7.0 – 8.5
Refractive Index	1.3655 ± 0.0020
Viscosity	3.25 ± 1.0 cSt*
Spreading Coefficient	3.0 minimum at 3%
Pour Point	27 °F (-3 °C)
Freeze Point	27 °F (-3 °C)

*Cannon-Fenske viscometer at 25 °C

Application

CHEMGUARD C306-MS 3% AFFF Concentrate is intended for use on Class B hydrocarbon fuel fires having low water solubility such as crude oils, gasolines, diesel fuels, and aviation fuels. It is not suitable for use on polar fuels having appreciable water solubility, such as methyl and ethyl alcohol, acetone, and methyl ethyl ketone.

The concentrate has excellent wetting properties that can effectively combat Class A fires as well. It may also be used in conjunction with dry chemical agents to provide even greater fire suppression performance.

CHEMGUARD C306-MS Concentrate is ideal for fixed and emergency response firefighting systems designed to protect naval and aviation assets. Typical applications include:

- Military and civilian aircraft facilities
- Crash fire rescue (per US DOT FAA AC No. 150/5210-6D)
- On-board marine/naval fire suppression systems
- Storage tanks
- Docks/marine tankers

009787

Approvals, Listings, and Standards

CHEMGUARD C306-MS 3% AFFF Concentrate is approved, listed, qualified under, or meets the requirements of the following specifications and standards:

- US Department of Defense Military Specification
  - MIL-F-24385F: Fire Extinguishing Agent, Aqueous Film-Forming Foam (AFFF) Liquid Concentrate for Fresh and Sea Water.
- Underwriters Laboratories Inc. (UL)
  - UL Standard 162, Foam Liquid Concentrates
  - Fresh and Sea Water
- National Fire Protection Association (NFPA)
  - NFPA 403, Standard for Aircraft Rescue and Fire-Fighting Services at Airports
  - NFPA 409, Standard on Aircraft Hangars
  - NFPA 412, Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Fire Equipment
  - NFPA 414, Standard for Aircraft Rescue and Fire-Fighting Vehicles
  - NFPA 418, Standard for Heliports

Please contact Tyco Fire Protection Products Technical Services and/or refer to listing agency for current product and compatible hardware listings.

The environmentally-mindful CHEMGUARD C306-MS Concentrate formulation contains short-chain, C-6 fluoro-chemicals manufactured using a telomer-based process. The telomer process produces no PFOS, and these C-6 materials do not breakdown to yield PFOA. The fluorochemicals used in the concentrate meet the goals of the U.S. Environmental Protection Agency 2010/15 PFOA Stewardship Program.

ENVIRO-MINDED FORMULA C6

Foaming Properties

CHEMGUARD C306-MS 3% AFFF Concentrate may be effectively applied using most conventional foam discharge equipment at 3% dilution with fresh, salt, or hard water. For optimum performance, water hardness should not exceed 500 ppm expressed as calcium and magnesium.

Because of the low energy required to create foam with CHEMGUARD C306-MS Concentrate, the foam solution may be applied with aspirating and non-aspirating discharge devices. Aspirating discharge devices typically produce expansion ratios from 3.5:1 to 10:1, depending on the type of device and the flow rate. Non-aspirating devices, such as handline water fog/stream nozzles or standard sprinkler heads, typically produce expansion ratios from 2:1 to 4:1. Medium-expansion discharge devices typically produce expansion ratios from 20:1 to 60:1.

TYPICAL FOAM CHARACTERISTICS (Fresh and Sea Water)**

Proportioning Rate	3%
Expansion Ratio LE	9.5
25% Drain Time (min:sec)	3:30
50% Drain Time (min:sec)	5:45

**per EN 1568-3, 2008 protocol

Proportioning

CHEMGUARD C306-MS 3% AFFF Concentrate can be correctly proportioned using most conventional, properly calibrated, in-line proportioning equipment such as:

- Balanced and in-line balanced pressure pump proportioners
- Balanced pressure bladder tanks and ratio flow controllers
- Around-the-pump type proportioners
- Fixed or portable in-line venturi type proportioners
- Handline nozzles with fixed eductor/pick-up tubes

For immediate use: The concentrate may also be diluted with fresh or sea water to a 3% pre-mix solution.

For delayed use: Consult Technical Services for guidance regarding suitability of a pre-mix solution (fresh water only).

Materials of Construction Compatibility

CHEMGUARD C306-MS Concentrate compatibility with HDPE has been successfully evaluated using ASTM D1693-70 protocol under UL-162 standard. Concentrate corrosion studies with cold-rolled carbon steel (UNS G10100), 90-10 copper-nickel (UNS C70600), 70-30 nickel-copper (UNC N04400), bronze (UNS C90500), and CRES steel (UNS S30400) have been successfully completed per ASTM E527 protocol under MIL-F-24385F specification.

To avoid corrosion, galvanized pipe and fittings should never be used in contact with undiluted concentrate. Please refer to Technical Bulletin No. 59 for recommendations and guidance regarding compatibility of CHEMGUARD concentrates with common materials of construction in the firefighting foam industry.

Storage and Handling

CHEMGUARD C306-MS 3% AFFF Concentrate should be stored in the original supplied package (HDPE totes, drums, or pails) or in the foam system equipment recommended by Technical Services. The product should be maintained within the recommended 35 °F to 120 °F (2 °C to 49 °C) operational temperature range. If the concentrate freezes during transport or storage, full product serviceability can be restored upon thaw with gentle re-mixing.

Factors affecting the foam concentrate long-term effectiveness include temperature exposure and cycling, storage container, air exposure, evaporation, dilution, and contamination. The effective life of CHEMGUARD C306-MS Concentrate can be maximized through optimal storage conditions and proper handling.

CHEMGUARD foam concentrates have demonstrated effective firefighting performance with contents stored in the original package under proper conditions for more than 10 years.

CHEMGUARD C306-MS 3% AFFF Concentrate has been successfully evaluated by the US Naval Sea Systems Command for prolonged compatibility with other 3% AFFF concentrates qualified under MIL-F-24385F specification.

- Mixing with foam concentrates not vetted by MIL-F-24385F is not recommended.
- For immediate incident response, it is appropriate to use the concentrate in conjunction with comparable 3% AFFF products.

Inspection

CHEMGUARD C306-MS 3% AFFF Concentrate should be inspected periodically per NFPA 11 “Standard for Low-, Medium-, and High-Expansion Foam,” EN 13565-2 “Foam System Standard,” or other relevant standard. A representative concentrate sample should be sent to Tyco Fire Protection Products Foam Analytical Services or other qualified laboratory for quality analysis per the applicable standard. An annual inspection and sample analysis is typically sufficient, unless the product has been exposed to unusual conditions.

Ordering Information

Concentrate is available in commercial packaging only under CHEMGUARD C306-MS-C product designation and is not available for direct, contract government acquisition (per MIL-F-24385F packaging provision). Concentrate is available in pails, drums, totes or bulk shipment, with pail and drum containers being UL-162 compliant.

Part No.	Description	Shipping Weight	Cube
770809	Pail 5 gal (19 L)	45 lb (20.4 kg)	1.25 ft^3 (0.0353 m^3)
770810	Drum 55 gal (208 L)	495 lb (224.5 kg)	11.83 ft^3 (0.3350 m^3)
770811	Tote 265 gal (1000 L)	2463 lb (1117 kg)	50.05 ft^3 (1.42 m^3)

Safety Data Sheet (SDS) available at www.chemguard.com

Note: The converted metric values in this document are provided for dimensional reference only and do not reflect an actual measurement.

Chemguard Specialty Chemical and Fire Suppression Products

An Environmental Statement

Fluorine-containing organic surfactants, or fluorosurfactants, are used in everyday consumer and industrial products such as paints, waxes, cleaners, polishes, adhesives, inks and, notably, fire-fighting foams. There are no known substitutes that have the same functionality and outstanding performance characteristics. Often, fluorosurfactant products are misunderstood to be made from perfluorooctanoic acid (PFOA) or perfluorooctane sulfonate (PFOS), when in fact there are a large number of different types of fluorosurfactants in use.

Chemguard Specialty Chemical and Fire Suppression Products contain no significant levels of PFOA or PFOS. Neither PFOA nor PFOS is an intentional ingredient in any Chemguard products.

Over the past decade or so, there has been increasing concern about products that contain PFOA or PFOS. Both are thought to be persistent in the environment, bioaccumulative, and potentially toxic. The US Environmental Protection Agency became aware in the late 1990's that PFOS was found at very low levels in blood samples representing the general population.[1] However, studies show that blood levels have been declining in the past decades.[2] PFOA and PFOS are produced by the electrochemical fluorination (ECF) process practiced by several companies within the US and abroad, although, this production process is in decline. As a business decision based on precaution, 3M ceased commercial production of PFOS in 2002.[3]

However, given the scientific uncertainties regarding exposure routes and human health effects, the EPA does not believe there is any reason for consumers to stop using any consumer or industrial related products because of concerns about PFOA.[1] The limited, but still existing, stocks of such products are still allowed for use until supplies are exhausted.[4] Despite the low risks, the precautionary principle (i.e., caution due to uncertainty) requires that action be taken to further minimize any potential adverse effects these substances may pose. In 2006, the EPA initiated its "2010/15 PFOA Stewardship Program" in which industrial participants agree, in summary, to (1) reduce by 95% the product content and emissions of PFOA and precursor materials by 2010, and (2) eliminate such by 2015.

To distinguish PFOA and PFOS from fluorosurfactants that are in common use, it is necessary to have a sense of the chemical structures involved. Both PFOA and PFOS molecules contain a chain of 8 carbon atoms in which all the typical hydrogen atoms bonded to the carbons are substituted with fluorine atoms.[5] This chemical group is generally referred to as a "C8 perfluoroalkyl chain," or simply as "C8". The fluorine-carbon bond, also found in Teflon®[6]

products, is very strong, making the molecule resistant to degradation and adhesion. The C8 chain length has been preferred for fluorosurfactants because it gives optimum performance to a large number of product properties. Due to its common use, it has also received the most scrutiny, as mentioned above. The response by manufacturers, driven by EPA and other such regulatory authorities, has been to shift production to C6-based substances, which cannot degrade to C8. The EPA's 2010/15 PFOA Stewardship Program applies to all potential PFOA precursors, which includes C8 and longer chain lengths.

Furthermore, fluorosurfactants today are based on an entirely different production process, known as telomerization, as opposed to the ECF process mentioned above. Telomerization chemistry does not use or produce PFOS, however trace levels of PFOA may result as a byproduct. As a class, however, telomerization products have been shown in EPA studies to be neither toxic nor bioaccumulative.[7] Fluorosurfactants based on C6 telomerization chemistry cannot degrade into PFOA or PFOS.[8]

All Chemguard fluorosurfactants are derived from the telomerization process and are therefore substantially free of both PFOA and PFOS. Only trace levels of PFOA are present, and these originate as minor impurities in the raw materials that Chemguard relies on, as mentioned. At present, Chemguard Specialty Chemical products typically contain less than 5 ppm PFOA. As a practice, fluorosurfactant use in Fire Suppression foams is minimized by synergistic formulation with non-fluorinated surfactants and other components to provide maximum effectiveness. Therefore, Chemguard Fire Suppression foams typically contain less than 1 ppm PFOA. Chemguard is a participant in the EPA 2010/15 PFOA Stewardship Program and dedicated to ultimately eliminating C8 and longer chain chemistry from all products. As our conversion proceeds toward C6 chemistry, the PFOA level in our products is expected to fall well below 1 ppm, approaching the lower ppb level.

Chemguard is a conscientious and technology-driven company with a dedication to safety and product stewardship. We share the environmental concerns expressed by our customers and support the progressing regulatory environment in which we operate. We have the research, production and sales capabilities to respond with superior products that meet or exceed both our customers' expectations and our environmental responsibilities.

---

1 Source: www.epa.gov/oppt/pfoa/pubs/pfoainfo.htm.

2 (a) Environmental Health Perspectives, v. 113, n. 5, May 2005,
(b) Source: www.cdc.gov/exposurereport/perfluorinated_compounds2.htm.

3 Source: solutions.3m.com/wps/portal/3M/en_US/PFOS/PFOA/Information/Action.

4 EU and Canada regulations specify deadlines for use.

5 PFOA contains a 7 carbon perfluoroalkyl group, with the organic acid functionality representing the 8th carbon.

6 Registered trademark of DuPont.

7 Industrial Fire Journal, Sept. 2007, p. 26.

8 International Fire Protection, August 2008, p. 29.

Tier Classification Legal Notice

CAPE COD MEDIA GROUP

Order Confirmation

Ad Order Number	Customer	PO Number
0000605375	HORSLEY WITTEN GROUP INC.	
Sales Rep.	**Customer Account**	**Ordered By**
mcdermottf	600042652	Trisha Rood
	Customer Address	**Customer Fax**
	90 ROUTE 6A SANDWICH MA 02563 USA	**Customer EMail**
	Customer Phone	
	508-833-6600	

Total Amount	Payment Method	Payment Amount	Amount Due
$195.99		$0.00	$195.99

Ad Number	Pick Up	Placement	Position
0000605375-01		Legals CC - CLS	Legal Ads C-Legal
Run Dates		**Classification:** Legal Ads CLS	
11/13/2017			

NOTICE OF TIER CLASSIFICATION
BARNSTABLE MUNICIPAL AIRPORT
242 BARNSTABLE ROAD, HYANNIS, MASSACHUSETTS
RELEASE TRACKING NUMBER 4-24672

A release of oil and/or hazardous materials has occurred at this location, which is a disposal site as defined by M.G.L. c. 21E, § 2 and the Massachusetts Contingency Plan, 310 CMR 40.0000. To evaluate the release, a Phase I Initial Site Investigation was performed pursuant to 310 CMR 40.0480. The site has been classified as TIER I pursuant to 310 CMR 40.0500. On November 10, 2017, the Barnstable Municipal Airport management filed a TIER I Classification Submittal with the Department of Environmental Protection (MassDEP). To obtain more information on this disposal site, please contact Horsley Witten Group, Inc., 90 Route 6A, Sandwich, Massachusetts 02563, (508) 833-6600. The Tier Classification Submittal and the disposal site file can be viewed at MassDEP website using Release Tracking Number (RTN) 4-26347 at http://public.dep.state.ma.us/SearchableSites2/Search.aspx or at MassDEP, Southeast Regional Office, 20 Riverside Drive, Lakeville, Massachusetts, 02347, (508) 946-2700. Additional public involvement opportunities are available under 310 CMR 40.1403(9) and 310 CMR 40.1404.
11/13/17

Signature of approval: _____