Naval Facilities Engineering Systems Command Washington
Washington, D.C.

Final

Per- and Polyfluoroalkyl Substances
Site Inspection Report
Site 10 - Fire Testing Area

Naval Research Laboratory – Chesapeake Bay Detachment
Chesapeake Beach, Maryland

June 2022

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Prepared for NAVFAC Washington
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Executive Summary

The use of aqueous film-forming foam (AFFF) for fire suppressant testing has been conducted since 1968 and is currently ongoing at Site 10 - Fire Testing Area at the Naval Research Laboratory – Chesapeake Bay Detachment (NRL-CBD) in Chesapeake Beach, Maryland. This has prompted the Department of the Navy (Navy) to conduct a per- and polyfluoroalkyl substances (PFAS) Site Inspection (SI) at the installation. PFAS are considered "emerging chemicals of environmental concern" by the United States Environmental Protection Agency (USEPA) and the Department of Defense (DoD).[1] There are currently no legally enforceable federal or Maryland standards for PFAS.

The following objectives of the PFAS SI at Site 10 were identified in the *Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection Naval Research Laboratory – Chesapeake Bay Detachment, Chesapeake Beach, Maryland* (CH2M, 2020a), hereafter referred to as the SAP:

- Determine whether PFAS are present in soil, surface water, and/or sediment, and if present, determine whether concentrations of perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS) exceed screening levels[2].
- Further refine the lateral and vertical extents of PFOS, PFOA, and PFBS in groundwater in the surficial aquifer and determine whether current concentrations exceed screening levels[2].
- Determine the current concentrations of PFAS in the Piney Point aquifer, and if present, whether current concentrations of PFOS, PFOA, and PFBS exceed screening levels[2].
- Determine the potential for PFOS, PFOA, and PFBS (if present) in groundwater and surface water to migrate off-Base.
- Further characterize the nature of total petroleum hydrocarbons (TPH) in surficial groundwater at the site from burning of gasoline, diesel, and jet propulsion fuel at the site.

The SI field investigation was conducted between September 2020 and February 2021 and consisted of 1) installation of five monitoring wells (screened in the surficial aquifer); 2) collection of soil samples in potential AFFF release areas; 3) groundwater sampling of newly installed and existing monitoring wells screened in the surficial aquifer and deep Piney Point aquifer; 4) collection of surface water and sediment samples from streams and ponds located to the north and south of Site 10; 5) installation of staff gauges in streams and ponds located to the north and south of Site 10.

Table ES-1 lists each specific objective from the Site 10 SI SAP (CH2M, 2020), followed by the conclusions and recommendations of the SI with respect to each objective.

1 The most current version of DoD Instruction 4715.18 (DoD, 2019) defines emerging chemicals of environmental concern as "Chemicals relevant to the DoD that are characterized by a perceived or real threat to human health or the environment and that have new or changing toxicity values or new or changing human health or environmental regulatory standards. Changes may be due to new science discoveries, detection capabilities, or exposure pathways."

2 Subsequent to issuance of *the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection* in August 2020, the screening levels for PFBS were revised to reflect the updated chronic reference dose for PFBS (DoD, 2021).

Table ES-1. Summary of Site Inspection Objectives, Findings/Conclusions, and Recommendations
PFAS Site Inspection Report Site 10 – Fire Testing Area
NRL-CBD, Chesapeake Beach, Maryland

Site Inspection Objective	Investigation Findings/Conclusions	Recommendations for Additional Characterization during RI
Determine whether PFOS, PFOA, and PFBS are present in soil, surface water, and/or sediment, and if present, determine whether concentrations exceed human health screening levels	• PFOA was detected in soil, surface water, and sediment; however, only concentrations in surface water exceeded screening levels. • PFOS was detected in soil, surface water and sediment; concentrations exceeded screening levels in all media. • PFBS was detected in soil and surface water; however, all detected concentrations were below screening levels. PFBS was not detected in the sediment. • While it was not a site inspection objective outlined in the SAP, an HHRS was completed and PFOS was identified as a COPC for surface and subsurface soil and surface water. No COPCs were identified for sediment.	• Collect additional soil samples (surface and subsurface) to define the extent of PFOS in soil. Samples will be analyzed for PFAS in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued. • Collect additional surface water and sediment samples. Samples will be analyzed in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued. Although PFOS, PFOA and PFBS were not identified as COPCs in sediment based on the SI data set, additional sediment sampling will be conducted to further refine the presence of PFAS in sediment. • Install and sample permanent monitoring wells to further refine the lateral and vertical extent of PFOA and PFOS in the unconfined surficial aquifer beneath NRL-CBD and beyond the installation boundary and monitor for potential migration. Samples will be analyzed for PFAS in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued. • Perform a quantitative human health risk assessment (HHRA). The HHRA will evaluate potential risks to human health associated with exposure to PFOS, PFOA, and PFBS in soil, groundwater, and surface water and sediment. • Perform an ecological risk screening (ERS). The ERS should be conducted using the most up to date science available in the literature at the time of performance and in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued.
Further refine the lateral and vertical extents of PFOS, PFOA and PFBS in groundwater in the surficial aquifer and determine whether current concentrations exceed screening levels	• PFOA and PFOS were detected at concentrations exceeding screening levels at wells screened at the water table within the unconfined surficial aquifer beneath Site 10 and at downgradient monitoring wells located at the installation boundary. • PFBS was detected in the surficial aquifer; however, all detected concentrations were below the screening level. • Based on the HHRS, PFOS and PFOA were identified as COPCs for groundwater from the surficial aquifer.	

Table ES-1. Summary of Site Inspection Objectives, Findings/Conclusions, and Recommendations
PFAS Site Inspection Report Site 10 – Fire Testing Area
NRL-CBD, Chesapeake Beach, Maryland

Site Inspection Objective	Investigation Findings/Conclusions	Recommendations for Additional Characterization during RI
Determine the current concentrations of PFOS, PFOA and PFBS in the Piney Point aquifer, and if present, whether current concentrations exceed screening levels	• PFOA, PFOS, and PFBS were detected in the Piney Point aquifer; however, all detected concentrations were below screening levels. • Based on the HHRS, no COPCs were identified for Piney Point groundwater.	• Collect groundwater samples from monitoring wells screened within the Piney Point aquifer on Base, which is a source of drinking water to nearby private wells, to provide data in support of temporal trend analysis.
Determine the potential for PFOS, PFOA, and PFBS (if present) in groundwater and surface water to migrate off-Base	• In the stream north of the site, PFOA and PFOS were detected at concentrations exceeding human health screening levels throughout the stream. • In the stream south of the site, PFOS was detected at concentrations exceeding human health screening levels at the two most downgradient locations immediately downgradient of the wastewater treatment plant. • Based on the HHRS, PFOS was identified as a COPC for surface water. • Based on results of the staff gauges, both streams north and south of Site 10 are gaining streams indicating groundwater contributes to surface water. • Exceedances of human health screening levels for PFOS and PFOA are present in groundwater and surface water near the Base boundary and there is potential for PFOS and PFOA to migrate off-Base.	• Collect water samples from the wastewater treatment plant, located downgradient of Site 10, to determine if the wastewater treatment plant is contributing to PFAS in surface water. • Collect surface water samples in down-gradient drainages to define the extent of PFOS in surface water. Samples will be analyzed for PFAS in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued.
Further characterize the nature of TPH impacts from kerosene, diesel, gasoline, and jet propulsion fuel burning in the surficial aquifer at the site.	• TPH-DRO and TPH-GRO were detected at concentrations exceeding the screening level in the surficial aquifer. Concentrations of TPH were relatively similar to those detected in 2009 with the exception of groundwater at CBD-AOA-MW02 where the concentration of TPH-DRO is 810 µg/L.	• Collect groundwater samples to define the extent of fuel-related constituents in the surficial aquifer.

Note:

COPC = constituent of potential concern

DRO = diesel range organics

GRO = gasoline range organics

HHRS = human health risk screening

RI = Remedial Investigation

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Acronyms and Abbreviations

AFFF	aqueous film-forming foam
ASD	Assistant Secretary of Defense
AST	above-ground storage tank
bgs	below ground surface
CLEAN	Comprehensive Long-term Environmental Action – Navy
COPC	constituent of potential concern
DI	deionized
DO	dissolved oxygen
DoD	Department of Defense
DRO	diesel range organics
EP	Extraction Procedure
ERS	ecological risk screening
GRO	gasoline range organics
HHRA	human health risk assessment
HHRS	human health risk screening
HI	Hazard Index
HQ	hazard quotient
IDW	investigation-derived waste
LC-MS/MS	liquid chromatography/mass spectrometry/mass spectrometry
MDC	maximum detected concentration
MDE	Maryland Department of the Environment
MS	Matrix Spike
MSD	Matrix Spike Duplicate
µg/L	microgram(s) per liter
NAVFAC	Naval Facilities Engineering Systems Command
Navy	Department of the Navy
ng/g	nanogram(s) per grams
ng/L	nanogram(s) per liter
NRL-CBD	Naval Research Laboratory – Chesapeake Bay Detachment
ORP	oxidation-reduction potential
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonic acid
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QSM	Quality Systems Manual
RI	Remedial Investigation
RSL	regional screening level

SAP	Sampling and Analysis Plan
SI	Site Inspection
SL	screening level
SVOC	semivolatile organic compounds
TPH	total petroleum hydrocarbons
UCL	upper confidence limit
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds
WQP	water quality parameter

SECTION 1

Introduction

This report presents the data and findings obtained from a per- and polyfluoroalkyl substances (PFAS) Site Inspection (SI) conducted at Site 10 - Fire Testing Area at the Naval Research Laboratory – Chesapeake Bay Detachment (NRL-CBD) in Chesapeake Beach, Maryland. This report was prepared under the Department of the Navy (Navy), Naval Facilities Engineering Systems Command (NAVFAC), Comprehensive Long-term Environmental Action – Navy (CLEAN) 9000, Contract N62470-16-D-9000, Contract Task Order 4532, for submittal to NAVFAC Washington and the Maryland Department of the Environment (MDE).

PFAS are considered "emerging chemicals of environmental concern" by the United States Environmental Protection Agency (USEPA) and the Department of Defense (DoD).[3] There are currently no legally enforceable federal or Maryland standards for PFAS and have not been previously evaluated at Navy sites (USEPA, 2016a).

The field activities discussed in this report were conducted between September 2020 and February 2021 in accordance with the Uniform Federal Policy (UFP) – Sampling and Analysis Plan (SAP) titled *Final Sampling and Analysis Plan, Site 10 Fire Testing Area Inspection, Naval Research Laboratory – Chesapeake Bay Detachment, Chesapeake Beach, Maryland* (CH2M, 2020a), hereinafter referred to as the "SAP." Field activities included monitoring well and staff gauge installations, and soil, groundwater, surface water, and sediment sampling. A summary of the technical approach for conducting these activities and the field and laboratory analytical results are detailed below.

The objectives of the Site 10 SI were to:

- Determine whether perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS) are present in soil, surface water, and/or sediment, and if present, determine whether concentrations exceed the PFAS screening levels[4] for soil, surface water, and/or sediment.
- Further refine the lateral and vertical extents of PFOS, PFOA, and PFBS in groundwater in the surficial aquifer on-Base and determine whether current concentrations of PFAS exceed the PFAS screening levels[4] for groundwater.
- Determine the current concentrations of PFOS, PFOA, and PFBS in the Piney Point aquifer, and if present, whether current concentrations exceed the PFAS screening levels[4].
- Determine the potential for PFOS, PFOA, and PFBS in groundwater, and if present in surface water, to migrate off-Base.
- Further characterize the nature of total petroleum hydrocarbons (TPH) in surficial groundwater from kerosene, gasoline, and jet propulsion fuel burning at the site.

The activities completed to support the objectives of the SI included:

- Soil borings and sampling
- Installation of surficial monitoring wells
- Synoptic groundwater elevation survey

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3 The most current version of DoD Instruction 4715.18 (DoD, 2019) defines emerging chemicals of environmental concern as "Chemicals relevant to the DoD that are characterized by a perceived or real threat to human health or the environment and that have new or changing toxicity values or new or changing human health or environmental regulatory standards. Changes may be due to new science discoveries, detection capabilities, or exposure pathways."

4 Screening levels for PFOA and PFOS are based on a hazard quotient (HQ) of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense September 2021memorandum (DoD, 2021). Subsequent to issuance of *the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection* in August 2020, the screening levels for PFBS were revised to reflect the updated chronic reference dose for PFBS (DoD, 2021).

- Collection of soil (surface and subsurface), groundwater, surface water, and sediment
- Installation of staff gauges in drainage areas downgradient of site
- Gauging surface water elevations in streams

The SI Report is organized as follows:

- **Section 1** – Introduction
- **Section 2** – Background and Physical Setting
- **Section 3** – Investigation Methodology
- **Section 4** – Site Investigation Results
- **Section 5** – Human Health Risk Screening
- **Section 6** – Conclusions and Recommendations
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Tables and figures are provided at the end of each respective section. Appendixes are included at the end of the report.

SECTION 2

Background and Physical Setting

This section presents background information on NRL-CBD and Site 10, including site history, previous investigations, and the conceptual site model.

2.1 Installation and Site Background

2.1.1 Naval Research Laboratory-Chesapeake Bay Detachment Background

NRL-CBD is located at 5813 Bayside Road in Calvert County, Maryland, south of the town of Chesapeake Beach, Maryland. NRL-CBD is located approximately 40 miles southeast of Washington, D.C. and occupies approximately 160 acres of land along the western shoreline of the Chesapeake Bay (**Figure 2-1**). The facility is bounded by the Chesapeake Bay to the east and offsite residential housing areas to the north, south, and west. The facility is separated into an eastern and western portion, separated by Bayside Road (Maryland State Route 261).[5]

The mission of NRL-CBD is to provide and maintain facilities for use by the research divisions of the Naval Research Laboratory – Washington, D.C., for the testing, development, and evaluation of radar, radio, optical, and fire control equipment, along with other research projects requiring a maritime environment or open skies, but with land-based support facilities (NEESA, 1984).

The original acquisition of land for NRL-CBD was made in 1941, and construction progressed rapidly during World War II. Major expansion occurred in 1953 and 1954 with construction of a large laboratory building, shop facilities, and complete utility systems (NEESA, 1984).

2.1.2 Site 10 Background

Site 10 - Fire Testing Area, formerly known as Area of Concern A, is located near the center of the western portion of NRL-CBD (**Figures 2-1** and **2-2**). Navy Court bisects the site, separating the larger, northern area of the site from the smaller, southern area.

Since approximately 1968, Site 10 has been used to test extinguishing agents on fires started with various fuel sources (Price, 1988a, 1988b; MDE, 1988). The tests are conducted by creating a fire on a concrete testing pad by the open burning of petroleum products that included gasoline; diesel; jet-propulsion fuel, Grade 4; and jet-propulsion fuel, Grade 5 (Price, 1988b). As reported in the *Initial Assessment Study* (Naval Energy and Environmental Support Activity [NEESA], 1984), "Fire testing operations are currently conducted at NRL-CBD. These operations utilize two open burning areas and two smokehouses. Fire suppressants tested include AFFF, PKP (potassium bicarbonate), halons, and protein foam ("bean soup"). Typically, wastewater containing these solutions is drained into a holding pit and allowed to absorb slowly into the soil." This practice was conducted from the late-1960s until the mid-1980s. In the mid-to-late 1980s, several improvements were made to Site 10, including a new testing pad, a concrete-lined collection pit, and new conveyance piping from Site 10 structures to the new collection pit. These new improvements served to contain the wastewater for off-site disposal and prevent releases of wastewater to the environment and included pumping the wastewater into two 20,000-gallon above ground storage tanks. This practice was conducted from the mid-1980s until approximately 1999, based on consultation with current installation personnel familiar with the Site 10 historical practices. More recently, the use of the concrete-lined collection pit and the associated conveyance piping has been discontinued and instead wastewater is managed by conveyance piping connected to portable steel tank for off-site disposal. The fire

[5] In addition to the facility at 5813 Bayside Drive, NRL-CBD also operates a boat from a small dock area (referred to as the Navy Dock) located in downtown Chesapeake Beach, Maryland. The Navy Dock is approximately 1.7 miles north of the main NRL-CBD facility.

testing area and associated supporting buildings/structures are currently used for fire testing activities as of August 2021 and fire-fighting foams continue to be tested.

2.2 Previous Investigations

The 1984 *Initial Assessment Study* first documented historical activities and potential for hazardous releases at Site 10. Soil at Site 10 was investigated for petroleum related constituents (volatile organic compounds [VOCs] and Extraction Procedure [EP] Toxicity, lead) between 1988 and 1989. During this timeframe MDE and NRL-CBD exchanged a series of correspondence that led to NRL-CBD installing four soil borings around the collection pit with analytical samples collected and analyzed for VOCs and EP Toxicity, lead. The results of the analyses indicated that none of the parameters tested were present in any of the soil samples. Based on the analytical results, MDE concluded that no evidence of soil or groundwater impacts were apparent at the site and no further assessment was warranted (MDE, 1989).

In 2009, a Site Assessment was performed to assess the impacts to surficial groundwater at and downgradient of Site 10. The concentrations of VOCs, semivolatile organic compounds (SVOCs), and metals were below conservative tap water ingestion-based evaluation criteria in groundwater samples collected from the surficial aquifer at Site 10. Additionally, TPH- diesel range organics (DRO) and TPH-gasoline range organics (GRO) were detected in groundwater; however, the cumulative Hazard Index (HI) from the noncarcinogenic constituents (including TPH-DRO and TPH-GRO) was 0.9, which was below the HI value of 1 that USEPA and MDE use as a threshold to indicate the potential for noncancer adverse health effects. Soil did not appear to be impacted based on field screening performed during the Site Assessment; this determination also was supported by previous soil sampling performed in November 1989 (CH2M, 2009). Based on the results of the Site Assessment, no further action was recommended for groundwater at Site 10 for fuel related constituents.

In 2016, a records review was conducted as a part of the Navy's evaluation to identify and prioritize sites for investigation of drinking water resources, on- or off-Base, that were thought to be vulnerable to PFAS contamination from past Navy releases of PFAS. This records review identified the residential areas near NRL-CBD using private wells for drinking water supply. Additionally, it was identified that these private drinking water wells are on average 300 feet deep and screened within the Piney Point aquifer. The identification of drinking water resources led to a Priority 1 ranking and initiated the pre-SI investigation.

Prior to the SI, in 2017, an evaluation for the presence of PFAS in groundwater from the surficial aquifer and Piney Point aquifer was conducted on-Base. Analysis of PFAS in groundwater was limited to PFOA, PFOS, and PFBS (CH2M, 2018). The results indicated PFAS are present in surficial groundwater but were not detected in groundwater from the deeper Piney Point aquifer (CH2M, 2018). Concentrations of PFOS ranged between 1.01 and 234,000 nanograms per liter (ng/L). Concentrations of PFOA ranged between 21.5 and 14,900 ng/L. Concentrations of PFBS ranged between 7.09 and 1,220 ng/L. The highest PFAS concentrations detected in surficial groundwater were from monitoring wells near the center of Site 10, and concentrations decreased with distance from Site 10 (**Figure 2-3**). The assessment concluded that Site 10 was likely the source of a PFAS release to groundwater. Additionally, the assessment determined the surficial aquifer is isolated from the underlying Piney Point aquifer by the clay confining unit (Calvert confining unit) present beneath the site. Therefore, the transport pathway into downgradient private water supply wells near NRL-CBD did not appear to be complete based on available data, and off-Base drinking water sampling was not recommended. However, additional monitoring well installation and soil and groundwater sampling were recommended at the site to verify there are no continuing soil sources and to define the extent of PFAS in groundwater (CH2M, 2018).

In 2018, new information was provided to the Navy by a community resident indicating that there could be private wells screened in the surficial aquifer. Based on this new information and the potential that not all drinking water well completion reports are available in the County record system, the Navy initiated off-Base sampling of private drinking water wells (CH2M, 2020b). Eighty parcels were identified within the off-Base sampling areas, 25 of which were determined to be vacant based on property records obtained from

Calvert County. Of the 55 parcels identified with a private residential well, samples were collected from 42 parcels, and were analyzed for 14 PFAS listed in Method 537 revision 1.1 (USEPA, 2009). PFAS were detected in three of the 42 privately-owned, off-Base drinking water supply wells; however, detections of PFOA and PFOS were below the Lifetime Health Advisory of 70 ng/L (**Figure 2-4**). Also, PFBS was detected at one location but was below the screening level of 400,000 ng/L (subsequently revised to 600 ng/L in 2021). As such, no further action was warranted for the off-Base drinking water wells at that time (CH2M, 2020b).

2.3 Physical Setting

This section describes the physical setting of NRL-CBD, including geologic features relevant to this investigation.

2.3.1 Climate

Calvert County lies within the humid subtropical climate zone, bounded on the east by the Chesapeake Bay and on the west by the Patuxent River (https://www.weather.gov/jetstream/climates); summers are hot and humid, and winters are mild to chilly. The monthly precipitation distribution is fairly uniform throughout the year (https://www.weather.gov/lwx/bwinme) and the average yearly precipitation is 43.1 inches (https://www.calvertcountymd.gov/825/Location-and-Climate). The average summer temperature it 74.4 degrees Fahrenheit with the warmest month typically July, and the average winter temperature is 36.4 degrees Fahrenheit with the coldest month typically January (https://www.calvertcountymd.gov/825/Location-and-Climate and https://www.weather.gov/lwx/bwinme). The average yearly snowfall is 19.4 inches and the average duration of freeze-free period is 200 days (https://www.calvertcountymd.gov/825/Location-and-Climate).

2.3.2 Topography and Surface Drainage Features

The topography of Site 10 gently slopes to the east, with grassy areas separating the Fire Testing Pad, Fire 1 Test Chamber, Building 313 Fire Testing Building, Pump House, and Wastewater Collection Pit (concrete-lined) in the northern area of the site, and Building 314 Fire Testing Building in the southern area of the site (**Figure 2-5**). The elevation at the northern boundary Site 10 is approximately 98 feet above mean sea level and the elevation at the southeastern and western boundaries of Site 10 are approximately 125 feet above mean sea level. Surface drainage, as well as surficial groundwater flow at the facility, is controlled by topography and surface water features such as ponds, ravines, and the Chesapeake Bay. North of Navy Court, surface runoff moves northeast and east, toward the stormwater pond and Chesapeake Bay, respectively, and south of Navy Court, surface runoff moves southeast toward a stream that discharges into the Chesapeake Bay to the east.

2.4 Land Use

Land use at NRL-CBD is industrial and consists of laboratory buildings, shop facilities, and other structures that support its mission. Site 10 is currently used as a fire suppression testing area, gasoline, diesel, and other fuels continue to be used at Site 10 for fire testing activities. Public access is restricted, and there are no planned land use changes for the future. There is no residential land use at Site 10 or within NRL-CBD.

2.4.1 Geologic Setting

2.4.1.1 Regional Geology

NRL-CBD lies within the Atlantic Coastal Plain Physiographic Province. The sediments of the Coastal Plain are a thick sequence of unconsolidated sands, clays, and gravels and, at times, indurated lime or iron-cemented sands (NEESA, 1984). At NRL-CBD, deposits of the Miocene series of the Chesapeake group are evident at the surface and include the Choptank Formation, which ranges from 75 to 100 feet thick, and the underlying Calvert Formation, which is approximately 150 feet thick; both formations slope to the southeast (NEESA, 1984). The

Choptank Formation is characterized by interbedded brown to yellow, very fine-grained to fine-grained sand, and gray to dark bluish-green argillaceous silt, calcareous sandstone, and prominent shell beds (Maryland Geological Survey, 1968). The Calvert Formation is separated into two members: the upper Plum Point Marls Member and the Fairhaven Member. Plum Point Marls Member consists of interbedded dark green to dark bluish-gray, fine-grained argillaceous sand and sandy clay with prominent shell beds, and locally silica-cemented sandstones. The Fairhaven Member consists of greenish-blue diatomaceous clay that weathers to pale gray, pale brown to white fine-grained argillaceous sand, and greenish-blue sandy clay (Maryland Geological Survey, 1968).

Deposits of the Eocene series of the Pamunkey Group underlie the Calvert Formation and include the Piney Point Formation and Nanjemoy Formation. The Piney Point Formation consists of light gray to yellowish, glauconitic, medium- to coarse-grained sand and interbedded shell beds 10 to possibly 280 feet thick. The Nanjemoy Formation consists of dark green to gray, argillaceous, glauconitic, fine- to medium-grained sand with minor gray to pale brown clay, with the Marlboro Clay Member at base. The Marlboro Clay Formation is a pink to gray, homogeneous plastic clay with local lenses of very fine-grained white sand and up to 30 feet thick; present only west of the Chesapeake Bay (Maryland Geological Survey, 1968). The Nanjemoy Formation slopes southeast and is approximately 200 feet thick in the vicinity of NRL-CBD (NEESA, 1984).

2.4.1.2 Site Geology

At Site 10, the surficial geology is composed of clayey silt, poorly graded silty sands, and silty clays underlain by silty lean-to-fat clays. At approximately 10 to 30 feet below ground surface (bgs), the surficial geology is underlain by the Calvert confining unit, which consists of fat-to-lean clay and is continuous across the Base (CH2M, 2018). The confining unit varies in thickness from approximately 66 to 113 feet (CH2M, 2018). Below this confining unit is the Piney Point formation. A middle confining bed, comprised of the Nanjemoy Formation and Marlboro Clay, underlies the Piney Point formation from approximately 230 to 400 feet bgs, which in turn is underlain by the Aquia formation at approximately 400 to 600 feet bgs (Achmad and Hansen, 1997).

2.4.2 Hydrogeologic Setting

Major aquifers in the region include (from shallow to deep), the surficial, Piney Point/Nanjemoy, Aquia, Magothy, Upper Patapsco, and Lower Patapsco aquifers (Andreasen, D.C., Achmad, G., and Staley, A.W., 2013). NRL-CBD is underlain by the surficial aquifer from ground surface to approximately 50 feet bgs. The surficial aquifer transitions into a thick green clay confining unit that extends to approximately 200 feet bgs. This confining unit is believed to be laterally continuous and fully confining. Below this confining unit is the Piney Point aquifer, the extent of which is unknown below the facility (CH2M, 2017). Beneath NRL-CBD, the Calvert and Nanjemoy/Marlboro confining units serve as a barrier to groundwater migration between the first water zones within the surficial units, which are not considered significant drinking water sources, and the deeper regional aquifers.

2.4.3 Groundwater Flow

At Site 10, a groundwater divide is present within the surficial aquifer and extends along Navy Court (**Figure 2-5**). Surficial groundwater flow north of Navy Court migrates towards the north-northeast and flow south of Navy Court migrates to the south-southeast. Groundwater flow in the surficial aquifer in the immediate vicinity of the burn pads is to the north-northeast toward the stormwater pond approximately 700 feet north-northeast of Site 10. Groundwater flow in the Piney Point aquifer is generally to the northeast (**Figure 2-6**). It is possible that deep groundwater flow may have a stronger eastward component not observable with the current well network, or that flow to the northeast is driven by a paleochannel or pumping of the many Piney Point drinking water supply wells to the northeast.

2.4.4 Drinking Water

The two aquifers mainly in use for drinking water supply in Calvert County are the Piney Point/Nanjemoy aquifer and the Aquia aquifer. Because the southern Maryland region is almost entirely dependent on groundwater for its drinking water supply, these aquifers are considered a valuable natural resource. Drinking water at NRL-CBD is supplied by two on-Base production wells installed in 1953 at depths of 514 and 540 feet bgs, within the Aquia aquifer (Maryland Geological Survey, 1984). Samples have been collected from the on-Base drinking water source, most recently in November 2020, and analyzed for PFAS; there were no detections of PFAS.

The residential areas adjacent to and within 1 mile of NRL-CBD (**Figure 2-4**) use private wells for drinking water supply (Calvert County, 2015), and at least one well identified within 1 mile of NRL-CBD was screened in the surficial aquifer. These private wells average 300 feet deep and are believed to be screened in the Piney Point aquifer.

\\dc1vs01\GISNavyClean\WASHINGTON\NavalResearchLab\Chesapeake_Bay\MapFiles\Site10\PFAS_SIReport\Figure2-1_NRL-CBD_Site10_BaseLocationMap.mxd 8/19/2021 jcarr3



Legend

- Road
- Naval Research Laboratory-Chesapeake Bay Detachment (NRL-CBD) Base Boundary

N

0 200 400 Feet

1 inch = 400 feet

Imagery: Calvert County, MD - 2017

Figure 2-1
Base Location Map
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

ch2m

\\dc1vs01\GISNavyClean\WASHINGTON\NavalResearchLab\Chesapeake_Bay\MapFiles\Site10\PFAS_SIReport\Figure_2-2_NRL-CBD_Site10_SiteLayout.mxd 11/15/2021 jcarr3



Legend

- Direction of Overland Flow
- Elevation Contour - 10ft Interval
- Surface Water Centerline
- Direction of Stream Flow
- Surface Water
- Site 10 Boundary
- NRL-CBD Base Boundary

N

0 150 300 Feet

1 in = 300 ft

Imagery: Calvert County, MD - 2017

Figure 2-2
Site Location and Layout Map
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

\\dc1vs01\GISNavyClean\WASHINGTON\NavalResearchLab\Chesapeake_Bay\MapFiles\Site10\PFAS_SIReport\Figure_2-3_NRL-CBD_Site10_PFOS_PFOA_PFBS_2017Results.mxd11/18/2021jcarr3

CHESAPEAKE BAY

BKG-MW01*	3/20/2017
Well Depth	35.2
PFBS	4.1 U
PFOA	2.05 U
PFOS	7.19 J

AOA-MW01	
Well Depth	16.9
Date	*8/12/2009*
TPH-DRO (µg/L)	**270***
TPH-GRO (µg/L)	7.1 J*
Date	*3/21/2017*
PFBS	280 J
PFOA	8,260
PFOS	65,500

AOA-MW05	3/17/2017
Well Depth	35.2
PFBS	4.07 U
PFOA	2.03 U
PFOS	1.01 J

AOA-MW06	3/17/2017
Well Depth	35.5
PFBS	3.94 U
PFOA	46.4
PFOS	2.71 J

AOA-MW08	3/17/2017
Well Depth	25.6
PFBS	258
PFOA	1,890
PFOS	1,330

AOA-MW11	3/23/2017
Well Depth	287.5
No detections	

AOA-MW07	
Well Depth	26.1
Not sampled in 2017	

SO4-MW01	3/17/2017
Well Depth	25.6
PFBS	8.44
PFOA	21.5
PFOS	266

AOA-MW03	
Well Depth	9.1
Date	*8/12/2009*
TPH-DRO (µg/L)	**350**
TPH-GRO (µg/L)	21 U
Date	*3/21/2017*
PFBS	1,220
PFOA	14,900
PFOS	341

AOA-MW04	
Well Depth	9.8
Date	*8/12/2009*
TPH-DRO (µg/L)	**66 B**
TPH-GRO (µg/L)	21 U
Date	*3/21/2017*
PFBS	222 J
PFOA	11,300
PFOS	73,600

AOA-MW02	
Well Depth	15.1
Date	*8/12/2009*
TPH-DRO (µg/L)	**200**
TPH-GRO (µg/L)	**57 K**
Date	*3/21/2017*
PFBS	215 J
PFOA	7,110
PFOS	234,000

AOA-MW12	3/27/2017
Well Depth	293.7
No detections	

AOA-MW13	3/27/2017
Well Depth	219.1
No detections	

BKG-MW02	3/20/2017
Well Depth	43.9
PFBS	3.97 U
PFOA	1.98 U
PFOS	0.893 U

AOA-MW09	
Well Depth	25.4
Not sampled in 2017	

HVGGW09	
Well Depth	25.0
Not sampled in 2017	

SO3-MW01	3/17/2017
Well Depth	31.7
PFBS	7.09 J
PFOA	116
PFOS	1,200

HVGGW10	
Well Depth	29.8
Not sampled in 2017	

AOA-MW10*	3/21/2017
Well Depth	20.3
PFBS	28.7
PFOA	365
PFOS	341

BKG-MW03	3/20/2017
Well Depth	28.7
PFBS	3.88 U
PFOA	1.94 U
PFOS	1.3 J

AOA-MW14	3/22/2017
Well Depth	158.1
No detections	

SO3-MW02	3/17/2017
Well Depth	28.9
PFBS	17.5
PFOA	85.3
PFOS	105

700
7,000
400
70,000
70
40
7,000
700
70

Navy Ct
Bayside Rd

Notes:
PFBS - Perfluorobutanesulfonic acid
PFOS - Perfluorooctane Sulfonate
PFOA - Perfluorooctanoic acid
well depth is feet below ground surface
PFAS results are reported as nanograms per liter (ng/L)
µg/L - micrograms per liter
B - Analyte not detected above the level reported in blanks
J - Analyte detected, concentration is estimated
K - Analyte present. Value may be biased high. Value may be lower
U - Not detected
D - Sample was diluted prior to analysis
Bold text indicates exceedance of MD Cleanup Standard
*Duplicate sample collected at this location; highest detection is reported

Legend

- Existing Piney Point Aquifer Monitoring Well Location
- Existing Surficial Aquifer Monitoring Well Location
- PFBS Concentration Contour (dashed where inferred)
- PFOA Concentration Contour (dashed where inferred)
- PFOS Concentration Contour (dashed where inferred)
- Direction of Surficial Aquifer Groundwater Flow
- Surface Water Centerline
- Fire Testing Area Boundary
- NRL-CBD Base Boundary
- Surface Water

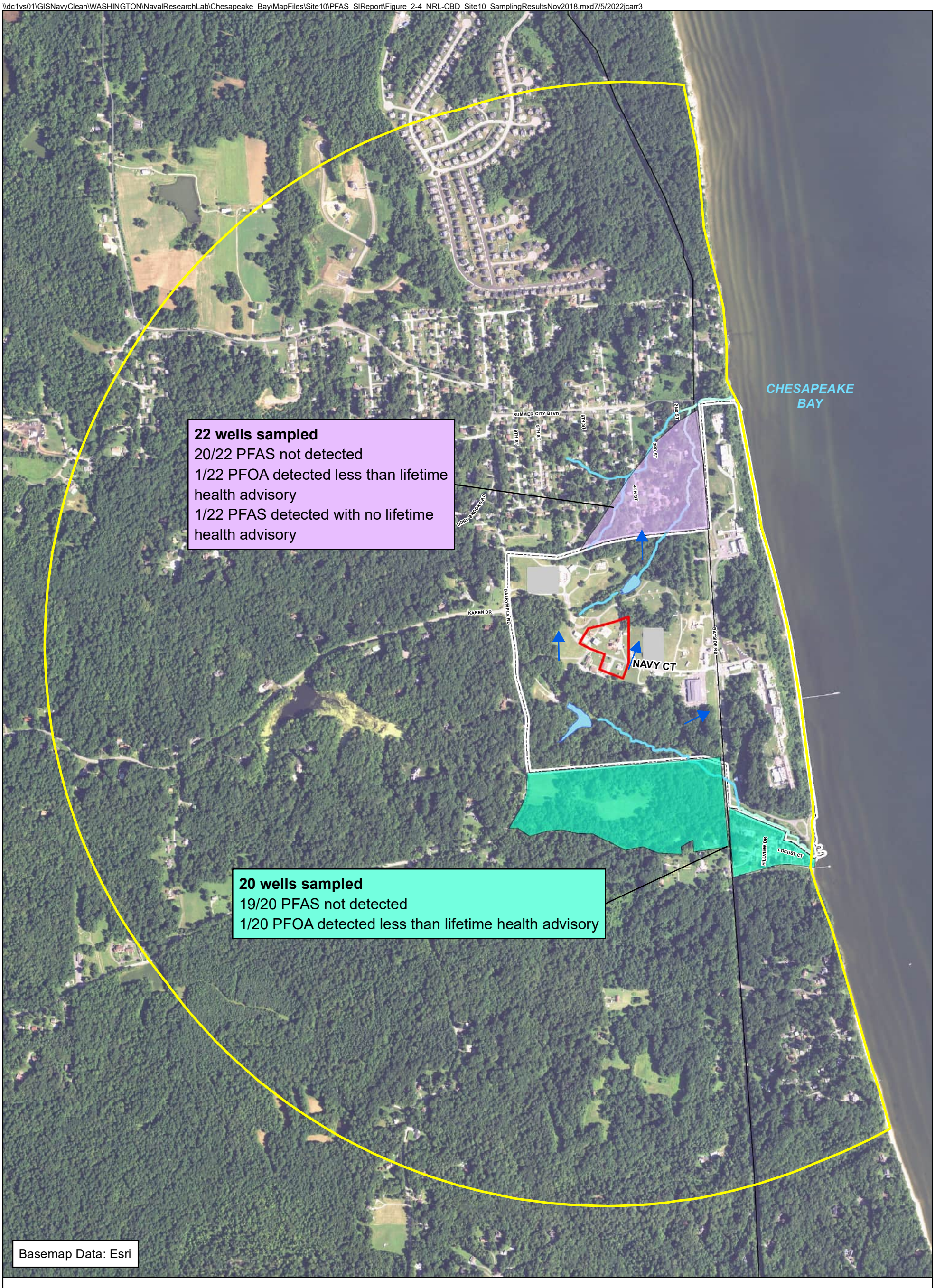
N

0 150 300
Feet

1 inch equals 300 feet
Imagery: Calvert County, MD - 2017

Figure 2-3
2017 PFBS, PFOA, and PFOS Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

\\dc1vs01\GISNavyClean\WASHINGTON\NavalResearchLab\Chesapeake_Bay\MapFiles\Site10\PFAS_SIReport\Figure_2-4_NRL-CBD_Site10_SamplingResultsNov2018.mxd7/5/2022jcarr3



Legend

- Sampling Area
- Sampling Area
- Fire Testing Area Boundary
- Base Boundary
- Surface Water
- Fire Testing Area Boundary - 1-mile zone
- Assumed Stream Channel
- Stream
- Direction of Piney Point Aquifer Groundwater Flow (October 2020)

N

0 225 450 900 Feet

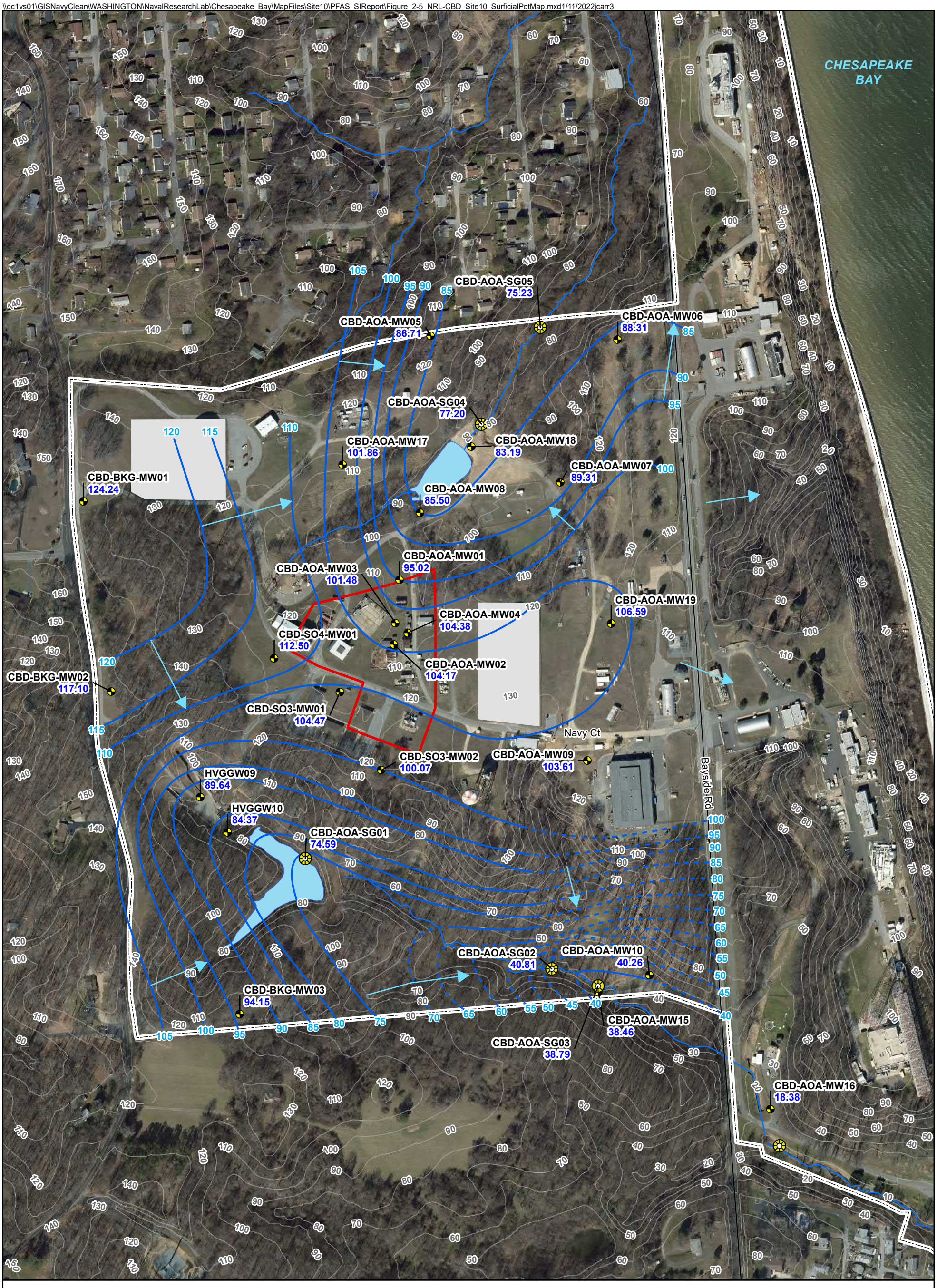
1 inch equals 900 feet

Imagery: Calvert County, MD - 2017

Figure 2-4
Off-Base Drinking Water Sampling Results through November 2018
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Note:
EPA Lifetime Health Advisory of 70 ng/L for the sum of PFOS and PFOA.

\\dc1vs01\GISNavyClean\WASHINGTON\NavalResearchLab\Chesapeake_Bay\MapFiles\Site10\PFAS_SIReport\Figure_2-5_NRL-CBD_Site10_SurficialPotMap.mxd1/11/2022jcarr3



Legend

- Surficial Aquifer Monitoring Well
- contour inferred
- Groundwater Contour
- Direction of Surficial Aquifer Groundwater Flow
- Surface Water Centerline
- Elevation Contour - 10ft Interval
- Fire Testing Area Boundary
- NRL-CBD Base Boundary
- Surface Water

Notes:
88.31 – Groundwater elevation above mean sea level
Water levels were measured on October 27, 2020

N

0 150 300
Feet

1 inch equals 300 feet

Imagery: Calvert County, MD - 2017

Figure 2-5
Site 10 Surficial Aquifer Potentiometric Surface Map
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

\\dc1vs01\GISNavyClean\WASHINGTON\NavalResearchLab\Chesapeake_Bay\MapFiles\Site10\PFAS_SIReport\Figure_2-6_NRL-CBD_Site10_PineyPointPotMap.mxd11/15/2021jcarr3



Legend

- Piney Point Aquifer Monitoring Well
- Groundwater Contour
- Direction of Piney Point Aquifer Groundwater Flow
- Surface Water Centerline
- Fire Testing Area Boundary
- NRL-CBD Base Boundary
- Surface Water

N

0 150 300 Feet

1 inch equals 300 feet

Imagery: Calvert County, MD - 2017

Notes:
-8.41 – Groundwater elevation above mean sea level
Water levels were measured on October 27, 2020

Figure 2-6
Site 10 Piney Point Aquifer Potentiometric Surface Map
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

SECTION 3

Investigation Methodology

3.1 Objectives and Approach

The field activities discussed in this report were performed in accordance with the SAP (CH2M, 2020a). Activities were conducted between September 2020 and February 2021 and included:

- Site preparation and utility locate
- Installation of surficial monitoring wells
- Completion of a synoptic groundwater elevation survey
- Collection of soil (surface and subsurface), groundwater, surface water, and sediment
- Installation of staff gauges in drainage areas downgradient of Site 10.
- Gauging surface water elevations in streams

A summary of the technical approach for conducting these activities is provided below.

3.2 Site Preparation and Utility Location

Prior to the advancement of soil borings and installations of monitoring wells at Site 10, utilities within five feet of the proposed locations were marked by a third-party utility clearance subcontractor. Changes to the proposed locations in the SI SAP (CH2M, 2020) are described in **Section 3.3**, **Section 3.4.1**, **Section 3.5.3**, and **Section 3.5.4.1**.

3.3 Soil Sampling

Twenty-nine borings were advanced using a direct-push technology drill rig to a maximum depth of 25 feet bgs using PFAS free materials (**Figure 3-1**). Subsurface soil cores were collected at each location using a 5-foot-long core barrel with new disposable acetate liners. Continuous soil cores were collected for lithology. Soil descriptions, including grain size, color, moisture content, relative density, consistency, soil structure, minerology, and other relevant information were noted in the field logbook. Boring logs for each location are presented in **Appendix A**. At each soil boring location, surface and subsurface soil samples were co-located and collected. Deviations from the proposed locations in the SI SAP (CH2M, 2020) are discussed below:

- CBD-AOA-SO02 – This sample was moved approximately ten feet east due to marsh ground encountered at the original location. The surface soil sample was collected at this revised location; however, due to refusal encountered at 20.5 feet bgs, the subsurface soil sample was collected approximately five feet northwest, along the edge of the berm.
- CBD-AOA-SO03 – The original location was under metal debris from the above-ground storage tank (AST) demolition that was being conducted at the time of the SI fieldwork (under separate contract and unrelated to this PFAS SI). This sample location was moved five feet south, closer to the location of the former ASTs, where metal debris was not present.
- CBD-AOA-SO10 – This sample location was moved five feet north to avoid a subsurface electric line.
- CBD-AOA-SO16 – This sample location was moved five feet east to avoid subsurface electric lines on the southwest side of the Fire 1 Test Chamber building.
- CBD-AOA-SO18 - The original location of this soil boring was on a concrete slab. Due to a water line located along the road at the edge of the concrete slab, this sample location was moved approximately 17 feet east, into the road.

- CBD-AOA-SO21 - The location of soil boring was moved three feet south, closer to the C204FT Fire Test Facility, due to the existence of a water line.
- CBD-AOA-SO27 – The original location of this soil boring was on a concrete slab; the soil boring was moved directly northwest, off the concrete pad and on the ground surface.
- CBD-AOA-SO28 – This sample location was moved five feet west to avoid a potential storm drain on the north side of Building 314.

3.3.1 Surface Soil Samples

Surface soil samples were collected at each soil boring location from 0 to 6 inches bgs.

3.3.2 Subsurface Soil Samples

Subsurface soil samples were collected at each soil boring location. Soil samples were collected from two-foot intervals displaying evidence of petroleum (for example, soil staining, photo-ionization detector readings) as determined during soil characterization. If no evidence of impacts were observed, a single subsurface soil sample was collected directly above the water table. In addition, at five locations (boring locations CBD-AOA-SO25 through CBD-AOA-SO29 on **Figure 3-1**), an additional subsurface sample was collected from the 8- to 10-foot bgs interval (the approximate depth of a building foundation). Deviations from these five additional proposed locations in the SI SAP (CH2M, 2020) are discussed below:

- CBD-AOA-SO09 – Due to petroleum observed at 5 feet, 7 inches to 5 feet, 9 inches bgs, an additional subsurface soil sample was collected from the interval 5.5 feet to 7.5 feet bgs.
- CBD-AOA-SO18 – Due to visible black staining at 8 feet bgs, an additional subsurface soil sample was collected from the interval 7 feet, 6 inches to 8 feet, 10 inches (no recovery below 8 feet, 10 inches).
- CBD-AOA-SO15 – A subsurface sample was collected from 8 to 10 feet bgs at this location instead of CBD-AOA-SO27 since the re-located SO27 was no longer downgradient of Fire 1 Test Chamber.
- CBD-AOA-SO27 – The subsurface soil sample planned to be collected from 8 to 10 feet bgs was moved to SO15 since the re-located SO27 was no longer down gradient.

3.4 Monitoring Well Installation and Development

3.4.1 Monitoring Well Installation

Monitoring wells were installed with PFAS free materials in accordance with the State of Maryland well construction standards by a Maryland-licensed driller (Ground Zero Environmental Field Services). Locations of the new monitoring wells (CBD-AOA-MW15, CBD-AOA-MW16, CBD-AOA-MW17, CBD-AOA-MW18, and CBD-AOA-MW19) are provided on **Figure 3-2**. Deviations from the proposed location in the SI SAP (CH2M, 2020) are discussed below:

CBD-AOA-MW16 – The location of this monitoring well was moved fifteen feet east to avoid a storm drain line and placement of the well on a steep topographic slope.

Five surficial monitoring wells were installed using hollow stem auger drilling techniques and constructed with a 2-inch inside-diameter Schedule 40 polyvinyl chloride (PVC) riser connected to a 10-foot, 2-inch inside-diameter factory-slotted (0.010-inch or 10-slot) PVC screen with a bottom cap. The surficial wells were screened across first encountered groundwater within the surficial aquifer. The top of the 10-foot screen was set just above the water table. A sand filter pack was placed around the annular space of the well screen from the bottom of the boring and extend to a minimum height of 2 feet above the top of the well screen. A fluorine-free bentonite seal, at least

2 feet thick, was placed above the top of the sand pack. After the bentonite was hydrated, a cement-bentonite grout was placed in the remaining annular space.

The monitoring wells were constructed as either flush-mounted or stick-up/aboveground completions, depending on site conditions, set in 2-foot by 2-foot by 4-inch-thick concrete pads. Flush-mounted well completions include 8-inch-diameter steel, bolt-down lids, and stick-up wells were furnished with a steel protective casing surrounded by steel bollards, as needed. A locking watertight cap was placed on the PVC pipe, and the wells were properly labeled on the exterior of the locking cap or protective casing with a metal stamp indicating the well identification. Well construction details for all the monitoring wells including the five new wells installed in October 2020 are presented in **Table 3-1**. Well construction diagrams are included in **Appendix A**.

3.4.2 Monitoring Well Development

After completing the well installation, the drilling subcontractor developed each monitoring well using a combination of surging and pumping throughout the well screen. During monitoring well development, CH2M measured water quality parameters (including pH, temperature, conductivity, and turbidity) with a water quality meter. Development continued for a minimum of 1 hour and/or until the turbidity of the water removed from the well was as clear as practicable, using professional judgment. All materials used for development were PFAS free.

Development information, including turbidity, pH, specific conductivity, temperature, and gallons of water removed were recorded as field notes on loose-leaf notebook paper. In addition, the water quality meter was calibrated daily (at a minimum), and the calibration will be documented in the field notes. Well development logs are provided in **Appendix B**.

3.5 Groundwater, Surface Water, and Sediment Sampling

3.5.1 Synoptic Groundwater Elevation Survey

Following monitoring well installation and development, and prior to starting groundwater sampling, a synoptic groundwater elevation survey was conducted at all five newly installed monitoring wells and 22 existing monitoring wells. An electronic water-level meter with a probe that is not coated with Teflon or other fluorinated polymers was used to measure the depth to water from the top of casing to the nearest 0.01 foot. The synoptic groundwater elevation survey is presented in **Table 3-1**. Based on the groundwater elevation survey, a potentiometric surface map was created to illustrate groundwater flow direction for the Surficial aquifer (**Figure 2-5**) and deeper Piney Point aquifer (**Figure 2-6**). Surficial aquifer groundwater flow at the facility is controlled by topography and surface water features such as ponds, ravines, and the Chesapeake Bay. A groundwater divide is present, which generally extends along Navy Court with surficial groundwater flow north of the road migrating towards the north-northeast and flow south of the road migrating to the south-southeast (**Figure 2-5**). Groundwater flow in the surficial aquifer in the immediate vicinity of the burn pads is to the north-northeast toward the stormwater pond approximately 700 feet north-northeast of Site 10 (**Figure 2-5**). Groundwater flow in the Piney Point aquifer is generally to the northeast (**Figure 2-6**).

3.5.2 Groundwater Sampling

Groundwater samples were collected from 5 newly installed and 22 existing monitoring wells as presented on **Figure 3-2**. Groundwater samples were collected using low-flow sampling techniques. A peristaltic pump was used to collect samples for wells with a sampling depth of 30 feet or less, and a PFAS-free submersible pump was used for wells screened at deeper depths. The PFAS-free peristaltic tubing or pump was set in the middle of the well screen.

Groundwater quality parameters (pH, conductivity, turbidity, dissolved oxygen [DO], temperature, salinity, and oxidation-reduction potential [ORP]) were collected during purging of each well using a water quality meter and a

flow-through cell. During purging, depth-to-water readings and water quality parameters (WQPs) were measured and recorded at regular time intervals of at least five minutes. Depth-to-water was measured with a water level indicator, and WQPs were measured using a water quality meter, calibrated daily at a minimum. The wells were purged at a rate such that drawdown in the well was less than 0.5 feet. Sampling began when three well volumes had been purged and/or WQPs had stabilized for three consecutive readings, as follows:

- Temperature within 1 degree Celsius
- pH within 0.1 pH units
- Conductivity within 3 percent
- ORP within 10 millivolts
- Dissolved oxygen within 0.1 milligrams per liter
- Turbidity measurements are within 10 percent or less than 10 nephelometric turbidity units

Final water quality parameters are presented in **Table 3-2**. Field purge logs are presented in **Appendix B**.

Samples were collected into laboratory-prepared sample bottles and packed on ice for overnight shipment. All samples were collected for PFAS analysis via LC-MS/MS, compliant with Table B-15 of QSM v53 (DoD, 2019). Seven of the monitoring wells (CBD-AOA-MW01 through CBD-AOA-MW04, CBD-AOA-MW08, CBD-S03-MW01, and CBD-S03-MW02) were sampled for TPH (GRO and DRO) analysis via SW-846 815C in addition to PFAS. Samples for PFAS analysis were shipped to Battelle Memorial Institute in Norwell, Massachusetts, and samples for TPH analysis were shipped to Advanced Environmental Laboratories in Jacksonville, Florida.

3.5.3 Surface Water and Sediment Sampling

Surface water samples were collected at 11 locations identified on **Figure 3-3**. Deviations from the proposed location in the SI SAP (CH2M, 2020) are discussed below:

- CBD-AOA-SW11 – The original location of this surface water sample location was placed outside the stormwater pond and was moved to collect a sample within the southwest area of the stormwater pond.
- CBD-AOA-SW09 – Due to absence of water at the original sample location, this surface water sample location was moved approximately 30 feet east, downstream, to the location where stream water was first observed.

Before collecting samples, water quality readings (pH, conductivity, turbidity, DO, temperature, salinity, and ORP) were obtained with a Horiba U-52 or similar water quality meter, and water depth and flow rate were measured. Surface water samples were collected manually by submerging a clean stainless steel or high-density polyethylene container into the water. The surface water samples were collected in approved laboratory containers and analyzed for PFAS analysis via LC-MS/MS, compliant with Table B-15 of QSM v5.3 (DoD, 2019).

Sediment samples were collected from four locations as identified on **Figure 3-3**. Sediment samples were collected from 0 to 6 inches bgs using a stainless-steel trowel, disposable scoop, hand auger, or other appropriate tool, and were collected regardless of whether water was present. The sediment samples were collected in approved laboratory containers and analyzed for PFAS via LC-MS/MS, compliant with Table B-15 of QSM v5.3 (DoD, 2019).

3.5.4 Staff Gauges

3.5.4.1 Staff Gauge Installation

Staff gauges were installed at five locations shown on **Figure 3-3**. The staff gauges were attached to a metal stake and installed vertically in stream sediment at the shown locations. The gauge height and water levels were recorded once after installation and concurrently with the synoptic well gauging. Deviations from the proposed location in the SI SAP (CH2M, 2020) are discussed below:

- CBD-AOA-SG01 – The original location of this staff gauge was at the beginning of the stream located southeast of the pond to the southwest of Site 10. Due to the presence of riprap and river cobbles in the re-worked streambed, this staff gauge was relocated to the northeast bank of the pond.
- CBD-AOA-SG02 – Due to the presence of riprap and river cobbles in the re-worked streambed, this staff gauge was relocated to the southeast where the re-worked stream section ends.
- CBD-AOA-SG04 – The original location of this staff gauge was on the top of the berm along the south end of the stormwater pond north of Site 10. This staff gauge was relocated to the northeast adjacent to the down-stream discharge point of the stormwater pond.

3.5.4.2 Staff Gauge Monitoring

Water levels at the staff gauges were recorded on October 27, 2020 and not within 24 hours of a precipitation event. Water level measurements and corresponding elevations from the staff gauges are presented in **Table 3-3** and shown on **Figure 3-3** along with water level elevations recorded at surficial aquifer monitoring wells. Based on results of the groundwater and stream gauging event, the streams north and south of the site are gaining streams with groundwater contributing to surface water.

3.6 Surveying

The spatial locations and elevations of all newly installed monitoring wells and staff gauge locations were surveyed by Bowman Consulting, a Maryland-licensed and registered surveyor. The survey achieved vertical and horizontal control to an accuracy of ±0.01 foot and ±0.1 foot, respectively (**Appendix C**). Monitoring wells were surveyed at the top of the PVC casing and at the ground surface. The survey point at the top of the PVC casing was marked at the time the well survey was performed.

Vertical elevations were referenced to National American Vertical Datum of 1988 to remain consistent with the coordinate system and datum currently in use at NRL-CBD. Horizontal coordinates were referenced to the Maryland State Plane Coordinate System, North American Datum of 1983. The survey report is presented in **Appendix C**.

3.7 Quality Assurance and Quality Control

Field quality assurance (QA) and quality control (QC) samples were collected during sampling. These samples were obtained to:

- Ensure that disposable and reusable sampling equipment were free of contaminants
- Evaluate field methodology
- Establish ambient field background conditions
- Evaluate whether cross-contamination occurred during sampling and/or shipping

Several types of field QA/QC samples that were collected and analyzed are defined as follows:

- **Equipment Rinsate Blank (decontaminated equipment):** Equipment blanks were collected at the frequency of one per day of sampling. These samples were obtained by running laboratory-grade deionized (DI) water over or through sample collection equipment after the decontamination procedures had been conducted. These samples, which were collected during groundwater sampling only, were used to determine whether decontamination procedures for reusable equipment were adequate.
- **Equipment Rinsate Blank (disposable equipment):** Equipment blanks were collected at the frequency of one per lot. These samples were obtained by running laboratory-grade DI water over or through sample collection equipment prior to the equipment's use. These samples, which were collected during groundwater sampling

only, were used to determine whether disposable, one-time-use equipment was contaminant-free prior to use.

- **Field Blank:** Field blanks were collected at the frequency of one per week. These samples were collected by pouring the laboratory-provided blank water into the blank container. The purpose of these samples is to assess the potential for field contamination.
- **Duplicate Sample:** Duplicate samples were collected at the same time and under identical conditions as their respective associated sample at the frequency of one per 10 field samples of similar matrix. These samples were collected to evaluate the field and laboratory reproducibility of sample results and are one way to evaluate field methodology.

In addition to samples collected to monitor field QC, samples were also collected to monitor quality within the laboratory. These included the following:

- **Matrix Spike (MS):** An aliquot of a matrix (that is, groundwater) was spiked with known quantities of analytes of interest and subjected to the entire analytical procedure. By measuring the recovery of these spiked quantities, the appropriateness of the method for the matrix was demonstrated.
- **Matrix Spike Duplicate (MSD):** These samples were collected as second aliquots of the same matrix as the MS to determine the precision of the method.

One MS sample and one MSD sample were collected for every 20 environmental samples collected (or greater than or equal to 5 percent of the samples collected) per medium including field duplicates.

3.8 Decontamination Procedures

All decontamination activities were conducted in accordance with the SOPs included in the SAP, and cross-contamination of PFAS was considered during decontamination between sites (CH2M, 2020).

Non-disposable sampling equipment was decontaminated using the following solutions in this order:

1. Distilled water (laboratory certified PFAS-free) and Liquinox solution
2. Distilled water (laboratory certified PFAS-free) rinse 10 percent isopropanol and distilled water solution (laboratory certified PFAS-free) and air-dried
3. Laboratory-grade DI water (laboratory certified PFAS-free)

Water generated during decontamination of non-disposable sampling equipment was collected and transferred to approved 55-gallon drums to await characterization and disposal.

Disposable sampling equipment and personal protective equipment, such as Masterflex tubing and nitrile gloves, were not decontaminated after use and instead were disposed as nonhazardous solid waste. After use, disposable equipment was placed in plastic contractor bags and disposed in an onsite trash dumpster.

Reusable heavy drilling equipment was decontaminated before and in between each borehole via thorough truck-side cleaning. Decontamination fluids were containerized into approved 55-gallon drums to await characterization and disposal. All heavy drilling equipment decontamination procedures were conducted in accordance with the SOPs included in the SAP (CH2M, 2020).

3.9 Investigation-Derived Waste Management

During the SI field effort, generated investigation-derived waste (IDW) included soil cuttings, purge-water generated through groundwater sampling, and decontamination rinse-water from non-disposable sampling equipment and heavy drilling equipment. The IDW was containerized in approved 55-gallon drums that were properly labeled and staged onsite near the Former Photography Laboratory (Building 43) prior to transfer for

offsite disposal. A total of nine drums of solid IDW and seven drums of aqueous IDW were generated during the field activities at Site 10.

Prior to disposal, CH2M field staff collected one composite sample from the aqueous IDW drums and one composite sample from the solid IDW drums. The IDW samples were analyzed for Toxicity Characteristic Leaching Procedure analyses (volatile organic compounds, semivolatile organic compounds, pesticides, and inorganic constituents), ignitability, reactive cyanide, reactive sulfide, corrosivity, and PFAS. For the aqueous sample, PFAS analytical results for PFOA and PFOS were greater than the USEPA lifetime health advisory of 70 ng/L. Based on the overall analytical results, all IDW was characterized as nonhazardous, PFAS-containing. As such, solid IDW was disposed of as nonhazardous with notification of the PFAS results to the receiving facility. Aqueous IDW was first solidified and then both the aqueous and solid IDW were mixed with the additive RemBind to encapsulate the PFAS prior to disposal by Clearfield MMG at the Navy's approved disposal facility in Chesapeake, Virginia.

All IDW-management activities were conducted in accordance with the SOPs included in the SAP (CH2M, 2020). **Appendix D** provides an analytical summary for the IDW samples and includes all IDW handling and disposal information.

3.10 Data Quality Assessment

The data quality assessment (data validation and review) was a multi-tiered approach. The process began with an internal laboratory review, continued with an independent review by a third-party validator, and ended with an overall review by the CH2M project chemistry team. A technical memorandum summarizing the data quality assessment is included as **Appendix E.**

As shown in **Appendix E**, the data set was deemed to be 100 percent complete. The validation review demonstrated that all data are available for use in the project decision-making process, qualified as applicable.

Table 3-1. Site 10 Monitoring Well Construction and Gauging Data
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Well ID	Total Depth (ft bgs)	Ground Surface Elevation (ft asml)	Screened Interval (ft btoc)	TOC Elevation (ft amsl)	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
Shallow Aquifer						
CBD-AOA-MW01	20.24	105.09	10.24-20.24	108.39	13.37	95.02
CBD-AOA-MW02	18.27	108.49	8.27-18.27	111.70	7.52	104.18
CBD-AOA-MW03	12.05	107.97	Unknown	110.94	9.45	101.49
CBD-AOA-MW04	12.90	106.22	Unknown	109.28	4.90	104.38
CBD-AOA-MW05	38.80	114.80	28.8-38.80	118.44	31.73	86.71
CBD-AOA-MW06	38.03	117.60	28.03-38.03	120.19	31.88	88.31
CBD-AOA-MW07	29.40	108.90	19.40 - 29.40	112.23	22.92	89.31
CBD-AOA-MW08	28.90	91.70	18.90 - 28.90	94.98	9.48	85.50
CBD-AOA-MW09	28.54	126.80	18.49-28.49	129.87	26.26	103.61
CBD-AOA-MW10	23.67	44.50	13.69-23.69	47.85	7.59	40.26
CBD-AOA-MW15	14.00	114.40	4.00 - 14.00	47.67	9.21	38.46
CBD-AOA-MW16	14.00	24.46	4.00 - 14.00	27.16	8.78	18.38
CBD-AOA-MW17	14.00	112.98	4.00 - 14.00	115.40	13.54	101.86
CBD-AOA-MW18	20.00	91.96	10.00 - 20.00	94.45	11.26	83.19
CBD-AOA-MW19	25.00	123.81	15.00 - 25.00	123.41	16.82	106.59
CBD-BKG-MW01	35.20	149.58	25.20 - 35.20	152.15	27.91	124.24
CBD-BKG-MW02	46.86	151.10	34.00 - 43.96	154.01	36.91	117.10
CBD-BKG-MW03	31.33	113.38	18.70 - 28.69	116.01	21.86	94.15
CBD-HVGGW09	27.57	96.20	Unknown	98.81	9.17	89.64
CBD-HVGGW10	32.93	93.60	Unknown	96.97	12.60	84.37
CBD-S04-MW01	25.56	126.98	15.60 - 25.56	130.76	18.26	112.50
CBD-S03-MW01	25.18	117.62	12.30 - 22.31	120.49	16.02	104.47
CBD-S03-MW02	28.26	119.94	15.90 - 25.88	122.32	22.25	100.07
Piney Point Aquifer						
CBD-AOA-MW11	290.90	114.40	280.92-290.92	117.82	126.23	-8.41
CBD-AOA-MW12	297.00	150.90	286.8-296.8	154.18	160.37	-6.19
CBD-AOA-MW13	222.18	111.90	212.21-222.21	114.98	121.00	-6.02
CBD-AOA-MW14	161.33	43.90	151.33-161.33	47.16	53.57	-6.41

Notes:
Depth to water measurements were collected on 10/27/2020
ft amsl = feet above mean sea level
ft bgs = feet below ground surface
ft btoc = feet below top of casing
TOC = top of casing

Table 3-2. Site 10 Water Quality Parameter Summary
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	Date Sampled	Temperature (°C)	Specific Conductivity (mS/cm)	pH (SU)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)
CBD-AOA-MW01	10/19/20	21.81	0.157	6.17	0.37	-6	35.2
CBD-AOA-MW02	10/19/20	21.04	0.448	6.28	0.00	-29	0.0
CBD-AOA-MW03	10/19/20	20.45	0.118	5.26	0.05	227	0.2
CBD-AOA-MW04	10/19/20	19.56	0.185	6.30	0.00	118	9.8
CBD-AOA-MW05	10/21/20	16.29	0.290	6.30	0.30	-10	695
CBD-AOA-MW06	10/20/20	17.30	0.410	6.78	4.35	54	>1000
CBD-AOA-MW07	10/20/20	18.99	0.139	6.10	0.43	86	478
CBD-AOA-MW08	10/19/20	16.24	0.560	7.40	NA[a]	-101	14.3
CBD-AOA-MW09	10/20/20	21.34	2.280	7.34	0.55	-8	335
CBD-AOA-MW10	10/15/20	17.35	0.870	7.07	0.00	-73	0.0
CBD-AOA-MW11	10/28/20	16.73	1.850	12.27	4.24	-35	0.0
CBD-AOA-MW12	10/28/20	16.64	0.472	10.94	3.21	25	41.7
CBD-AOA-MW13	10/28/20	16.24	0.461	9.88	4.24	-59	46.9
CBD-AOA-MW14	10/28/20	16.90	1.720	12.24	4.45	-45	0.0
CBD-AOA-MW15	10/16/20	16.54	0.640	6.19	0.01	-72	0.0
CBD-AOA-MW16	10/16/20	19.33	1.220	6.41	0.88	-21	0.0
CBD-AOA-MW17	10/20/20	20.54	0.311	7.29	5.13	132	14.4
CBD-AOA-MW18	10/19/20	21.30	0.494	6.43	0.00	-62	6.5
CBD-AOA-MW19	10/20/20	19.17	0.137	6.30	4.05	176	0.0
CBD-BKG-MW01	10/20/20	17.72	0.100	4.08	3.59	383	0.0
CBD-BKG-MW02	10/20/20	15.62	0.149	4.28	2.91	352	0.0
CBD-BKG-MW03	10/15/20	16.75	0.265	3.53	0.36	415	0.0
CBD-S03-MW01	10/19/20	20.64	0.168	4.61	4.57	375	7.8
CBD-S03-MW02	10/19/20	15.43	0.444	7.19	0.15	15	79.6
CBD-S04-MW01	10/15/20	18.80	0.059	4.54	5.65	358	0.0
CBD-HVG-GW09	10/14/20	18.05	0.551	6.74	0.00	-24	0.0
CBD-HVG-GW10	10/14/20	18.40	0.808	6.34	0.00	-136	0.0

Notes:
[a] Instrument error
ID = identification
NA = Not available
°C = degrees Celsius
mS/cm = millisiemen(s) per centimeter
SU = standard units
mg/L = milligram(s) per liter
mV = millivolt(s)
NTU = Nephelometric turbidity units

Table 3-3. Site 10 Surface Water Gauging

PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Staff Gauge ID	Top of Post Elevation (feet amsl)	NAVD88 Rebar/ Cap[1] Elevation (feet amsl)	October 27, 2020		
			Stream Staff Gauge Reading (feet)	Time of Stream Staff Gauge Reading	Stream Surface Water Elevation (feet amsl)[2]
CBD-AOA-SG01[3]	77.595	75.2432	0.35	12:06 PM	74.5932
CBD-AOA-SG02[4]	44.591	40.6346	0.18	12:09 PM	40.8146
CBD-AOA-SG03	42.731	38.6831	0.11	12:17 PM	38.7931
CBD-AOA-SG04	80.112	76.5446	0.66	11:12 AM	77.2046
CBD-AOA-SG05	78.52	75.1248	0.11	11:15 AM	75.2348

Notes:

[1]Rebar with plastic cap on top. Top of rebar cap aligns with the "0" mark on each staff gauge with the exception of CBD-AOA-SG01. (Staff Gauge information: Ben Meadows: 1251114, Fiberglass Stream Gauge, 0-4 Feet, Graduated in feet/10ths/100ths [Forestry Suppliers Item #39600, https://www.forestry-suppliers.com/product_pages/products.php?mi=29602&itemnum=39600])

[2]Stream surface water elevation = (NABD88 Rebar/Cap Elevation) + (Stream Staff Gauge Reading), with exception of staff gauge CBD-AOA-SG01. See note 3. below.

[3]Rebar set during installation of the staff gauge on 10/16/20 could not be located while surveying on 1/29/21. Therefore, the surveyor installed another rebar on 1/29/21 and measured the elevation off this rebar that was set 22 inches away from staff gauge CBD-AOA-SG01; the top of this rebar cap is aligned with the 1 foot mark on CBD-AOA-SG01 and is 3.04 feet below the top of the steel post. Stream surface water elevation at CBD-AOA-SG01 = (NABD88 Rebar/Cap Elevation) - (1.00 - Stream Staff Gauge Reading).

[4]During installation, the rebar cap was placed flush with the streambed due to the very shallow stream; the "0" mark on the staff this staff gauge was aligned with the streambed.

amsl = above mean sea level

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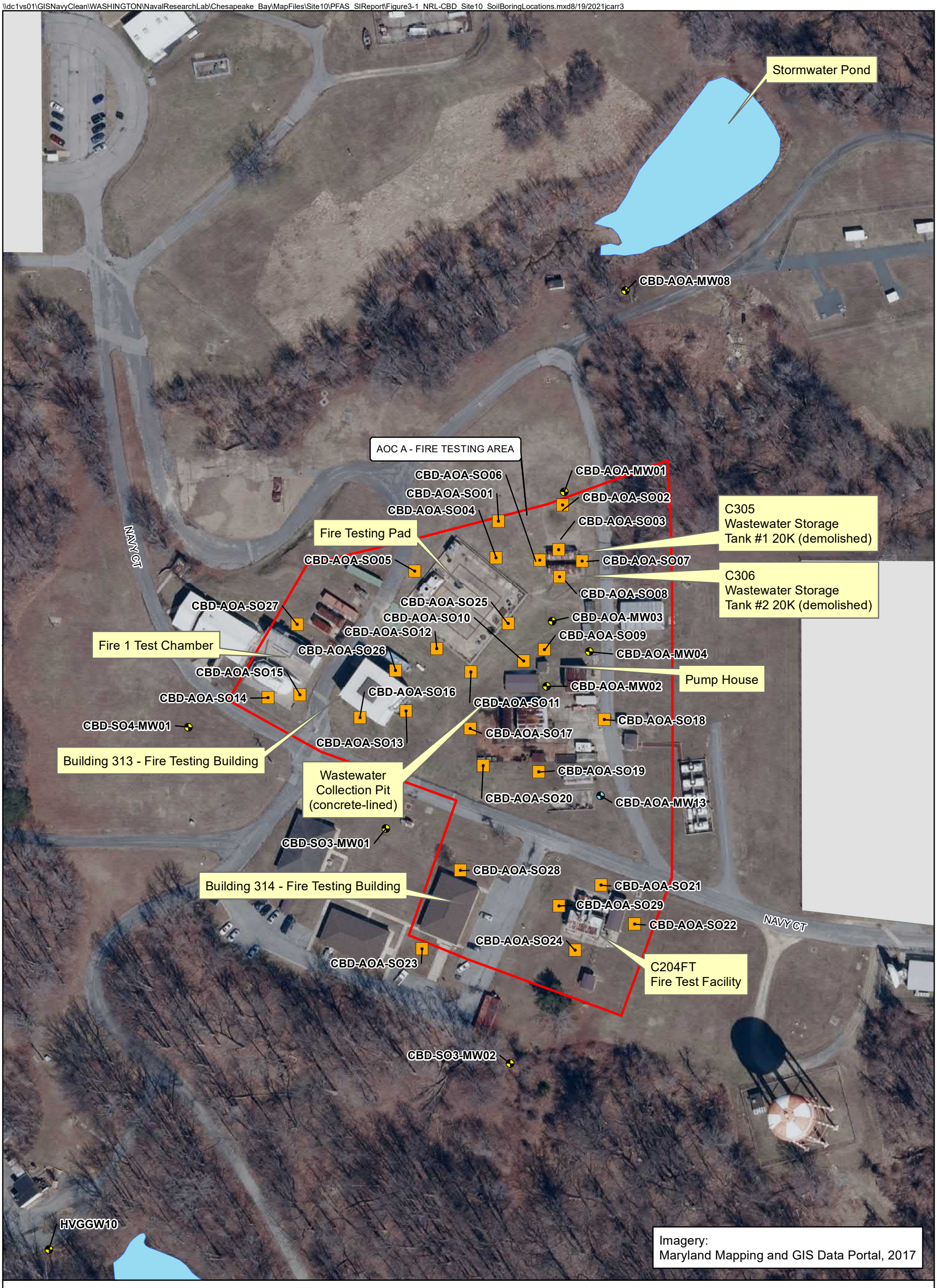

Legend

- Surface/Subsurface Soil Location
- Shallow Aquifer Monitoring Well
- Piney Point Aquifer Monitoring Well
- Fire Testing Area Boundary
- Surface Water

N

0 100 200 Feet

1 in = 100 ft

Figure 3-1
Soil Boring Locations
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

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Legend

- Surficial Aquifer Monitoring Well
- Piney Point Aquifer Monitoring Well
- Surface Water Centerline
- Surface Water
- Fire Testing Area Boundary
- NRL-CBD Base Boundary

CBD-AOA-MW17 - Newly installed monitoring well

N

0 150 300 Feet

1 inch equals 300 feet

Imagery: Maryland Mapping and GIS Data Portal, 2017

Figure 3-2
Monitoring Well Locations
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

\\dc1vs01\GISNavyClean\WASHINGTON\NavalResearchLab\Chesapeake_Bay\MapFiles\Site10\PFAS_SIReport\Figure_3-3_NRL-CBD_Site10_SurfaceWaterSedimentStaffGauge.mxd 4/14/2022 jcarr3



Legend

- Co-located Surface Water/Sediment Location
- Staff Gauge Location
- Surface Water Location
- Fire Testing Area Boundary
- Surface Water
- Surface Water Centerline
- NRL-CBD Base Boundary

0 150 300 Feet

1 inch equals 350 feet

N

Figure 3-3
Surface Water, Sediment, and Staff Gauge Locations
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

SECTION 4

Site Inspection Results

This section presents the results of the investigation described in Section 3.

Soil, groundwater, surface water, and sediment analytical data for PFOA, PFOS, and PFBS were screened against the following screening levels:

- Soil – Residential scenario risk screening levels based on a Hazard Quotient (HQ) of 0.1 consistent with Assistant Secretary of Defense (ASD) technical guidance (DoD,2021). That is, the current USEPA residential soil regional screening level (RSL) for PFBS (based on an HQ of 0.1), and residential soil screening levels for PFOS and PFOA generated using the USEPA RSL calculator and based on a HQ of 0.1.
- Groundwater:
  - Residential scenario risk screening levels based on an HQ of 0.1 and consistent with Assistant Secretary of Defense (ASD) technical guidance (DoD,2021). That is, the current USEPA tap water RSL for PFBS (based on an HQ of 0.1) and tap water screening levels for PFOS and PFOA generated using the USEPA RSL calculator and based on an HQ of 0.1.
  - The Maryland Cleanup Standards, residential cleanup standards for TPH-GRO and TPH-DRO. There are no USEPA tap water RSLs for TPH-GRO or TPH-DRO.
- Surface Water – Ten times the residential scenario risk screening levels for groundwater that are based on an HQ of 0.1 and consistent with Assistant Secretary of Defense (ASD) technical guidance (DoD,2021). That is, the current USEPA tap water RSL for PFBS (based on an HQ of 0.1) and tap water screening levels for PFOS and PFOA generated using the USEPA RSL calculator and based on an HQ of 0.1.
- Sediment – Ten times the residential scenario risk screening levels for soil, that are based on an HQ of 0.1 and consistent Assistant Secretary of Defense (ASD) technical guidance (DoD,2021). That is, the current USEPA residential soil RSL for PFBS (based on an HQ of 0.1), and residential soil screening levels for PFOS and PFOA generated using the USEPA RSL calculator and based on a HQ of 0.1.

The soil and groundwater screening levels (i.e., EPA RSLs) for PFOA, PFOS and PFBS were calculated using the EPA RSL calculator and were derived using the default, most conservative generic exposure assumptions to avoid underestimation of risks at a site. The screening levels do not account for site-specific exposure assumptions and/or ambient (background) conditions at a particular site. Therefore, the exceedance of a SL does not determine the presence of a risk, but rather serves as a screening value used to indicate the need for further investigation at a site. The groundwater and soil screening levels for surface water and sediment are being used as initial evaluation criteria as there are no other screening levels for these media currently available. These are conservative as exposure to surface water and sediment are typically lower than exposure to groundwater and soil. The groundwater (tap water) and residential soil screening levels assume exposure 350 days per year, while exposure to surface water and sediment is typically assumed to occur about 52 days/year (an average of 1 day/week), with potentially a maximum exposure of 104 days/year (an average of 2 days/week). Additionally, the groundwater screening levels assume that the groundwater is used for drinking water, and the surface water at this facility is not used for drinking water. Since the groundwater is assumed to be used as a water supply, it is assumed that dermal exposure would result in full body exposure, while dermal exposure for surface water, unless used for swimming, would not include the full body.

Because ecological risk assessment for PFOS, PFOA and PFBS is emerging and the available screening values for these PFAS in the environment are limited and not comprehensive, a screening for ecological risk was not conducted as part of the SI. However, ecological screening values (ESVs) for PFOS, PFOA and PFBS in surface water and sediment were identified in the work plan and were used to determine if analytical reporting limits for each media were sufficient to provide data that can be used in a future ecological risk evaluation.

Analytical data for all media were also obtained for 15 other PFAS constituents that do not have screening criteria, and these results may be screened in the future if criteria are established. Laboratory analytical results for soil, groundwater, surface water, and sediment samples collected at Site 10 are summarized in **Tables 4-1** through **4-6**. These tables present data screened against screening levels for PFOA, PFOS, and PFBS; **Appendix F** presents data for all 18 PFAS constituents analyzed. **Figure 4-1** through **Figure 4-6** illustrate PFOA, PFOS, and PFBS concentrations for each of the media that exceeded screening levels.

4.1 Soil

4.1.1 Surface Soil Analytical Results

As listed in **Table 4-1** and shown on **Figure 4-1**, analysis of surface soil collected from 0-6 inches at 29 sample locations indicated the following:

- PFOA was detected in the surface soil at 15 locations at concentrations ranging from 0.82 J nanogram per grams (ng/g) to 25.4 ng/g. None of the PFOA detections exceeded the screening level (130 ng/g).
- PFOS was detected in the surface soil at eight locations. At all eight locations, concentrations exceeded the screening level (130 ng/g). Detected concentrations ranged from 138 ng/g to 4,660 ng/g. Soil exceedances are all located north of Navy Court near the Fire Testing Pad, Wastewater Storage Tanks, Pump House, Wastewater Collection Pit, and Building 313.
- PFBS was detected in the surface soil at CBD-AOA-SO08 and CBD-AOA-SO17 at concentrations 0.58 J ng/g and 0.66 J ng/g respectively. None of the PFBS detections exceeded the screening level (1,900 ng/g).

4.1.2 Subsurface Soil Analytical Results

As listed in **Table 4-2** and shown on **Figure 4-2**, analysis of subsurface soil collected from 29 sample locations indicated the following:

- PFOA was detected in the subsurface soil at 13 locations from depths ranging from 1 foot bgs to 18 feet bgs at concentrations ranging from 0.76 J ng/g to 75.9 ng/g. None of the PFOA detections exceeded the screening level (130 ng/g).
- PFOS was detected in the subsurface soil at nine locations from depths ranging from 1 foot bgs to 17 feet bgs. At eight of these locations, concentrations exceeded the screening level (130 ng/g). Detected concentrations ranged from 106 ng/g to 7,950 ng/g. Soil exceedances are all located north of Navy Court near the Fire Testing Pad, Pump House, Wastewater Collection Pit, and Building 313.
- PFBS was detected in the surface soil at four locations at concentrations ranging from 0.59 J ng/g to 6.08 J ng/g. None of the PFBS detections exceeded the screening level (1,900 ng/g).

4.2 Groundwater Results

4.2.1 Surficial Aquifer

4.2.1.1 PFAS Investigation

As listed in **Table 4-3** and shown on **Figure 4-3**, analysis of surficial groundwater collected from 23 monitoring wells indicated the following:

- PFOA was detected in the surficial groundwater at 20 monitoring wells at concentrations ranging from 0.98 J ng/L to 171,000 ng/L. At 11 of the monitoring wells, concentrations exceeded the screening level (40 ng/L).
- PFOS was detected in the surficial groundwater at 20 monitoring wells at concentrations ranging from 3.17 J ng/L to 6,800 ng/L. At 11 of the monitoring wells, concentrations exceeded the screening level (40 ng/L).
- PFBS was detected in the groundwater at 20 monitoring wells at concentrations ranged from 1.04 J ng/L to 501 ng/L. None of the PFBS detections exceeded the screening level (600 ng/L).

4.2.1.2 TPH Investigation

Total petroleum hydrocarbon (TPH) results represent a mixture of petroleum hydrocarbons and do not provide information about the actual types of hydrocarbons present. Typically, U.S. Environmental Protection Agency (USEPA) site characterization for petroleum hydrocarbons focuses on the individual constituents that are part of the TPH that have established toxicity criteria (e.g., benzene, toluene, ethylbenzene, xylene, and polyaromatic hydrocarbons). There are no USEPA RSLs or MCLs for TPH-DRO or TPH-GRO; however, the State of Maryland has default cleanup standards for groundwater for TPH-DRO (47 µg/L) and TPH-GRO (47 µg/L) (MDE, 2018).

As listed in **Table 4-3** and shown on **Figure 4-3**, analysis of groundwater collected from seven surficial monitoring wells indicated the following:

- TPH-DRO was detected in surficial groundwater at four monitoring wells. At all four monitoring wells, concentrations exceeded the Maryland Cleanup Level (47 micrograms per liter [µg/L])[6] with concentrations ranging from 180 J µg/L to 810 µg/L. Exceedances are located on the northern boundary of the site, in the center of the site near the Pump House, and south of the site.
- TPH-GRO was detected in surficial groundwater at only one monitoring well (CBD-AOA-MW01) on the northern boundary of the site. The detected concentration of 52 J exceeded the Maryland Cleanup Level (47 µg/L).

The 2009 TPH analytical results are presented in **Table 4-4** along with the 2020 TPH analytical results from groundwater within the surficial aquifer[7]. Concentrations from both 2009 and 2020 were compared to the same screening levels that consist of the Maryland Cleanup Standards for TPH-DRO and TPH-GRO. Based on review of the analytical results from monitoring wells CBD-AOA-MW01 through CBD-AOA-MW04, in 2009, concentrations of TPH-DRO ranged from 200 to 350 µg/L and TPH-GRO ranged from 7.1 J to 57 µg/L. In 2020, concentrations of TPH-DRO ranged from 190-810 µg/L and TPH-GRO was detected in one well (CBD-AOA-MW01) at 52 µg/L. Concentrations of TPH were relatively similar to those detected in 2009 with the exception of groundwater at CBD-AOA-MW02 where the concentration of TPH-DRO is 810 µg/L.

4.2.2 Piney Point Aquifer

As listed in **Table 4-5**, analysis of groundwater collected from four deep monitoring wells indicated the following (**Figure 4-4**):

- PFOA was detected at all four wells, but the concentrations were below the screening level (40 ng/L).
- PFOS was detected at one well, but the concentration was below the screening level (40 ng/L).
- PFBS was detected in one well, but the concentration was below the screening level (600 ng/L).

[6] Maryland Cleanup Levels for TPH-DRO and TPH-GRO based on Table 2 – Generic Numeric Cleanup Standards for Groundwater and Soil for Total Petroleum Hydrocarbon (TPH), State of Maryland Department of the Environment, Cleanup Standards for Soil and Groundwater, October 2018 (Interim Final Guidance, Update No. 3) (MDE, 2018).

[7] In 2009, groundwater at four monitoring wells (CBD-AOA-MW01 through CBD-AOA-MW04) was analyzed for TPH; in 2020, groundwater at seven monitoring wells (CBD-AOA-MW01 through CBD-AOA-MW04, CBD-AOA-MW08, CBD-S03-MW01, and CBD-SO3-MW02) was analyzed for TPH.

4.3 Surface Water

As listed in **Table 4-6** and shown on **Figure 4-5**, analysis of surface water collected from 11 sample locations indicated the following:

- PFOA was detected in the surface water at all 11 locations. At four of these locations, concentrations exceeded the surface water human health screening level of 400 ng/L, which is 10 times the groundwater screening level. Detected concentrations ranged from 2.93 J ng/L to 578 ng/L. Surface water exceedances are located only in the stream north of the Site and concentrations appear to be similar upgradient and downgradient.
- PFOS was detected in the surface water at all 11 locations. At seven of these locations, concentrations exceeded the surface water human health screening level of 400 ng/l, which is 10 times the groundwater screening level. Detected concentrations ranged from 12.8 J ng/L to 4,960 ng/L. Surface water exceedances are located in the streams north and south of the Site. In the stream north of the site, concentrations appear to be similar upgradient and downgradient. In the stream south of the site, exceedances are located at the two most downgradient locations and immediately downgradient of the wastewater treatment plant.
- PFBS was detected in the surface water at all 11 locations. None of the PFBS detections exceeded the surface water human health screening level of 6,000 ng/L, which is 10 times the groundwater screening level. Detected concentrations ranged from 1.74 J ng/L to 64.1 ng/L.

4.4 Sediment

As listed in **Table 4-7** and shown on **Figure 4-6**, analysis of sediment collected from four sample locations indicated the following:

- PFOS was detected in the sediment at all four sediment locations. None of the PFOS detections exceeded the sediment human health screening level of 1,300 ng/g, which is 10 times the soil screening level. Detected concentrations ranged from 1.63 J ng/g to 34.9 ng/g.
- PFOA and PFBS were not detected in the sediment at any of the four sediment locations.

Table 4-1. Site 10 Detected Analytical Results - Surface Soil
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	CBD-AOA-SO01		CBD-AOA-SO02	CBD-AOA-SO03	CBD-AOA-SO04	CBD-AOA-SO05	CBD-AOA-SO06
Sample ID		CBD-AOA-SS01-000H	CBD-AOA-SS01P-000H	CBD-AOA-SS02-000H	CBD-AOA-SS03-000H	CBD-AOA-SS04-000H	CBD-AOA-SS05-000H	CBD-AOA-SS06-000H
Sample Date		10/01/20	10/01/20	09/30/20	09/30/20	10/01/20	10/06/20	09/30/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (ng/g)								
Perfluorooctane sulfonic acid (PFOS)	130	19.6 U	20.4 U	58.7 U	84.6 U	**168**	11 U	19.7 U
Perfluorooctanoic acid (PFOA)	130	**0.92 J**	**0.82 J**	**2.22 J**	**4.02 J**	**4.76 J**	2.35 U	**1.76 J**
Perfluorobutanesulfonic acid (PFBS)	1,900	1.28 U	1.2 U	1.54 U	1.27 U	1.1 U	1.18 U	1.29 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
ng/g = Nanograms per gram
Surface soil samples were collected from 0 to 6 inches below ground surface
[1] Screening levels for PFOA and PFOS are based on an HQ of 0.1 and were generated using the United States Environmental Protection Agency Regional Screening Level calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-1. Site 10 Detected Analytical Results - Surface Soil
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	CBD-AOA-SO07	CBD-AOA-SO08	CBD-AOA-SO09	CBD-AOA-SO10	CBD-AOA-SO11		CBD-AOA-SO12
Sample ID		CBD-AOA-SS07-000H	CBD-AOA-SS08-000H	CBD-AOA-SS09-000H	CBD-AOA-SS10-000H	CBD-AOA-SS11-000H	CBD-AOA-SS11P-000H	CBD-AOA-SS12-000H
Sample Date		10/05/20	09/30/20	10/01/20	10/01/20	10/05/20	10/05/20	10/05/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (ng/g)								
Perfluorooctane sulfonic acid (PFOS)	130	34.3 U	**195**	**178**	**138**	128 U	114 U	36.2 U
Perfluorooctanoic acid (PFOA)	130	**1.46 J**	**4.05 J**	**2.67 J**	**1.82 J**	**2.07 J**	**2.08 J**	2.52 U
Perfluorobutanesulfonic acid (PFBS)	1,900	1.18 U	**0.58 J**	1.33 U	1.23 U	1.55 U	1.75 U	1.26 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
ng/g = Nanograms per gram
Surface soil samples were collected from 0 to 6 inches below ground surface
[1] Screening levels for PFOA and PFOS are based on an HQ of 0.1 and were generated using the United States Environmental Protection Agency Regional Screening Level calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-1. Site 10 Detected Analytical Results - Surface Soil
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	CBD-AOA-SO13	CBD-AOA-SO14	CBD-AOA-SO15	CBD-AOA-SO16	CBD-AOA-SO17	CBD-AOA-SO18	CBD-AOA-SO19
Sample ID		CBD-AOA-SS13-000H	CBD-AOA-SS14-000H	CBD-AOA-SS15-000H	CBD-AOA-SS16-000H	CBD-AOA-SS17-000H	CBD-AOA-SS18-000H	CBD-AOA-SS19-000H
Sample Date		10/06/20	10/06/20	10/06/20	10/06/20	10/05/20	10/05/20	10/05/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (ng/g)								
Perfluorooctane sulfonic acid (PFOS)	130	6.18 U	3.87 U	6.51 U	16.1 U	**4,660**	82.1 U	**224**
Perfluorooctanoic acid (PFOA)	130	2.23 U	2.15 U	2.38 U	2.55 U	**25.4**	2.15 U	**8.07**
Perfluorobutanesulfonic acid (PFBS)	1,900	1.12 U	1.08 U	1.19 U	1.27 U	**0.66 J**	1.08 U	1.04 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
ng/g = Nanograms per gram
Surface soil samples were collected from 0 to 6 inches below ground surface
[1] Screening levels for PFOA and PFOS are based on an HQ of 0.1 and were generated using the United States Environmental Protection Agency Regional Screening Level calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-1. Site 10 Detected Analytical Results - Surface Soil
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	CBD-AOA-SO20	CBD-AOA-SO21		CBD-AOA-SO22	CBD-AOA-SO23	CBD-AOA-SO24	CBD-AOA-SO25
Sample ID		CBD-AOA-SS20-000H	CBD-AOA-SS21-000H	CBD-AOA-SS21P-000H	CBD-AOA-SS22-000H	CBD-AOA-SS23-000H	CBD-AOA-SS24-000H	CBD-AOA-SS25-000H
Sample Date		10/05/20	10/02/20	10/02/20	10/02/20	10/09/20	10/02/20	10/01/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (ng/g)								
Perfluorooctane sulfonic acid (PFOS)	130	**231**	7.12 U	6.41 U	7.91 U	16.1 U	7.1 U	91 U
Perfluorooctanoic acid (PFOA)	130	**4.06 J**	2.34 U	2.55 U	2.27 U	2.19 U	2.21 U	**2.29 J**
Perfluorobutanesulfonic acid (PFBS)	1,900	1.27 U	1.17 U	1.27 U	1.14 U	1.09 U	1.1 U	1.28 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
ng/g = Nanograms per gram
Surface soil samples were collected from 0 to 6 inches below ground surface
[1] Screening levels for PFOA and PFOS are based on an HQ of 0.1 and were generated using the United States Environmental Protection Agency Regional Screening Level calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-1. Site 10 Detected Analytical Results - Surface Soil
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	CBD-AOA-SO26	CBD-AOA-SO27	CBD-AOA-SO28	CBD-AOA-SO29
Sample ID		CBD-AOA-SS26-000H	CBD-AOA-SS27-000H	CBD-AOA-SS28-000H	CBD-AOA-SS29-000H
Sample Date		10/06/20	10/06/20	10/09/20	10/02/20
Chemical Name					
Per- and Polyfluorinated Alkyl Substances (ng/g)					
Perfluorooctane sulfonic acid (PFOS)	130	**1,160**	64.2 U	2.07 U	6.4 U
Perfluorooctanoic acid (PFOA)	130	**20.2**	**3.16 J**	2.07 U	2.38 U
Perfluorobutanesulfonic acid (PFBS)	1,900	1.18 U	1.24 U	1.04 U	1.19 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
ng/g = Nanograms per gram
Surface soil samples were collected from 0 to 6 inches below ground surface
[1] Screening levels for PFOA and PFOS are based on an HQ of 0.1 and were generated using the United States Environmental Protection Agency Regional Screening Level calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-2. Subsurface Soil Analytical Data for PFOS, PFOA, and PFBS
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	CBD-AOA-SO01	CBD-AOA-SO02	CBD-AOA-SO03	CBD-AOA-SO04	CBD-AOA-SO05		CBD-AOA-SO06	CBD-AOA-SO07	CBD-AOA-SO08
Sample ID		CBD-AOA-SB01-0709	CBD-AOA-SB02-0810	CBD-AOA-SB03-0810	CBD-AOA-SB04-1618	CBD-AOA-SB05-1113	CBD-AOA-SB05P-1113	CBD-AOA-SB06-0709	CBD-AOA-SB07-0809	CBD-AOA-SB08-0810
Sample Date		10/01/20	09/30/20	09/30/20	10/01/20	10/06/20	10/06/20	09/30/20	10/05/20	09/30/20
Sample Depth (ft bgs)		7 - 9	8 - 10	8 - 10	16 - 18	11 - 13		7 - 9	8 - 9	8 - 10
Chemical Name										
Per- and Polyfluorinated Alkyl Substances (NG/G)										
Perfluorooctane sulfonic acid (PFOS)	130	**214**	10.4 U	96.7 U	**106**	11 U	12.9 U	41 U	16.3 U	24.9 U
Perfluorooctanoic acid (PFOA)	130	2.53 U	2.9 U	**5.68 J**	**3.52 J**	2.35 U	2.53 U	**2.11 J**	3.25 U	**1.66 J**
Perfluorobutanesulfonic acid (PFBS)	1,900	1.27 U	1.45 U	1.59 U	1.69 U	1.18 U	1.27 U	**0.59 J**	1.63 U	1.52 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/G = Nanograms per gram
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-2. Subsurface Soil Analytical Data for PFOS, PFOA, and PFBS
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	CBD-AOA-SO09		CBD-AOA-SO10		CBD-AOA-SO11	CBD-AOA-SO12	CBD-AOA-SO13	CBD-AOA-SO14
Sample ID		CBD-AOA-SB09-0103	CBD-AOA-SB09-0608	CBD-AOA-SB10-0608	CBD-AOA-SB10P-0608	CBD-AOA-SB11-1315	CBD-AOA-SB12-0103	CBD-AOA-SB13-0103	CBD-AOA-SB14-1012
Sample Date		10/01/20	10/01/20	10/01/20	10/01/20	10/05/20	10/05/20	10/06/20	10/06/20
Sample Depth (ft bgs)		1 - 3	6 - 8	6 - 8		13 - 15	1 - 3	1 - 3	10 - 12
Chemical Name									
Per- and Polyfluorinated Alkyl Substances (NG/G)									
Perfluorooctane sulfonic acid (PFOS)	130	**7,150**	**7,950**	**1,200**	**915**	115 U	**568**	**613**	6.58 U
Perfluorooctanoic acid (PFOA)	130	**68**	**17.8**	**34.7**	**33.7**	**4.04 J**	**7.01**	**1.24 J**	2.33 U
Perfluorobutanesulfonic acid (PFBS)	1,900	**5.37 J**	**0.86 J**	**6.08 J**	**5.97 J**	1.68 U	1.15 U	1.1 U	1.16 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/G = Nanograms per gram
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-2. Subsurface Soil Analytical Data for PFOS, PFOA, and PFBS
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	CBD-AOA-SO15			CBD-AOA-SO16	CBD-AOA-SO17	CBD-AOA-SO18		CBD-AOA-SO19	CBD-AOA-SO20
Sample ID		CBD-AOA-SB15-1113	CBD-AOA-SB15P-1113	CBD-AOA-SB15-0810	CBD-AOA-SB16-0608	CBD-AOA-SB17-0608	CBD-AOA-SB18-0204	CBD-AOA-SB18-0809	CBD-AOA-SB19-0608	CBD-AOA-SB20-0810
Sample Date		10/06/20	10/06/20	10/06/20	10/06/20	10/05/20	10/05/20	10/05/20	10/05/20	10/05/20
Sample Depth (ft bgs)		11 - 13		8 - 10	6 - 8	6 - 8	2 - 4	8 - 9	6 - 8	8 - 10
Chemical Name										
Per- and Polyfluorinated Alkyl Substances (NG/G)										
Perfluorooctane sulfonic acid (PFOS)	130	15.2 U	14.7 U	5.29 U	6.69 U	**653**	84.6 U	6.1 U	123 U	4.63 U
Perfluorooctanoic acid (PFOA)	130	2.42 U	2.47 U	2.29 U	2.55 U	**20.6**	**75.9**	3.2 U	**2.15 J**	2.9 U
Perfluorobutanesulfonic acid (PFBS)	1,900	1.21 U	1.23 U	1.14 U	1.27 U	**2.35 J**	1.2 U	1.6 U	1.29 U	1.45 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/G = Nanograms per gram
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-2. Subsurface Soil Analytical Data for PFOS, PFOA, and PFBS
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	CBD-AOA-SO21	CBD-AOA-SO22	CBD-AOA-SO23	CBD-AOA-SO24	CBD-AOA-SO25			CBD-AOA-SO26	
Sample ID		CBD-AOA-SB21-1516	CBD-AOA-SB22-0911	CBD-AOA-SB23-1516	CBD-AOA-SB24-0103	CBD-AOA-SB25-1517	CBD-AOA-SB25-0810	CBD-AOA-SB25P-0810	CBD-AOA-SB26-1012	CBD-AOA-SB26-0810
Sample Date		10/02/20	10/02/20	10/09/20	10/02/20	10/01/20	10/01/20	10/01/20	10/06/20	10/06/20
Sample Depth (ft bgs)		15 - 16	9 - 11	15 - 16	1 - 3	15 - 17	8 - 10		10 - 12	8 - 10
Chemical Name										
Per- and Polyfluorinated Alkyl Substances (NG/G)										
Perfluorooctane sulfonic acid (PFOS)	130	15 U	2.38 U	2.6 U	39.5 U	**204**	**145**	**150**	**309**	**392**
Perfluorooctanoic acid (PFOA)	130	2.65 U	2.38 U	2.6 U	2.38 U	**3.34 J**	**0.76 J**	**0.89 J**	**9.76**	**2.77 J**
Perfluorobutanesulfonic acid (PFBS)	1,900	1.32 U	1.19 U	1.3 U	1.19 U	1.4 U	1.16 U	1.14 U	1.27 U	1.23 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/G = Nanograms per gram
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-2. Subsurface Soil Analytical Data for PFOS, PFOA, and PFBS
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level**[1]	CBD-AOA-SO27		CBD-AOA-SO28		CBD-AOA-SO29	
Sample ID		CBD-AOA-SB27-1012	CBD-AOA-SB27P-1012	CBD-AOA-SB28-1516	CBD-AOA-SB28-0809	CBD-AOA-SB29-0608	CBD-AOA-SB29-0810
Sample Date		10/06/20	10/06/20	10/09/20	10/09/20	10/02/20	10/02/20
Sample Depth (ft bgs)		10 - 12		15 - 16	8 - 9	6 - 8	8 - 10
Chemical Name							
Per- and Polyfluorinated Alkyl Substances (NG/G)							
Perfluorooctane sulfonic acid (PFOS)	130	2.45 U	2.16 U	15.2 U	2.83 U	3.15 U	3.61 U
Perfluorooctanoic acid (PFOA)	130	2.45 U	2.16 U	2.52 U	2.02 U	2.16 U	2.44 U
Perfluorobutanesulfonic acid (PFBS)	1,900	1.23 U	1.08 U	1.26 U	1.01 U	1.08 U	1.22 U

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/G = Nanograms per gram
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

Table 4-3. Site 10 Detected Analytical Results – Shallow Aquifer Groundwater
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	**Maryland Cleanup Standard**	CBD-AOA-MW01		CBD-AOA-MW02	CBD-AOA-MW03	CBD-AOA-MW04	CBD-AOA-MW05	CBD-AOA-MW06
Sample ID			CBD-AOA-MW01-1020	CBD-AOA-MW01P-1020	CBD-AOA-MW02-1020	CBD-AOA-MW03-1020	CBD-AOA-MW04-1020	CBD-AOA-MW05-1020	CBD-AOA-MW06-1020
Sample Date			10/19/20	10/19/20	10/19/20	10/19/20	10/19/20	10/21/20	10/27/20
Chemical Name									
Per- and Polyfluorinated Alkyl Substances (NG/L)									
Perfluorooctane sulfonic acid (PFOS)	40	--	**23,700**	**21,600**	**171,000**	**112,000**	**10,800**	0.94 U	**5.96**
Perfluorooctanoic acid (PFOA)	40	--	**1,970**	**2,330**	**3,870**	**6,800**	**1,090**	1.42 U	**55**
Perfluorobutanesulfonic acid (PFBS)	600	--	**167**	**171**	**261**	**574**	**88.8**	0.93 U	**1.04 J**
Total Petroleum Hydrocarbons (UG_L)									
TPH-diesel range (UG/L)	--	47	**190 J**	300 U	**810**	300 U	300 U	NA	NA
TPH-gas range (UG/L)	--	47	100 U	**52 J**	100 U	100 U	100 U	NA	NA

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold box indicates the result exceeded the Maryland Cleanup Standard
Bold indicates detections
NA = Not analyzed
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/L = Nanograms per liter
UG/L = Micrograms per liter
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect the reference dose provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021) and the resultant value was rounded to two significant figures, consistent with USEPA's RSL Table issued in May 2021.

Table 4-3. Site 10 Detected Analytical Results – Shallow Aquifer Groundwater
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	**Maryland Cleanup Standard**	CBD-AOA-MW07	CBD-AOA-MW08	CBD-AOA-MW09	CBD-AOA-MW10	CBD-AOA-MW15	CBD-AOA-MW16
Sample ID			CBD-AOA-MW07-1020	CBD-AOA-MW08-1020	CBD-AOA-MW09-1020	CBD-AOA-MW10-1020	CBD-AOA-MW15-1020	CBD-AOA-MW16-1020
Sample Date			10/20/20	10/19/20	10/21/20	10/15/20	10/16/20	10/16/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/L)								
Perfluorooctane sulfonic acid (PFOS)	40	--	3.94 U	**13,300**	**15.6**	**325**	**34.5**	**92 J**
Perfluorooctanoic acid (PFOA)	40	--	1.36 U	**4,630**	**9.05**	**248**	**431**	**22**
Perfluorobutanesulfonic acid (PFBS)	600	--	**2.45 J**	**501**	**1.88 J**	**33.3**	**30.2**	**9.89**
Total Petroleum Hydrocarbons (UG_L)								
TPH-diesel range (UG/L)	--	47	NA	300 U	NA	NA	NA	NA
TPH-gas range (UG/L)	--	47	NA	100 U	NA	NA	NA	NA

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold box indicates the result exceeded the Maryland Cleanup Standard
Bold indicates detections
NA = Not analyzed
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/L = Nanograms per liter
UG/L = Micrograms per liter
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect the reference dose provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021) and the resultant value was rounded to two significant figures, consistent with USEPA's RSL Table issued in May 2021.

Table 4-3. Site 10 Detected Analytical Results – Shallow Aquifer Groundwater
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	**Maryland Cleanup Standard**	CBD-AOA-MW17	CBD-AOA-MW18	CBD-AOA-MW19	CBD-HVGGW09	CBD-HVGGW10	CBD-BKG-MW01	CBD-BKG-MW02
Sample ID			CBD-AOA-MW17-1020	CBD-AOA-MW18-1020	CBD-AOA-MW19-1020	CBD-HVGGW09-1020	CBD-HVGGW10-1020	CBD-BKG-MW01-1020	CBD-BKG-MW02-1020
Sample Date			10/20/20	10/19/20	10/20/20	10/14/20	10/14/20	10/20/20	10/20/20
Chemical Name									
Per- and Polyfluorinated Alkyl Substances (NG/L)									
Perfluorooctane sulfonic acid (PFOS)	40	--	**9.67**	**12,700**	**21.1**	**3.17 J**	**3.27 J**	**10.8**	2.25 U
Perfluorooctanoic acid (PFOA)	40	--	**2.56 J**	**1,030**	**23.7**	1.42 U	**1.47 J**	**1.4 J**	**0.98 J**
Perfluorobutanesulfonic acid (PFBS)	600	--	**1.72 J**	**62**	**1.81 J**	**2.7 J**	**2.82 J**	1.19 U	0.99 U
Total Petroleum Hydrocarbons (UG_L)									
TPH-diesel range (UG/L)	--	47	NA	NA	NA	NA	NA	NA	NA
TPH-gas range (UG/L)	--	47	NA	NA	NA	NA	NA	NA	NA

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold box indicates the result exceeded the Maryland Cleanup Standard
Bold indicates detections
NA = Not analyzed
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/L = Nanograms per liter
UG/L = Micrograms per liter
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect the reference dose provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021) and the resultant value was rounded to two significant figures, consistent with USEPA's RSL Table issued in May 2021.

Table 4-3. Site 10 Detected Analytical Results – Shallow Aquifer Groundwater
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level**[1]	**Maryland Cleanup Standard**	CBD-BKG-MW03	CBD-S03-MW01	CBD-S03-MW02	CBD-S04-MW01	
Sample ID			CBD-BKG-MW03-1020	CBD-S03-MW01-1020	CBD-S03-MW02-1020	CBD-S04-MW01-1020	CBD-S04-MW01P-1020
Sample Date			10/15/20	10/19/20	10/20/20	10/15/20	10/15/20
Chemical Name							
Per- and Polyfluorinated Alkyl Substances (NG/L)							
Perfluorooctane sulfonic acid (PFOS)	40	--	**10.6**	**1,090**	**323**	**1,850**	**1,900**
Perfluorooctanoic acid (PFOA)	40	--	**2.89 J**	**59.6**	**94.2**	**12.1**	**12.9**
Perfluorobutanesulfonic acid (PFBS)	600	--	**1.11 J**	**7.5**	**10.1**	**168**	**154**
Total Petroleum Hydrocarbons (UG_L)							
TPH-diesel range (UG/L)	--	47	NA	**180 J**	**220 J**	NA	NA
TPH-gas range (UG/L)	--	47	NA	100 U	100 U	NA	NA

Notes:
Shading indicates the result exceeded the PFAS Screening Level
Bold box indicates the result exceeded the Maryland Cleanup Standard
Bold indicates detections
NA = Not analyzed
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/L = Nanograms per liter
UG/L = Micrograms per liter
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect the reference dose provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021) and the resultant value was rounded to two significant figures, consistent with USEPA's RSL Table issued in May 2021.

Table 4-4. Site 10 Comparison of 2009 and 2020 TPH
Analytical Results - Shallow Aquifer Groundwater
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**Maryland Cleanup Standard**	CBD-AOA-MW01				CBD-AOA-MW02		CBD-AOA-MW03	
Sample ID		NRB-MW01-0809	NRB-MW01P-0809	CBD-AOA-MW01-1020	CBD-AOA-MW01P-1020	NRB-MW02-0809	CBD-AOA-MW02-1020	NRB-MW03-0809	CBD-AOA-MW03-1020
Sample Date		8/12/2009	8/12/2009	10/19/20	10/19/20	8/12/2009	10/19/20	8/12/2009	10/19/20
Chemical Name									
Total Petroleum Hydrocarbons (UG_L)									
TPH-diesel range (UG/L)	47	**270**	**250**	**190 J**	300 U	**200**	**810**	**350**	300 U
TPH-gas range (UG/L)	47	21 U	**7.1 J**	100 U	**52 J**	**57 K**	100 U	21 U	100 U

Notes:

Bold box indicates the result exceeded the Maryland Cleanup
Bold indicates detections
B = Analyte not detected above the level reported in blanks
J = Analyte present, value may or may not be accurate or precise
K = Analyte present. Value may be biased high. Value may be lower
U = The material was analyzed for, but not detected
UG/L = micrograms per liter

Table 4-4. Site 10 Comparison of 2009 and 2020 TPH
Analytical Results - Shallow Aquifer Groundwater
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**Maryland Cleanup Standard**	CBD-AOA-MW04		CBD-AOA-MW08	CBD-S03-MW01	CBD-S03-MW02
Sample ID		NRB-MW04-0809	CBD-AOA-MW04-1020	CBD-AOA-MW08-1020	CBD-S03-MW01-1020	CBD-S03-MW02-1020
Sample Date		8/12/2009	10/19/20	10/19/20	10/19/20	10/20/20
Chemical Name						
Total Petroleum Hydrocarbons (UG_L)						
TPH-diesel range (UG/L)	47	66 B	300 U	300 U	**180 J**	**220 J**
TPH-gas range (UG/L)	47	21 U	100 U	100 U	100 U	100 U

Notes:

Bold box indicates the result exceeded the Maryland Cleanup

Bold indicates detections

B = Analyte not detected above the level reported in blanks

J = Analyte present, value may or may not be accurate or precise

K = Analyte present. Value may be biased high. Value may be lower

U = The material was analyzed for, but not detected

UG/L = micrograms per liter

Table 4-5. Site 10 Detected Analytical Results – Piney Point Aquifer Groundwater
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**PFAS Screening Level[1]**	**Maryland Cleanup Standard**	CBD-AOA-MW11		CBD-AOA-MW12	CBD-AOA-MW13	CBD-AOA-MW14
Sample ID			CBD-AOA-MW11-1020	CBD-AOA-MW11P-1020	CBD-AOA-MW12-1020	CBD-AOA-MW13-1020	CBD-AOA-MW14-1020
Sample Date			10/28/20	10/28/20	10/28/20	10/28/20	10/28/20
Chemical Name							
Per- and Polyfluorinated Alkyl Substances (NG/L)							
Perfluorooctane sulfonic acid (PFOS)	40	--	0.92 U	0.98 U	0.9 U	**17.9**	4.25 U
Perfluorooctanoic acid (PFOA)	40	--	**0.68 J**	**0.76 J**	**0.68 J**	**10**	**5.99**
Perfluorobutanesulfonic acid (PFBS)	600	--	0.46 U	0.49 U	0.45 U	0.5 U	**0.75 J**

Notes:
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/L = Nanograms per liter
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect the reference dose provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021) and the resultant value was rounded to two significant figures, consistent with USEPA's RSL Table issued in May 2021.

Table 4-6. Site 10 Detected Analytical Results - Surface Water

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Station ID	**10 x PFAS Screening Level[1]**	CBD-AOA-SW01	CBD-AOA-SW03	CBD-AOA-SW05	CBD-AOA-SW07	CBD-AOA-SW09	CBD-AOA-SW10	CBD-AOA-SW11	
Sample ID		CBD-AOA-SW01-1020	CBD-AOA-SW03-1020	CBD-AOA-SW05-1020	CBD-AOA-SW07-1020	CBD-AOA-SW09-1020	CBD-AOA-SW10-1020	CBD-AOA-SW11-1020	CBD-AOA-SW11P-1020
Sample Date		10/13/20	10/13/20	10/13/20	10/13/20	10/13/20	10/13/20	10/13/20	10/13/20
Chemical Name									
Per- and Polyfluorinated Alkyl Substances (NG/L)									
Perfluorooctane sulfonic acid (PFOS)	400	**12.8 J**	**137**	**1,230**	**1,140**	**2,990**	**4,050**	**4,370**	**3,820**
Perfluorooctanoic acid (PFOA)	400	**2.93 J**	**80.4**	**127**	**124**	**140**	**413**	**550**	**578**
Perfluorobutanesulfonic acid (PFBS)	6,000	**1.74 J**	**6.97**	**19.5**	**23.3**	**18.4**	**64.1**	**45**	**51.2**

Notes:

Shading indicates the result exceeded 10 times the PFAS Screening Level

Bold indicates detections

J = Analyte present, value may or may not be accurate or precise

U = The material was analyzed for, but not detected

UJ = Analyte not detected, quantitation limit may be inaccurate

NG/L = Nanograms per liter

[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect the reference dose provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021) and the resultant value was rounded to two significant figures, consistent with USEPA's RSL Table issued in May 2021.

Table 4-6. Site 10 Detected Analytical Results - Surface Water

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Station ID	**10 x PFAS Screening Level[1]**	CBD-AOA-SWSD02		CBD-AOA-SWSD04	CBD-AOA-SWSD06	CBD-AOA-SWSD08
Sample ID		CBD-AOA-SW02-1020	CBD-AOA-SW02P-1020	CBD-AOA-SW04-1020	CBD-AOA-SW06-1020	CBD-AOA-SW08-1020
Sample Date		10/13/20	10/13/20	10/13/20	10/13/20	10/13/20
Chemical Name						
Per- and Polyfluorinated Alkyl Substances (NG/L)						
Perfluorooctane sulfonic acid (PFOS)	400	**58.4 J**	**42.4**	**165**	**4,140**	**4,960**
Perfluorooctanoic acid (PFOA)	400	**10.1 J**	**11.1**	**23.9**	**521**	**453**
Perfluorobutanesulfonic acid (PFBS)	6,000	**2.41 J**	**3.33 J**	**5.57**	**51.2**	**51.1**

Notes:

Shading indicates the result exceeded 10 times the PFAS Screening Level

Bold indicates detections

J = Analyte present, value may or may not be accurate or precise

U = The material was analyzed for, but not detected

UJ = Analyte not detected, quantitation limit may be inaccurate

NG/L = Nanograms per liter

[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect the reference dose provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021) and the resultant value was rounded to two significant figures, consistent with USEPA's RSL Table issued in May 2021.

Table 4-7. Site 10 Detected Analytical Results - Sediment
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Station ID	**10 x PFAS Screening Level[1]**	CBD-AOA-SWSD02	CBD-AOA-SWSD04	CBD-AOA-SWSD06	CBD-AOA-SWSD08	
Sample ID		CBD-AOA-SD02-000H	CBD-AOA-SD04-000H	CBD-AOA-SD06-000H	CBD-AOA-SD08-000H	CBD-AOA-SD08P-000H
Sample Date		10/13/20	10/13/20	10/13/20	10/13/20	10/13/20
Chemical Name						
Per- and Polyfluorinated Alkyl Substances (NG/G)						
Perfluorooctane sulfonic acid (PFOS)	1,300	**2.64 J**	**1.63 J**	**34.9**	**7.49**	**6.1**
Perfluorooctanoic acid (PFOA)	1,300	3.81 U	2.65 U	2.7 U	2.63 U	2.41 U
Perfluorobutanesulfonic acid (PFBS)	19,000	1.9 U	1.32 U	1.35 U	1.32 U	1.2 U

Notes:
Shading indicates the result exceeded 10 x PFAS Screening Level
Bold indicates detections
J = Analyte present, value may or may not be accurate or precise
U = The material was analyzed for, but not detected
NG/G = Nanograms per gram
[1] SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense October 15, 2019 memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" (DoD, 2019). The SL for PFBS was generated similarly, but the value was updated from that listed in the 2019 memorandum to reflect reference doses provided in "Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate" (USEPA, 2021).

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Station ID	CBD-AOA-SO04
Sample ID	CBD-AOA-SS04-000H
Sample Date	10/01/20
Chemical Name	
PFAS (NG/G)	
PFOS	**168**
PFOA	**4.76 J**

Station ID	CBD-AOA-SO01	
Sample ID	CBD-AOA-SS01-000H	CBD-AOA-SS01P-000H
Sample Date	10/01/20	10/01/20
Chemical Name		
PFAS (NG/G)		
PFOA	**0.92 J**	**0.82 J**

Station ID	CBD-AOA-SO06
Sample ID	CBD-AOA-SS06-000H
Sample Date	09/30/20
Chemical Name	
PFAS (NG/G)	
PFOA	**1.76 J**

Station ID	CBD-AOA-SO02
Sample ID	CBD-AOA-SS02-000H
Sample Date	09/30/20
Chemical Name	
PFAS (NG/G)	
PFOA	**2.22 J**

Station ID	CBD-AOA-SO25
Sample ID	CBD-AOA-SS25-000H
Sample Date	10/01/20
Chemical Name	
PFAS (NG/G)	
PFOA	**2.29 J**

Station ID	CBD-AOA-SO03
Sample ID	CBD-AOA-SS03-000H
Sample Date	09/30/20
Chemical Name	
PFAS (NG/G)	
PFOA	**4.02 J**

Station ID	CBD-AOA-SO10
Sample ID	CBD-AOA-SS10-000H
Sample Date	10/01/20
Chemical Name	
PFAS (NG/G)	
PFOS	**138**
PFOA	**1.82 J**

Station ID	CBD-AOA-SO07
Sample ID	CBD-AOA-SS07-000H
Sample Date	10/05/20
Chemical Name	
PFAS (NG/G)	
PFOA	**1.46 J**

Station ID	CBD-AOA-SO27
Sample ID	CBD-AOA-SS27-000H
Sample Date	10/06/20
Chemical Name	
PFAS (NG/G)	
PFOA	**3.16 J**

Station ID	CBD-AOA-SO08
Sample ID	CBD-AOA-SS08-000H
Sample Date	09/30/20
Chemical Name	
PFAS (NG/G)	
PFOS	**195**
PFOA	**4.05 J**
PFBS	**0.58 J**

Station ID	CBD-AOA-SO26
Sample ID	CBD-AOA-SS26-000H
Sample Date	10/06/20
Chemical Name	
PFAS (NG/G)	
PFOS	**1,160**
PFOA	**20.2**

Station ID	CBD-AOA-SO09
Sample ID	CBD-AOA-SS09-000H
Sample Date	10/01/20
Chemical Name	
PFAS (NG/G)	
PFOS	**178**
PFOA	**2.67 J**

Station ID	CBD-AOA-SO11	
Sample ID	CBD-AOA-SS11-000H	CBD-AOA-SS11P-000H
Sample Date	10/05/20	10/05/20
Chemical Name		
PFAS (NG/G)		
PFOA	**2.07 J**	**2.08 J**

Station ID	CBD-AOA-SO17
Sample ID	CBD-AOA-SS17-000H
Sample Date	10/05/20
Chemical Name	
PFAS (NG/G)	
PFOS	**4,660**
PFOA	**25.4**
PFBS	**0.66 J**

Station ID	CBD-AOA-SO20
Sample ID	CBD-AOA-SS20-000H
Sample Date	10/05/20
Chemical Name	
PFAS (NG/G)	
PFOS	**231**
PFOA	**4.06 J**

Station ID	CBD-AOA-SO19
Sample ID	CBD-AOA-SS19-000H
Sample Date	10/05/20
Chemical Name	
PFAS (NG/G)	
PFOS	**224**
PFOA	**8.07**

CBD-AOA-MW08
CBD-AOA-MW01
CBD-AOA-SO05
CBD-AOA-MW03
CBD-AOA-SO12
CBD-AOA-MW04
CBD-AOA-SO14
CBD-AOA-SO16
CBD-AOA-MW02
CBD-AOA-SO15
CBD-SO4-MW01
CBD-AOA-SO13
CBD-AOA-SO18
CBD-AOA-MW13
CBD-SO3-MW01
CBD-AOA-SO28
CBD-AOA-SO21
CBD-AOA-SO29
CBD-AOA-SO22
CBD-AOA-SO24
CBD-AOA-SO23
CBD-SO3-MW02
HVGGW10
NAVY CT
NAVY CT

Notes
Shading indicates exceedance of PFAS screening level
Bold text indicates detection
NG/G - Nanograms per gram
J = Analyte present, value may or may not be accurate or
PFAS - Per- and Polyfluorinated Alkyl Substances
PFOS - Perfluorooctane sulfonic acid
PFOA - Perfluorooctanoic acid
PFBS - Perfluorobutanesulfonic acid

[1] Screening levels (SLs) for PFOA and PFOS are based on a hazard quotient (HQ) of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense September 2021 memorandum (DoD, 2021). Subsequent to issuance of the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection in August 2020, the screening levels (SLs) for PFBS were revised to reflect the updated chronic reference dose for PFBS (DoD, 2021).

Analyte Name	PFAS Screening Level[1]
Chemical Name	
PFAS (NG/G)	
PFOS	130
PFOA	130
PFBS	1,900

Imagery:
Maryland Mapping and GIS Data Portal, 2017

Legend

- Surface/Subsurface Soil Location
- No detections of PFOS, PFOA, and PFBS
- Surficial Aquifer Monitoring Well
- Piney Point Aquifer Monitoring Well
- Fire Testing Area Boundary
- Surface Water

Only detections of PFOA, PFOS, and/or PFBS are shown.

N

0 100 200 Feet

1 in = 100 ft

Figure 4-1
Surface Soil Exceedances
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

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Station ID	CBD-AOA-SO25		
Sample ID	CBD-AOA-SB25-0810	CBD-AOA-SB25P-0810	CBD-AOA-SB25-1517
Sample Date	10/01/20	10/01/20	10/01/20
Sample Depth (ft bgs)	8-10	8-10	15-17
Chemical Name			
PFAS (NG/G)			
PFOS	**145**	**150**	**204**
PFOA	**0.76 J**	**0.89 J**	**3.34 J**

Station ID	CBD-AOA-SO01
Sample ID	CBD-AOA-SB01-0709
Sample Date	10/01/20
Sample Depth (ft bgs)	7-9
Chemical Name	
PFAS (NG/G)	
PFOS	**214**

Station ID	CBD-AOA-SO06
Sample ID	CBD-AOA-SB06-0709
Sample Date	09/30/20
Sample Depth (ft bgs)	7-9
Chemical Name	
PFAS (NG/G)	
PFOA	**2.11 J**
PFBS	**0.59 J**

Station ID	CBD-AOA-SO03
Sample ID	CBD-AOA-SB03-0810
Sample Date	09/30/20
Sample Depth (ft bgs)	8-10
Chemical Name	
PFAS (NG/G)	
PFOA	**5.68 J**

Station ID	CBD-AOA-SO10	
Sample ID	CBD-AOA-SB10-0608	CBD-AOA-SB10P-0608
Sample Date	10/01/20	10/01/20
Sample Depth (ft bgs)	6-8	6-8
Chemical Name		
PFAS (NG/G)		
PFOS	**1,200**	**915**
PFOA	**34.7**	**33.7**
PFBS	**6.08 J**	**5.97 J**

Station ID	CBD-AOA-SO04
Sample ID	CBD-AOA-SB04-1618
Sample Date	10/01/20
Sample Depth (ft bgs)	16-18
Chemical Name	
PFAS (NG/G)	
PFOS	**106**
PFOA	**3.52 J**

Station ID	CBD-AOA-SO08
Sample ID	CBD-AOA-SB08-0810
Sample Date	09/30/20
Sample Depth (ft bgs)	8-10
Chemical Name	
PFAS (NG/G)	
PFOA	**1.66 J**

Station ID	CBD-AOA-SO12
Sample ID	CBD-AOA-SB12-0103
Sample Date	10/05/20
Sample Depth (ft bgs)	1-3
Chemical Name	
PFAS (NG/G)	
PFOS	**568**
PFOA	**7.01**

Station ID	CBD-AOA-SO09	
Sample ID	CBD-AOA-SB09-0103	CBD-AOA-SB09-0608
Sample Date	10/01/20	10/01/20
Sample Depth (ft bgs)	1-3	6-8
Chemical Name		
PFAS (NG/G)		
PFOS	**7,150**	**7,950**
PFOA	**68**	**17.8**
PFBS	**5.37 J**	**0.86 J**

Station ID	CBD-AOA-SO26	
Sample ID	CBD-AOA-SB26-0810	CBD-AOA-SB26-1012
Sample Date	10/06/20	10/06/20
Sample Depth (ft bgs)	8-10	10-12
Chemical Name		
PFAS (NG/G)		
PFOS	**392**	**309**
PFOA	**2.77 J**	**9.76**

Station ID	CBD-AOA-SO18	
Sample ID	CBD-AOA-SB18-0204	CBD-AOA-SB18-0809
Sample Date	10/05/20	10/01/20
Sample Depth (ft bgs)	2-4	8-9
Chemical Name		
PFAS (NG/G)		
PFOA	**75.9**	3.2 U

Station ID	CBD-AOA-SO13
Sample ID	CBD-AOA-SB13-0103
Sample Date	10/06/20
Sample Depth (ft bgs)	1-3
Chemical Name	
PFAS (NG/G)	
PFOS	**613**
PFOA	**1.24 J**

Station ID	CBD-AOA-SO19
Sample ID	CBD-AOA-SB19-0608
Sample Date	10/05/20
Sample Depth (ft bgs)	6-8
Chemical Name	
PFAS (NG/G)	
PFOA	**2.15 J**

Station ID	CBD-AOA-SO17
Sample ID	CBD-AOA-SB17-0608
Sample Date	10/05/20
Sample Depth (ft bgs)	6-8
Chemical Name	
PFAS (NG/G)	
PFOS	**653**
PFOA	**20.6**
PFBS	**2.35 J**

Station ID	CBD-AOA-SO11
Sample ID	CBD-AOA-SB11-1315
Sample Date	10/05/20
Sample Depth (ft bgs)	13-15
Chemical Name	
PFAS (NG/G)	
PFOA	**4.04 J**

CBD-AOA-MW08
CBD-AOA-MW01
CBD-AOA-SO02
CBD-AOA-SO05
CBD-AOA-SO07
CBD-AOA-MW03
CBD-AOA-SO27
CBD-AOA-SO14
CBD-AOA-MW02
CBD-SO4-MW01
CBD-AOA-SO15
CBD-AOA-MW04
CBD-AOA-SO16
CBD-AOA-MW13
CBD-AOA-SO20
CBD-SO3-MW01
CBD-AOA-SO28
CBD-AOA-SO21
CBD-AOA-SO29
CBD-AOA-SO22
CBD-AOA-SO24
CBD-AOA-SO23
CBD-SO3-MW02
HVGGW10
NAVY CT
NAVY CT

Notes:

Shading indicates exceedance of PFAS screening level

Bold text indicates detection

ft bgs - feet below ground surface

NG/G - Nanograms per gram

J = Analyte present, value may or may not be accurate or

U = The material was analyzed for, but not detected

PFAS - Per- and Polyfluorinated Alkyl Substances

PFOS - Perfluorooctane sulfonic acid

PFOA - Perfluorooctanoic acid

PFBS - Perfluorobutanesulfonic acid

[1] Screening levels (SLs) for PFOA and PFOS are based on a hazard quotient (HQ) of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense September 2021 memorandum (DoD, 2021). Subsequent to issuance of the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection in August 2020, the screening levels (SLs) for PFBS were revised to reflect the updated chronic reference dose for PFBS (DoD, 2021).

Analyte Name	PFAS Screening Level[1]
Chemical Name	
PFAS (NG/G)	
PFOS	130
PFOA	130
PFBS	1,900

Imagery:
Maryland Mapping and GIS Data Portal, 2017

Legend

- Surface/Subsurface Soil Location
- No detections of PFOS, PFOA, and PFBS
- Surficial Aquifer Monitoring Well
- Piney Point Aquifer Monitoring Well
- Fire Testing Area Boundary
- Surface Water

Only detections of PFOA, PFOS, and/or PFBS are shown.

N

0 100 200 Feet

1 in = 100 ft

Figure 4-2
Subsurface Soil Exceedances
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

\\dc1vs01\GISNavyClean\WASHINGTON\NavalResearchLab\Chesapeake_Bay\MapFiles\Site10\PFAS_SIReport\Figure_4-3_NRL-CBD_Site10_Shallow_GW_Exceedances.mxd11/24/2021jcarr3

Notes:

Shading indicates exceedance of PFAS screening level

Bold box indicates exceedance of Maryland Cleanup Standard

Bold text indicates detection

NG/L - Nanograms per liter

UG/L - micrograms per liter

J = Analyte present, value may or may not be accurate or precise

U = The material was analyzed for, but not detected

PFAS - Per- and Polyfluorinated Alkyl Substances

PFOS - Perfluorooctane sulfonic acid

PFOA - Perfluorooctanoic acid

PFBS - Perfluorobutanesulfonic acid

TPH - Total petroleum hydrocarbons

[1] Screening levels (SLs) for PFOA and PFOS are based on a hazard quotient (HQ) of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense September 2021 memorandum (DoD, 2021). Subsequent to issuance of the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection in August 2020, the screening levels (SLs) for PFBS were revised to reflect the updated chronic reference dose for PFBS (DoD, 2021).

Analyte Name	PFAS Screening Level[1]
Chemical Name	
PFAS (NG/L)	
PFOS	40
PFOA	40
PFBS	600

Analyte Name	Maryland Cleanup Standard
Chemical Name	
TPH (UG/L)	
TPH-diesel range	47
TPH-gas range	47

CHESAPEAKE BAY

Station ID	CBD-AOA-MW17
Sample ID	CBD-AOA-MW17-1020
Sample Date	10/20/20
Chemical Name	
PFAS (NG/L)	
PFOS	**9.67**
PFOA	**2.56 J**
PFBS	**1.72 J**

Station ID	CBD-AOA-MW08
Sample ID	CBD-AOA-MW08-1020
Sample Date	10/19/20
Chemical Name	
PFAS (NG/L)	
PFOS	**13,300**
PFOA	**4,630**
PFBS	**501**

Station ID	CBD-AOA-MW06
Sample ID	CBD-AOA-MW06-1020
Sample Date	10/27/20
Chemical Name	
PFAS (NG/L)	
PFOS	**5.96**
PFOA	**55**
PFBS	**1.04 J**

Station ID	CBD-AOA-MW01	
Sample ID	CBD-AOA-MW01-1020	CBD-AOA-MW01P-1020
Sample Date	10/19/20	10/19/20
Chemical Name		
PFAS (NG/L)		
PFOS	**23,700**	**21,600**
PFOA	**1,970**	**2,330**
PFBS	**167**	**171**
TPH (UG_L)		
TPH-diesel range	**190 J**	300 U
TPH-gas range	100 U	**52 J**

Station ID	CBD-AOA-MW18
Sample ID	CBD-AOA-MW18-1020
Sample Date	10/19/20
Chemical Name	
PFAS (NG/L)	
PFOS	**12,700**
PFOA	**1,030**
PFBS	**62**

Station ID	CBD-AOA-MW07
Sample ID	CBD-AOA-MW07-1020
Sample Date	10/20/20
Chemical Name	
PFAS (NG/L)	
PFBS	**2.45 J**

Station ID	CBD-AOA-MW03
Sample ID	CBD-AOA-MW03-1020
Sample Date	10/19/20
Chemical Name	
PFAS (NG/L)	
PFOS	**112,000**
PFOA	**6,800**
PFBS	**574**

Station ID	CBD-BGK-MW01
Sample ID	CBD-BGK-MW01-1020
Sample Date	10/20/20
Chemical Name	
PFAS (NG/L)	
PFOS	**10.8**
PFOA	**1.4 J**

Station ID	CBD-AOA-MW04
Sample ID	CBD-AOA-MW04-1020
Sample Date	10/19/20
Chemical Name	
PFAS (NG/L)	
PFOS	**10,800**
PFOA	**1,090**
PFBS	**88.8**

Station ID	CBD-AOA-MW19
Sample ID	CBD-AOA-MW19-1020
Sample Date	10/20/20
Chemical Name	
PFAS (NG/L)	
PFOS	**21.1**
PFOA	**23.7**
PFBS	**1.81 J**

Station ID	CBD-BGK-MW02
Sample ID	CBD-BGK-MW02-1020
Sample Date	10/20/20
Chemical Name	
PFAS (NG/L)	
PFOA	**0.98 J**

Station ID	CBD-AOA-MW09
Sample ID	CBD-AOA-MW09-1020
Sample Date	10/21/20
Chemical Name	
PFAS (NG/L)	
PFOS	**15.6**
PFOA	**9.05**
PFBS	**1.88 J**

Station ID	CBD-AOA-MW02
Sample ID	CBD-AOA-MW02-1020
Sample Date	10/19/20
Chemical Name	
PFAS (NG/L)	
PFOS	**171,000**
PFOA	**3,870**
PFBS	**261**
TPH (UG_L)	
TPH-diesel range	**810**

Station ID	CBD-HVGGW09
Sample ID	CBD-HVGGW09-1020
Sample Date	10/14/20
Chemical Name	
PFAS (NG/L)	
PFOS	**3.17 J**
PFBS	**2.7 J**

Station ID	CBD-S03-MW02
Sample ID	CBD-S03-MW02-1020
Sample Date	10/20/20
Chemical Name	
PFAS (NG/L)	
PFOS	**323**
PFOA	**94.2**
PFBS	**10.1**
TPH (UG_L)	
TPH-diesel range	**220 J**

Station ID	CBD-AOA-MW10
Sample ID	CBD-AOA-MW10-1020
Sample Date	10/15/20
Chemical Name	
PFAS (NG/L)	
PFOS	**325**
PFOA	**248**
PFBS	**33.3**

Station ID	CBD-HVGGW10
Sample ID	CBD-HVGGW10-1020
Sample Date	10/14/20
Chemical Name	
PFAS (NG/L)	
PFOS	**3.27 J**
PFOA	**1.47 J**
PFBS	**2.82 J**

Station ID	CBD-BGK-MW03
Sample ID	CBD-BGK-MW03-1020
Sample Date	10/15/20
Chemical Name	
PFAS (NG/L)	
PFOS	**10.6**
PFOA	**2.89 J**
PFBS	**1.11 J**

Station ID	CBD-S03-MW01
Sample ID	CBD-S03-MW01-1020
Sample Date	10/19/20
Chemical Name	
PFAS (NG/L)	
PFOS	**1,090**
PFOA	**59.6**
PFBS	**7.5**
TPH (UG_L)	
TPH-diesel range	**180 J**

Station ID	CBD-AOA-MW16
Sample ID	CBD-AOA-MW16-1020
Sample Date	10/16/20
Chemical Name	
PFAS (NG/L)	
PFOS	**92 J**
PFOA	**22**
PFBS	**9.89**

Station ID	CBD-S04-MW01	
Sample ID	CBD-S04-MW01-1020	CBD-S04-MW01P-1020
Sample Date	10/15/20	10/15/20
Chemical Name		
PFAS (NG/L)		
PFOS	**1,850**	**1,900**
PFOA	**12.1**	**12.9**
PFBS	**168**	**154**

Station ID	CBD-AOA-MW15
Sample ID	CBD-AOA-MW15-1020
Sample Date	10/16/20
Chemical Name	
PFAS (NG/L)	
PFOS	**34.5**
PFOA	**431**
PFBS	**30.2**

CBD-AOA-MW05
CBD-AOA-MW11
CBD-AOA-MW12
CBD-AOA-MW13
CBD-AOA-MW14
Navy Ct
side Rd

Legend

- Surficial Aquifer Monitoring Well
- Piney Point Aquifer Monitoring Well
- No detections of PFOS, PFOA, and PFBS
- PFOA Concentration Contour (NG\L)
- PFOS Concentration Contour (NG\L)
- Surface Water Centerline
- Surface Water
- Fire Testing Area Boundary
- NRL-CBD Base Boundary

Only detections of PFOA, PFOS, and/or PFBS are shown.

TPH was analyzed from a subset of monitoring wells (CBD-AOA-MW01 through CBD-AOA-MW04, CBD-AOA-MW08, CBD-S03-MW01, and CBD-S03-MW02). Only detections are shown.

N

0 150 300 Feet

1 inch equals 350 feet

Figure 4-3
Surficial Aquifer Groundwater Exceedances
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

\\dc1vs01\GISNavyClean\WASHINGTON\NavalResearchLab\Chesapeake_Bay\MapFiles\Site10\PFAS_SIReport\Figure_4-4_NRL-CBD_Site10_PineyPoint_GW_Exceedances.mxd11/15/2021jcarr3



Station ID	CBD-AOA-MW11	
Sample ID	CBD-AOA-MW11-1020	CBD-AOA-MW11P-1020
Sample Date	10/28/20	10/28/20
Chemical Name		
PFAS (NG/L)		
PFOA	**0.68 J**	**0.76 J**

Station ID	CBD-AOA-MW12
Sample ID	CBD-AOA-MW12-1020
Sample Date	10/28/20
Chemical Name	
PFAS (NG/L)	
PFOA	**0.68 J**

Station ID	CBD-AOA-MW13
Sample ID	CBD-AOA-MW13-1020
Sample Date	10/28/20
Chemical Name	
PFAS (NG/L)	
PFOS	**17.9**
PFOA	**10**

Station ID	CBD-AOA-MW14
Sample ID	CBD-AOA-MW14-1020
Sample Date	10/28/20
Chemical Name	
PFAS (NG/L)	
PFOA	**5.99**
PFBS	**0.75 J**

Notes:

Shading indicates exceedance of PFAS screening level

Bold text indicates detection

NG/L - Nanograms per liter

UG/L - micrograms per liter

J = Analyte present, value may or may not be accurate or precise

U = The material was analyzed for, but not detected

PFAS - Per- and Polyfluorinated Alkyl Substances

PFOS - Perfluorooctane sulfonic acid

PFOA - Perfluorooctanoic acid

PFBS - Perfluorobutanesulfonic acid

[1] Screening levels (SLs) for PFOA and PFOS are based on a hazard quotient (HQ) of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense September 2021memorandum (DoD, 2021). Subsequent to issuance of the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection in August 2020, the screening levels (SLs) for PFBS were revised to reflect the updated chronic reference dose for PFBS (DoD, 2021).

Analyte Name	PFAS Screening Level[1]
Chemical Name	
PFAS (NG/L)	
PFOS	40
PFOA	40
PFBS	600

Legend

- Shallow Aquifer Monitoring Well
- Piney Point Aquifer Deep Monitoring Well
- Surface Water Centerline
- Surface Water
- Fire Testing Area Boundary
- NRL-CBD Base Boundary

Only detections of PFOA, PFOS, and/or PFBS are shown.

N

0 150 300 Feet

1 inch equals 350 feet

Figure 4-4
Piney Point Aquifer Groundwater Exceedances
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

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CHESAPEAKE BAY

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CBD-AOA-SG05

CBD-AOA-SG04

CBD-AOA-SG03

CBD-AOA-SG02

CBD-AOA-SG01

KAREN DR

DALRYMPLE RD

NAVY CT

BAYSIDE RD

Bayside Rd

RESEARCH LN

Waste Water Treatment Plant

Station ID	CBD-AOA-SWSD08
Sample ID	CBD-AOA-SW08-1020
Sample Date	10/13/20
Chemical Name	
PFAS (NG/L)	
PFOS	**4,960**
PFOA	**453**
PFBS	**51.1**

Station ID	CBD-AOA-SWSD06
Sample ID	CBD-AOA-SW06-1020
Sample Date	10/13/20
Chemical Name	
PFAS (NG/L)	
PFOS	**4,140**
PFOA	**521**
PFBS	**51.2**

Station ID	CBD-AOA-SW10
Sample ID	CBD-AOA-SW10-1020
Sample Date	10/13/20
Chemical Name	
PFAS (NG/L)	
PFOS	**4,050**
PFOA	**413**
PFBS	**64.1**

Station ID	CBD-AOA-SW11	
Sample ID	CBD-AOA-SW11-1020	CBD-AOA-SW11P-1020
Sample Date	10/13/20	10/13/20
Chemical Name		
PFAS (NG/L)		
PFOS	**4,370**	**3,820**
PFOA	**550**	**578**
PFBS	**45**	**51.2**

Station ID	CBD-AOA-SW09
Sample ID	CBD-AOA-SW09-1020
Sample Date	10/13/20
Chemical Name	
PFAS (NG/L)	
PFOS	**2,990**
PFOA	**140**
PFBS	**18.4**

Station ID	CBD-AOA-SW01
Sample ID	CBD-AOA-SW01-1020
Sample Date	10/13/20
Chemical Name	
PFAS (NG/L)	
PFOS	**12.8 J**
PFOA	**2.93 J**
PFBS	**1.74 J**

Station ID	CBD-AOA-SW03
Sample ID	CBD-AOA-SW03-1020
Sample Date	10/13/20
Chemical Name	
PFAS (NG/L)	
PFOS	**137**
PFOA	**80.4**
PFBS	**6.97**

Station ID	CBD-AOA-SWSD02	
Sample ID	CBD-AOA-SW02-1020	CBD-AOA-SW02P-1020
Sample Date	10/13/20	10/13/20
Chemical Name		
PFAS (NG/L)		
PFOS	**54.8 J**	**42.4 J**
PFOA	**10.1 J**	**11.1 J**
PFBS	**2.41 J**	**3.33 J**

Station ID	CBD-AOA-SWSD04
Sample ID	CBD-AOA-SW04-1020
Sample Date	10/13/20
Chemical Name	
PFAS (NG/L)	
PFOS	**165**
PFOA	**23.9**
PFBS	**5.57**

Station ID	CBD-AOA-SW05
Sample ID	CBD-AOA-SW05-1020
Sample Date	10/13/20
Chemical Name	
PFAS (NG/L)	
PFOS	**1,230**
PFOA	**127**
PFBS	**19.5**

Station ID	CBD-AOA-SW07
Sample ID	CBD-AOA-SW07-1020
Sample Date	10/13/20
Chemical Name	
PFAS (NG/L)	
PFOS	**1,140**
PFOA	**124**
PFBS	**23.2**

Notes
Shading indicates exceedance of 10 x PFAS screening level
Bold text indicates detection
NG/L - Nanograms per liter
J = Analyte present, value may or may not be accurate
PFAS - Per- and Polyfluorinated Alkyl Substances
PFOS - Perfluorooctane sulfonic acid
PFOA - Perfluorooctanoic acid
PFBS = Perfluorobutanesulfonic acid
Only detections of PFOA, PFOS, and/or PFBS are shown.
[1] Screening levels (SLs) for PFOA and PFOS are based on a hazard quotient (HQ) of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense September 2021 memorandum (DoD, 2021). Subsequent to issuance of the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection in August 2020, the screening levels (SLs) for PFBS were revised to reflect the updated chronic reference dose for PFBS (DoD, 2021).

Analyte Name	10 x PFAS Screening Level
Chemical Name	
PFAS (NG/L)	
PFOS	400
PFOA	400
PFBS	6,000

Imagery:
Maryland Mapping and GIS Data Portal, 2017

Legend

- Co-located Surface Water/Sediment Location
- Staff Gauge Location
- Surface Water Location
- Fire Testing Area Boundary
- Surface Water
- Surface Water Centerline
- NRL-CBD Base Boundary

0 150 300 Feet

1 inch equals 350 feet

N

Only detections of PFOA, PFOS, and/or PFBS are shown.

Figure 4-5
Surface Water Exceedances
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

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CHESAPEAKE BAY

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OFFICERS CIR

Station ID	CBD-AOA-SWSD08	
Sample ID	CBD-AOA-SD08-000H	CBD-AOA-SD08P-000H
Sample Date	10/13/20	10/13/20
Chemical Name		
PFAS (NG/G)		
PFOS	**7.49**	**6.1**

Station ID	CBD-AOA-SWSD06
Sample ID	CBD-AOA-SD06-000H
Sample Date	10/13/20
Chemical Name	
PFAS (NG/G)	
PFOS	**34.9**

CBD-AOA-SG05

CBD-AOA-SG04

CBD-AOA-SW10

CBD-AOA-SW11

CBD-AOA-SW09

KAREN DR

DALRYMPLE RD

NAVY CT

BAYSIDE RD

Bayside Rd

RESEARCH LN

Station ID	CBD-AOA-SWSD04
Sample ID	CBD-AOA-SD04-000H
Sample Date	10/13/20
Chemical Name	
PFAS (NG/G)	
PFOS	**1.63 J**

CBD-AOA-SW01

CBD-AOA-SG01

Station ID	CBD-AOA-SWSD02
Sample ID	CBD-AOA-SD02-000H
Sample Date	10/13/20
Chemical Name	
PFAS (NG/G)	
PFOS	**2.64 J**

CBD-AOA-SG02

CBD-AOA-SW03

CBD-AOA-SG03

Waste Water Treatment Plant

CBD-AOA-SW05

CBD-AOA-SW07

Notes

Bold text indicates detection

NG/G - Nanograms per gram

J = Analyte present, value may or may not be accurate or precise

PFAS - Per- and Polyfluorinated Alkyl Substances

PFOS - Perfluorooctane sulfonic acid

Only detections of PFOA, PFOS, and/or PFBS are shown.

[1] Screening levels (SLs) for PFOA and PFOS are based on a hazard quotient (HQ) of 0.1 and were generated using the USEPA RSL calculator as described in the Assistant Secretary of Defense September 2021 memorandum (DoD, 2021). Subsequent to issuance of the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection in August 2020, the screening levels (SLs) for PFBS were revised to reflect the updated chronic reference dose for PFBS (DoD, 2021).

Analyte Name	10 x PFAS Screening Level
Chemical Name	
PFAS (NG/G)	
PFOS	1,300

Imagery:
Maryland Mapping and GIS Data Portal, 2017

Legend

- Co-located Surface Water/Sediment Location
- Staff Gauge Location
- Surface Water Location
- Fire Testing Area Boundary
- Surface Water
- Surface Water Centerline
- NRL-CBD Base Boundary

Only detections of PFOA, PFOS, and/or PFBS are shown

0 150 300 Feet

1 inch equals 350 feet

N

Figure 4-6
Sediment Detections
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

SECTION 5

Human Health Risk Screening

A human health risk screening (HHRS) evaluation was performed on the currently available PFAS data set to assess the potential human health risks associated with exposure to PFAS in the following exposure media:

- Surface soil (0 to 6 inches bgs)
- Subsurface soil combined (1 to 18 feet bgs)
- Surficial aquifer groundwater
- Piney Point aquifer groundwater
- Sediment (water bodies on the north and south side of Site 10 evaluated separately)
- Surface water (water bodies on the north and south side of Site 10 evaluated separately)

Completion of a human health risk screening was not identified as an objective in the SAP (CH2M, 2021a); however, it was completed using the Site 10 SI data to evaluate if concentrations of PFOS, PFOA and PFBS detected in site media represent a potential risk to human health. The results of the HHRS provided a preliminary indication of potential risks from exposure to PFOS, PFOA and/or PFBS in these exposure media, and the results were used to help evaluate whether future unrestricted use of the site is acceptable (for example, residential, including potable use of groundwater), or if the site requires further evaluation.

5.1 Human Health Conceptual Site Model

The human health CSM presents an overview of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors. The facility and site background and history are presented in Section 2.1 and land use is discussed in Section 2.4.

The potential source of PFAS at Site 10 is discussed in detail in Section 2.1.2 and includes the use of the site to test extinguishing agents on fires started with various fuel sources. The potential release and transport mechanisms for PFAS from the potential source is direct release to surface soil and/or subsurface soil, leaching from soil to groundwater, transport via advection in groundwater, direct release to drainage ditches, discharge of groundwater to surface water and sediment, and overland flow and surficial runoff to surface soil, surface water, and sediment.

Access to NRL-CBD is restricted; however, once on the facility people can access Site 10. Current receptors may include adult and adolescent trespassers and visitors, as well as adult industrial workers, exposed to surface soil, surface water, and/or sediment through incidental ingestion and dermal contact. The two onsite streams and storm water retention ponds do not support a fishable fish population, and therefore, ingestion of fish from the site is not a complete exposure pathway. Surficial aquifer and Piney Point aquifer groundwater at NRL-CBD are not used as a water supply, and therefore, there are no current exposures to the groundwater from the site.

Future receptors include the current receptors. In addition, although there are no plans for redevelopment of the site, the future receptors also include future residents and construction workers. Future receptors could be exposed to surface soil, surface water, and sediment, and subsurface soil if future development activities occur at the site (for example, construction of residential housing or industrial buildings) or if utility or excavation work results in exposing subsurface soil. Exposure routes for future exposure to site media are the same as those for current exposure. Although surficial aquifer and Piney Point aquifer groundwater are not used as a water supply at the facility, as a conservative approach to evaluate potential future risks it is assumed that groundwater from these aquifers could be used as a future water supply source. Potential future receptors for surficial aquifer and Piney Point aquifer groundwater could include future residents or industrial workers who might use the water as a potable water supply. Residents could be exposed to the groundwater through incidental ingestion and dermal contact. Industrial workers could be exposed to the groundwater through ingestion since they are assumed not to bath at the site and would not be expected to have significant dermal exposure to the groundwater. Additionally,

since groundwater is within 15 feet of the ground surface, future construction workers could be exposed through dermal contact in an open excavation.

There are currently no toxicity criteria for inhalation of PFAS, and therefore, the inhalation pathway is not evaluated for any of the site media.

5.2 Data Evaluation

The surface soil (0 to 6 inches bgs), subsurface soil (1 to 18 feet bgs), surficial aquifer groundwater, Piney Point aquifer groundwater, sediment, and surface water samples were assessed in the HHRS. Soil, groundwater, and sediment and surface water sample locations at Site 10 are shown on **Figure 3-1, Figure 3-2**, and **Figure 3-3**, respectively. The corresponding data for PFOA, PFOS, and PFBS evaluated in the HHRS were validated. Validation of the data identified the following criteria for data usability:

- Estimated values flagged with a J qualifier were treated as unqualified detected concentrations.
- Values flagged with a U qualifier were considered non-detected values.

The maximum detected concentration (MDC) between a native sample and field duplicate sample was used as the sample concentration. If the constituent was only detected in one of the samples, the detected concentration was used as the sample concentration.

5.3 Human Health Risk Screening Methodology

The HHRS was conducted in three steps using the risk ratio technique described in the guidance document *Overview of Screening, Risk Ratio, and Toxicological Evaluation. Procedures for Northern Division Human Health Risk Assessments* (Navy, 2000). The third step was only conducted if at least one Step 2 constituent of potential concern (COPC) had eight or more samples in the data set. The HHRS is a conservative estimate of potential human health risks and was prepared using screening levels based on residential site use only; no other exposure scenarios were evaluated. Site 10 is an industrial site, currently used for fire testing activities. There is no residential land use at Site 10 or within NRL-CBD. Public access is restricted and there are no planned land use changes for the future. Additionally, the Surficial aquifer groundwater and Piney Point aquifer groundwater are not used as drinking water supplies by NRL-CBD.

5.3.1.1 Step 1:

The MDCs for PFAS in surface soil, subsurface soil, surficial aquifer groundwater, Piney Point aquifer groundwater, sediment and surface water were compared to the screening levels identified in Section 4. The HHRS tables include analytical data for PFOA, PFOS, and PFBS only because they are the only PFAS with available toxicity values. As discussed in previous sections of this report, 15 other PFAS were analyzed by the laboratory in all media; however, as screening values and toxicity values for these other 15 PFAS are not currently available, the corresponding analytical results were not compared to human health risk-based screening levels. These additional PFAS were analyzed by the laboratory for comparison to screening levels that may be developed in the future.

For each data group, if the MDC exceeded the screening level, the constituent was identified as a Step 1 COPC and carried forward to Step 2.

5.3.1.2 Step 2:

A risk level was calculated for the constituents identified as COPCs in Step 1 according to the following approach discussed in the guidance document *Overview of Screening, Risk Ratio, and Toxicological Evaluation. Procedures for Northern Division Human Health Risk Assessments* (Navy, 2000):

For a carcinogenic constituent identified as COPCs in Step 1, carcinogenic risk was calculated using the following equation:

$$carcinogenic\ risk = \frac{MDC \times target\ risk\ level\ of\ SL}{SL}$$

where,

MDC = maximum detected concentration (µg/kg or ng/L)
target risk level of SL = 1 x 10-6 (unitless)
SL = screening level based on carcinogenic risk of 1 x 10-6 (µg/kg or ng/L)

For noncarcinogenic constituents identified as COPCs in Step 1, an HI was calculated using the following equation:

$$HI = \frac{MDC \times target\ HI\ of\ SL}{SL}$$

where,

MDC = maximum detected concentration (µg/kg or ng/L)
target HI of SL = 1 (unitless)
SL = screening level based on HI of 1 (µg/kg or ng/L)

The carcinogenic risk and noncarcinogenic HI were calculated for Step 1 COPCs that act through carcinogenic and noncarcinogenic effects. The carcinogenic risks for all of the COPCs within an exposure medium were summed to calculate the cumulative carcinogenic risk, and the noncarcinogenic HIs were summed to calculate the cumulative noncarcinogenic HI. A cumulative noncarcinogenic HI was also calculated for each target organ/target effect. If the cumulative noncarcinogenic HI for a target organ/target effect was greater than 0.5 (the target level presented in the Navy risk ratio guidance document [Navy, 2000]), or the cumulative carcinogenic risk was greater than 1×10^{-5} (the MDE target risk level, which is lower than the Navy risk ratio guidance target risk level of 5×10^{-5}), the constituents contributing to these risk values were identified as Step 2 COPCs.

5.3.1.3 Step 3

Step 3 was only performed for exposure media where COPCs were identified in Step 2 and at least one COPC had eight or more samples in the data set. For constituents identified as COPCs in Step 2, a risk level was calculated as previously discussed for Step 2. However, in Step 3, the 95 percent upper confidence limit (UCL) of the arithmetic mean calculated using USEPA's ProUCL statistical software program (USEPA, 2015, 2016b) was used in place of the MDC to obtain a more site-specific risk ratio. The 95 percent UCL of the mean is used to estimate a conservative average exposure, since it is not likely a receptor would be exposed to COPCs only at the location of the MDCs. The input and output files from ProUCL are included in **Appendix G**.

If the cumulative HI by target organ/effect for a medium is greater than the risk-ratio screening benchmark of 0.5 specified in the Navy risk ratio guidance document (Navy, 2000), or the cumulative carcinogenic risk for a medium is greater than the 1×10^{-5} MDE target risk level, the constituents contributing to these values are identified as Step 3 COPCs. Identification of a Step 3 COPC was considered an indicator of potentially unacceptable human health risk associated with PFAS exposure.

5.4 Human Health Risk Screening Results

The HHRS results are presented in **Tables 5-1** through **5-6.**

5.4.1 Surface Soil

Tables 5-1, **5-1a**, and **5-1b** present the HHRS for surface soil. The MDC of PFOS exceeded the soil screening level (**Table 5-1**); therefore, PFOS was identified as a Step 1 COPC. Based on the Step 2 (**Table 5-1a**) and Step 3

(**Table 5-1b**) evaluations, PFOS was identified as a COPC. The MDCs of PFOA and PFBS were below the soil screening levels.

Residential exposure to surface soil may result in potentially unacceptable human health risks associated with PFOS.

5.4.2 Subsurface Soil

Tables 5-2, **5-2a**, and **5-2b** present the HHRS for subsurface soil. The MDC of PFOS exceeded the soil screening level (**Table 5-2**); therefore, PFOS was identified as a Step 1 COPC. Based on the Step 2 (**Table 5-2a**) and Step 3 (**Table 5-2b**) evaluations, PFOS was identified as a COPC. The MDCs of PFOA and PFBS were below the soil screening levels.

Residential exposure to subsurface soil may result in potentially unacceptable human health risks associated with PFOS.

5.4.3 Surficial Aquifer Groundwater

Tables 5-3, **5-3a**, and **5-3b** present the HHRS for surficial aquifer groundwater. The MDCs of PFOS and PFOA exceeded the groundwater screening levels (**Table 5-3**); therefore, PFOS and PFOA were identified as Step 1 COPCs. Based on the Step 2 (**Table 5-3a**) and Step 3 (**Table 5-3b**) evaluations, PFOS and PFOA were identified as COPCs. The MDC of PFBS was below the groundwater screening level.

Hypothetical use of potable use of surficial aquifer groundwater may result in potentially unacceptable human health risks associated with PFOA and PFOS.

5.4.4 Piney Point Aquifer Groundwater

Table 5-4 present the HHRS for Piney Point aquifer groundwater. The MDCs of PFOA, PFOS, and PFBS were below the groundwater screening levels (**Table 5-4**); therefore, no PFAS were identified as Step 1 COPCs.

Potable use of Piney Point aquifer groundwater would not result in unacceptable human health risks associated with PFAS.

5.4.5 Sediment

Tables 5-5 and **5-6** present the HHRS for sediment from the northern and southern surface water bodies, respectively. The MDCs of PFOS in both the northern and southern surface water bodies were below the sediment screening level (**Tables 5-5** and **5-6**); therefore, no PFAS were identified as Step 1 COPCs. PFOA and PFBS were not detected in any sediment samples.

Exposure to sediment would not result in unacceptable human health risks associated with PFAS.

5.4.6 Surface Water

Tables 5-7 and **5-7a** present the HHRS for surface water from the northern water body. The MDCs of PFOS and PFOA exceeded the surface water screening levels (**Table 5-7**); therefore, PFOS and PFOA were identified as Step 1 COPCs. Based on the Step 2 (**Table 5-7a**), PFOS was identified as a COPC. The MDC of PFBS was below the surface water screening level. PFOA was eliminated as a COPC in Step 2. Step 3 was not performed since less than 8 surface water samples were available for the northern water body.

Tables 5-8 and **5-8a** present the HHRS for surface water from the southern water body. The MDC of PFOS exceeded the surface water screening level (**Table 5-8**); therefore, PFOS was identified as Step 1 COPCs. Based on

the Step 2 (**Table 5-8a**), PFOS was not identified as a COPC. The MDCs of PFOA and PFBS were below the surface water screening levels. PFOA was eliminated as a COPC in Step 2.

Exposure to surface water in the northern water body may result in potentially unacceptable human health risks associated with PFOS. Exposure to surface water in the southern water body would not result in unacceptable human health risks.

5.5 Human Health Risk Screening Findings

The HHRS identified potentially unacceptable human health risks in the following exposure media:

- Surface soil – PFOS was identified as a COPC.
- Subsurface soil – PFOS was identified as a COPC.
- Surficial aquifer groundwater – PFOS and PFOA were identified as COPCs.
- Surface water in northern water body – PFOS was identified as a COPC.

The two onsite streams and storm water retention ponds do not support a fishable fish population, and therefore, ingestion of fish on-Base is not a complete exposure pathway. However, the onsite surface water bodies discharge to the Chesapeake Bay which does have sustainable fish and shellfish populations. Therefore, there is a potential receptor pathway which will be further evaluated.

Table 5-1. Occurrence, Distribution, and Selection of COPCs in Surface Soil

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Surface Soil	**1763-23-1**	**Perfluorooctane sulfonic acid (PFOS)**	**138**	**4660**	**ng/g**	**CBD-AOA-SS17-000H**	**8/29**	**2.07 - 114**	**4660**	**N/A**	**130 N**	**N/A**	**N/A**	**YES**	**ASL**
	335-67-1	Perfluorooctanoic acid (PFOA)	0.92 J	25.4	ng/g	CBD-AOA-SS17-000H	16/29	2.07 - 2.55	25.4	N/A	130 N	N/A	N/A	NO	BSL
	375-73-5	Perfluorobutanesulfonic acid (PFBS)	0.58 J	6.08 J	ng/g	CBD-AOA-SS17-000H	2/29	1.04 - 1.55	6.08	N/A	1900 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Residential soil SLs are based on an HQ of 0.1 and were identified in accordance with the Assistant Secretary of Defense September 15, 2021 memorandum Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (ASD, 2021).

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
DoD = Department of Defense
HQ = hazard quotient
J = Estimated Value
N = Noncarcinogenic
N/A = not available
ng/g = Nanogram(s) per gram
RSL = Regional Screening Level
SL = Screening Level
USEPA = U.S. Environmental Protection Agency

References:

USEPA. 2021. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate. Washington, DC, EPA/690/R-21/001F, 2021.

Table 5-1a. Risk Ratio Screening for Surface Soil Based on Maximum Detected Concentration

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (ng/g)	Sample Location of Maximum Detected Concentration	Carcinogenic Residential Soil SL (ng/g)	Target Risk Level of SL	Cancer Risk[a]	Non-carcinogenic Residential Soil SL (ng/g)	Target Hazard Level of SL	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS)	**8/29**	**4660**	**BD-AOA-SS17-000**	**N/A**	**N/A**	**N/A**	**1300**	**1**	**4**	**Developmental**
Cumulative Hazard Index[c]									**4**	
Cumulative Cancer Risk[d]						**N/A**				
								Total Developmental HI =		**4**

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the SL divided by the target risk level of the SL.

[b] Hazard Index equals maximum detected concentration divided by the target hazard level of the SL.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes a hazard index greater than 0.1 to a cumulative hazard index for a target organ greater than 0.5, or contributes to a cumulative cancer risk greater than 1E-05.

Constituents selected as COPCs are indicated by bold and shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

ng/g = Nanogram(s) per gram

N/A = Not available/not applicable

SL = Screening Level

Table 5-1b. Risk Ratio Screening for Surface Soil Based on 95% Upper Confidence Limit on Mean

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Analyte	Detection Frequency	95% UCL (ng/g)	95% UCL Rationale	Carcinogenic Residential Soil SL (ng/g)	Target Risk Level of SL	Cancer Risk[a]	Non-carcinogenic Residential Soil SL (ng/g)	Target Hazard Level of SL	Hazard Index[b]	Target Organ	Retained for Further Consideration?
Perfluorooctane Sulfonate (PFOS)	**8/29**	**988 4**	**95% KM (Chebyshev) UCL**	**N/A**	**N/A**	**N/A**	**1300**	**1**	**0.8**	**Developmental**	**Yes**
Cumulative Hazard Index[c]									**0.8**		
Cumulative Cancer Risk[d]						**N/A**					
								Total Developmental HI =	**0.8**		

Notes:

[a] Cancer Risk equals 95% UCL concentration on mean divided by the SL divided by the target risk level of the SL.

[b] Hazard Index equals 95% UCL concentration on mean divided by the target hazard level of the SL.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes a hazard index greater than 0.1 to a cumulative hazard index for a target organ greater than 0.5, or contributes to a cumulative cancer risk greater than 1E-05.

Constituents selected as COPCs are indicated by bold and shading.

COPC = Chemical of Potential Concern
ng/g = Nanogram(s) per gram
HI = Hazard Index
N/A = Not available/not applicable
UCL = Upper Confidence Limit
KM = Kaplan-Meier
SL = Screening Level

ProUCL, Version 5.1.002 used to determine distribution of data. ProUCL used to calculate exposure point concentration, following recommendations based on distribution and standard deviation in User's Guide (USEPA. October, 2015. ProUCL, Version 5.1. Prepared by Lockheed Martin Environmental Services).

Upper Confidence Limit (UCL) Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W test/Lilliefors indicates data are normally distributed.
(3) Anderson-Darling and/or Kolmogorov-Smirnov tests indicate data are gamma distributed.
(4) Distribution tests are inconclusive

Table 5-2. Occurrence, Distribution, and Selection of COPCs in Subsurface Soil

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Subsurface Soil	**1763-23-1**	**Perfluorooctane sulfonic acid (PFOS)**	**106**	**7950**	**ng/g**	**CBD-AOA-SB09-0608**	**12/36**	**2.02 - 198**	**7950**	**N/A**	**130 N**	**N/A**	**N/A**	**YES**	**ASL**
	335-67-1	Perfluorooctanoic acid (PFOA)	0.89 J	75.9	ng/g	CBD-AOA-SB18-0204	17/36	2.02 - 3.39	75.9	N/A	130 N	N/A	N/A	NO	BSL
	375-73-5	Perfluorobutanesulfonic acid (PFBS)	0.59 J	6.08 J	ng/g	CBD-AOA-SB10-0608	5/36	1.01 - 1.69	6.08	N/A	1900 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Residential soil SLs are based on an HQ of 0.1 and were identified in accordance with the Assistant Secretary of Defense September 15, 2021 memorandum Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (ASD, 2021).

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
DoD = Department of Defense
HQ = hazard quotient
J = Estimated Value
N = Noncarcinogenic
N/A = not available
ng/g = Nanogram(s) per gram
RSL = Regional Screening Level
SL = Screening Level
USEPA = U.S. Environmental Protection Agency

References:

USEPA. 2021. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate. Washington, DC, EPA/690/R-21/001F, 2021.

Table 5-2a. Risk Ratio Screening for Subsurface Soil Based on Maximum Detected Concentration

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (ng/g)	Sample Location of Maximum Detected Concentration	Carcinogenic Residential Soil SL (ng/g)	Target Risk Level of SL	Cancer Risk[a]	Non-carcinogenic Residential Soil SL (ng/g)	Target Hazard Level of SL	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS)	**12/36**	**7950**	**CBD-AOA-SB09-0608**	**N/A**	**N/A**	**N/A**	**1300**	**1**	**6**	**Developmental**
Cumulative Hazard Index[c]									**6**	
Cumulative Cancer Risk[d]						**N/A**				
								Total Developmental HI =		**6**

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the SL divided by the target risk level of the SL.

[b] Hazard Index equals maximum detected concentration divided by the target hazard level of the SL.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes a hazard index greater than 0.1 to a cumulative hazard index for a target organ greater than 0.5, or contributes to a cumulative cancer risk greater than 1E-05.

Constituents selected as COPCs are indicated by bold and shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

ng/g = Nanogram(s) per gram

N/A = Not available/not applicable

SL = Screening Level

Table 5-2b. Risk Ratio Screening for Subsurface Soil Based on 95% Upper Confidence Limit on Mean

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Analyte	Detection Frequency	95% UCL (ng/g)	95% UCL Rationale	Carcinogenic Residential Soil SL (ng/g)	Target Risk Level of SL	Cancer Risk[a]	Non-carcinogenic Residential Soil SL (ng/g)	Target Hazard Level of SL	Hazard Index[b]	Target Organ	Retained for Further Consideration?
Perfluorooctane Sulfonate (PFOS)	**12/36**	**4997 1**	**95% H-UCL**	**N/A**	**N/A**	**N/A**	**1300**	**1**	**3.8**	**Developmental**	**Yes**
Cumulative Hazard Index[c]									**3.8**		
Cumulative Cancer Risk[d]						**N/A**					
								Total Developmental HI =	**3.8**		

Notes:

[a] Cancer Risk equals 95% UCL concentration on mean divided by the SL divided by the target risk level of the SL.

[b] Hazard Index equals 95% UCL concentration on mean divided by the target hazard level of the SL.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes a hazard index greater than 0.1 to a cumulative hazard index for a target organ greater than 0.5, or contributes to a cumulative cancer risk greater than 1E-05.

Constituents selected as COPCs are indicated by bold and shading.

COPC = Chemical of Potential Concern
ng/g = Nanogram(s) per gram
HI = Hazard Index
N/A = Not available/not applicable
UCL = Upper Confidence Limit
SL = Screening Level

ProUCL, Version 5.1.002 used to determine distribution of data. ProUCL used to calculate exposure point concentration, following recommendations based on distribution and standard deviation in User's Guide (USEPA. October, 2015. ProUCL, Version 5.1. Prepared by Lockheed Martin Environmental Services).

Upper Confidence Limit (UCL) Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W test/Lilliefors indicates data are normally distributed.
(3) Anderson-Darling and/or Kolmogorov-Smirnov tests indicate data are gamma distributed.
(4) Distribution tests are inconclusive

Table 5-3. Occurrence, Distribution, and Selection of COPCs in Shallow Groundwater

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Shallow Aquifer Groundwater	**1763-23-1**	**Perfluorooctane sulfonic acid (PFOS)**	**3.17 J**	**171000**	**ng/L**	**CBD-AOA-MW02-1020**	**20/23**	**0.9 - 2300**	**171000**	**N/A**	**40 N**	**N/A**	**N/A**	**YES**	**ASL**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**0.98 J**	**6800**	**ng/L**	**CBD-AOA-MW03-1020**	**20/23**	**1.36 - 221**	**6800**	**N/A**	**40 N**	**N/A**	**N/A**	**YES**	**ASL**
	375-73-5	Perfluorobutanesulfonic acid (PFBS)	1.04 J	574	ng/L	CBD-AOA-MW03-1020	20/23	0.45 - 5.9	574	N/A	600 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Tapwater SLs are based on an HQ of 0.1 and were identified in accordance with the Assistant Secretary of Defense September 15, 2021 memorandum Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (ASD, 2021).

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
DoD = Department of Defense
HQ = hazard quotient
J = Estimated Value
N = Noncarcinogenic
ng/L = Nanograms/Liter
RSL = Regional Screening Level
SL = Screening Level
USEPA = U.S. Environmental Protection Agency

References:

USEPA. 2021. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate. Washington, DC, EPA/690/R-21/001F, 2021.

Table 5-3a. Risk Ratio Screening for Shallow Groundwater Based on Maximum Detected Concentration

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (ng/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water SL (ng/L)	Target Risk Level of SL	Cancer Risk[a]	Non-carcinogenic Tap Water SL (ng/L)	Target Hazard Level of SL	Hazard Index[b]	Target Organ	Retained for Further Consideration?
Perfluorooctane sulfonic acid (PFOS)	20/23	171000	CBD-AOA-MW02-1020	N/A	N/A	N/A	400	1	428	Developmental	Yes
Perfluorooctanoic acid (PFOA)	20/23	6800	CBD-AOA-MW02-1020	1100	1.0E-06	6.2E-06	400	1	17	Developmental	
Cumulative Hazard Index[c]									445		
Cumulative Cancer Risk[d]						6E-06					
								Total Developmental HI =		445	

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the SL divided by the target risk level of the SL.

[b] Hazard Index equals maximum detected concentration divided by the SL divided by the target hazard level of the SL.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 1E-05.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

N/A = Not available/not applicable

ng/L = Nanograms/Liter

SL = Screening Level

Table 5-3b. Risk Ratio Screening for Shallow Groundwater Based on 95% Upper Confidence Limit on Mean

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Analyte	Detection Frequency	95% UCL (ng/L)		95% UCL Rationale	Carcinogenic Tap Water SL (ng/L)	Target Risk Level of SL	Cancer Risk[a]	Non-carcinogenic Tap Water SL (ng/L)	Target Hazard Level of SL	Hazard Index[b]	Target Organ	Retained for Further Consideration?
Perfluorooctane sulfonic acid (PFOS)	20/23	53883	3	Gamma Adjusted KM-UCL	N/A	N/A	N/A	400	1	135	Developmental	Yes
Perfluorooctanoic acid (PFOA)	20/23	2234	3	Gamma Adjusted KM-UCL	1100	1.0E-06	2.0E-06	400	1	6	Developmental	
Cumulative Hazard Index[c]										140		
Cumulative Cancer Risk[d]							2E-06					
									Total Developmental HI =		140	

Notes:

[a] Cancer Risk equals 95% UCL concentration on mean divided by the SL divided by the target risk level of the SL.

[b] Hazard Index equals 95% UCL concentration on mean divided by the target hazard level of the SL.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 1E-05.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern
HI = Hazard Index
N/A = Not available/not applicable
ng/L = Nanograms/Liter
UCL = Upper Confidence Limit
KM = Kaplan-Meier
SL = Screening Level

Upper Confidence Limit (UCL) Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive

Table 5-4. Occurrence, Distribution, and Selection of COPCs in Piney Point Aquifer
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Deep Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Piney Point Aquifer Groundwater	1763-23-1	Perfluorooctane sulfonic acid (PFOS)	17.9	17.9	ng/L	CBD-AOA-MW13-1020	1/4	0.9 - 1	17.9	N/A	40 N	70	HA	NO	BSL
	335-67-1	Perfluorooctanoic acid (PFOA)	0.68 J	10	ng/L	CBD-AOA-MW13-1020	4/4	1.36 - 1.5	10	N/A	40 N	70	HA	NO	BSL
	375-73-5	Perfluorobutanesulfonic acid (PFBS)	0.75 J	0.75 J	ng/L	CBD-AOA-MW14-1020	1/4	0.45 - 0.5	0.75	N/A	600 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Tapwater SLs are based on an HQ of 0.1 and were identified in accordance with the Assistant Secretary of Defense September 15, 2021 memorandum Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (ASD, 2021). Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate (USEPA, 2021).
[5] Rationale Codes
Deletion Reason: Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
DoD = Department of Defense
HQ = hazard quotient
HA = Health Advisory
J = Estimated Value
N = Noncarcinogenic
ng/L = Nanograms/Liter
RSL = Regional Screening Level
SL = Screening Level

References:
USEPA. 2021. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate. Washington, DC, EPA/690/R-21/001F, 2021.

Table 5-5. Occurrence, Distribution, and Selection of COPCs in Sediment (Northern)
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Sediment (Northern)	1763-23-1	Perfluorooctane sulfonic acid (PFOS)	7.49	34.9	ng/g	CBD-AOA-SD06-000H	2/2	2.41 - 2.70	34.9	N/A	1300 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Sediment SLs are 10 times residential soil SLs.
Residential soil SLs are based on an HQ of 0.1 and were identified in accordance with the Assistant Secretary of Defense September 15, 2021 memorandum Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (ASD, 2021).
[5] Rationale Codes
Deletion Reason: Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
DoD = Department of Defense
HQ = hazard quotient
N = Noncarcinogenic
ng/g = Nanogram(s) per gram
RSL = Regional Screening Level
SL = Screening Level
USEPA = U.S. Environmental Protection Agency

References:
USEPA. 2021. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate. Washington, DC, EPA/690/R-21/001F, 2021.

Table 5-6. Occurrence, Distribution, and Selection of COPCs in Sediment (Southern)
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Sediment (Southern)	1763-23-1	Perfluorooctane sulfonic acid (PFOS)	1.63 J	2.64 J	ng/g	CBD-AOA-SD02-000H	2/2	2.65 - 3.81	2.64	N/A	1300 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Sediment SLs are 10 times residential soil SLs.
Residential soil SLs are based on an HQ of 0.1 and were identified in accordance with the Assistant Secretary of Defense September 15, 2021 memorandum Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (ASD, 2021).
[5] Rationale Codes
Deletion Reason: Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
DoD = Department of Defense
HQ = hazard quotient
J = Estimated Value
N = Noncarcinogenic
ng/g = Nanogram(s) per gram
RSL = Regional Screening Level
SL = Screening Level
USEPA = U.S. Environmental Protection Agency

References:
USEPA. 2021. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate. Washington, DC, EPA/690/R-21/001F, 2021.

Table 5-7. Occurrence, Distribution, and Selection of COPCs in Surface Water (Northern)
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Surface Water (Northern)	**1763-23-1**	**Perfluorooctane sulfonic acid (PFOS)**	**2990**	**4960**	**ng/L**	**CBD-AOA-SW08-1020**	**5/5**	**0.92 - 147**	**4960**	**N/A**	**400 N**	**N/A**	**N/A**	**YES**	**ASL**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**140**	**578**	**ng/L**	**CBD-AOA-SW11P-1020**	**5/5**	**1.39 - 36.1**	**578**	**N/A**	**400 N**	**N/A**	**N/A**	**YES**	**ASL**
	375-73-5	Perfluorobutanesulfonic acid (PFBS)	18.4	64.1	ng/L	CBD-AOA-SW10-1020	5/5	0.45 - 0.5	64.1	N/A	6000 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Surface water SLs are 10 times tapwater SLs.
Tapwater SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in DoD, 2019.
Tapwater SLs are based on an HQ of 0.1 and were identified in accordance with the Assistant Secretary of Defense September 15, 2021 memorandum Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (ASD, 2021).
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
DoD = Department of Defense
HQ = hazard quotient
N = Noncarcinogenic
ng/L = Nanograms/Liter
RSL = Regional Screening Level
SL = Screening Level
USEPA = U.S. Environmental Protection Agency

References:
USEPA. 2021. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate. Washington, DC, EPA/690/R-21/001F, 2021.

Table 5-7a. Risk Ratio Screening for Surface Water (Northern) Based on Maximum Detected Concentration

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (ng/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water SL x 10 (ng/L)	Target Risk Level of SL	Cancer Risk[a]	Non-carcinogenic Tap Water SL x 10 (ng/L)	Target Hazard Level of SL	Hazard Index[b]	Target Organ	Retained for Further Consideration?
Perfluorooctane sulfonic acid (PFOS)	**5/5**	**4960**	**CBD-AOA-SW08-1020**	**N/A**	**N/A**	**N/A**	**4000**	**1**	**1**	**Developmental**	**Yes**
Perfluorooctanoic acid (PFOA)	5/5	578	CBD-AOA-SW11P-1020	11000	1E-06	5E-08	4000	1	0.1	Developmental	No
Cumulative Hazard Index[c]									**1**		
Cumulative Cancer Risk[d]						**5E-08**					
								Total Developmental HI =		**1**	

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the SL divided by the target risk level of the SL.

[b] Hazard Index equals maximum detected concentration divided by the SL divided by the target hazard level of the SL.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 1E-05.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

N/A = Not available/not applicable

ng/L = Nanograms/Liter

SL = Screening Level

Table 5-8. Occurrence, Distribution, and Selection of COPCs in Surface Water (Southern)
PFAS Site Inspection Report, Site 10 - Fire Testing Area
NRL-CBD
Chesapeake Beach, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Surface Water (Southern)	**1763-23-1**	**Perfluorooctane sulfonic acid (PFOS)**	**12.8 J**	**1230**	**ng/L**	**CBD-AOA-SW05-1020**	**6/6**	**0.92 - 147**	**1230**	**N/A**	**400 N**	**N/A**	**N/A**	**YES**	**ASL**
	335-67-1	Perfluorooctanoic acid (PFOA)	2.93 J	127	ng/L	CBD-AOA-SW05-1020	6/6	1.39 - 36.1	127	N/A	400 N	N/A	N/A	NO	BSL
	375-73-5	Perfluorobutanesulfonic acid (PFBS)	1.74 J	23.3	ng/L	CBD-AOA-SW07-1020	6/6	0.45 - 0.5	23.3	N/A	6000 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Surface water SLs are 10 times tapwater SLs.
Tapwater SLs for PFOA and PFOS are based on an HQ of 0.1 and were generated using the USEPA RSL calculator as described in DoD, 2019.
Tapwater SLs are based on an HQ of 0.1 and were identified in accordance with the Assistant Secretary of Defense September 15, 2021 memorandum Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program (ASD, 2021).
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
DoD = Department of Defense
HQ = hazard quotient
J = Estimated Value
N = Noncarcinogenic
ng/L = Nanograms/Liter
RSL = Regional Screening Level
SL = Screening Level
USEPA = U.S. Environmental Protection Agency

References:
USEPA. 2021. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate. Washington, DC, EPA/690/R-21/001F, 2021.

Table 5-8a. Risk Ratio Screening for Surface Water (Southern) Based on Maximum Detected Concentration

PFAS Site Inspection Report, Site 10 - Fire Testing Area

NRL-CBD

Chesapeake Beach, Maryland

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (ng/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water SL x 10 (ng/L)	Target Risk Level of SL	Cancer Risk[a]	Non-carcinogenic Tap Water SL x 10 (ng/L)	Target Hazard Level of SL	Hazard Index[b]	Target Organ	Retained for Further Consideration?
Perfluorooctane sulfonic acid (PFOS)	6/6	1230	CBD-AOA-SW05-1020	N/A	N/A	N/A	4000	1	0.3	Developmental	Yes
Cumulative Hazard Index[c]									**0.3**		
Cumulative Cancer Risk[d]						**0E+00**					
								Total Developmental HI =		**0.3**	

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the SL divided by the target risk level of the SL.

[b] Hazard Index equals maximum detected concentration divided by the SL divided by the target hazard level of the SL.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 1E-05.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

N/A = Not available/not applicable

ng/L = Nanograms/Liter

SL = Screening Level

SECTION 6

Conclusions and Recommendations

An SI was conducted at Site 10 which included the sampling and analysis for multiple media (soil, groundwater, sediment, and surface water). Based on the results of the data collected and the human health risk screening a release of PFAS to environmental media from Site 10 has occurred and exposure to soil, surficial groundwater and surface water may present potentially unacceptable human health risks under a conservative residential use scenario. While the focus of the SI is based on historical releases of PFAS to the environment it should be noted that Site 10 is an active site and fire-fighting foams continue to be tested. The current fire testing operations include containment of wastewater which guards against further releases of PFAS to the environment. However, as an active site with use of PFAS unintentional releases from spills could still occur. TPH-DRO and TPH-GRO were also detected at concentrations exceeding screening levels in the surficial aquifer indicating a fuel-related release occurred. TPH concentrations in 2021 were relatively similar to those detected in 2009. Overall, Site 10 is recommended to be carried forward to the Remedial Investigation (RI) phase.

Table 6-1 lists each specific objective from the Site 10 SI SAP (CH2M, 2020), followed by the conclusions and recommendations of the SI with respect to each objective.

Table 6-1. Summary of Site Inspection Objectives, Findings/Conclusions, and Recommendations
Site 10 Site Inspection Report
NRL-CBD, Chesapeake Beach, Maryland

Site Inspection Objective	Investigation Findings/Conclusions	Recommendations for Additional Characterization during RI
Determine whether PFOS, PFOA, and PFBS are present in soil, surface water, and/or sediment, and if present, determine whether concentrations exceed human health screening levels	• PFOA was detected in soil, surface water, and sediment; however, only concentrations in surface water exceeded screening levels. • PFOS was detected in soil, surface water, and sediment; concentrations exceeded screening levels in all media. • PFBS was detected in soil and surface water; however, all detected concentrations were below screening levels. PFBS was not detected in the sediment. • While it was not a site inspection objective outlined in the SAP, an HHRS was completed and PFOS was identified as a COPC for surface and subsurface soil and surface water. No COPCs were identified for sediment.	• Collect additional soil samples (surface and subsurface) to define the extent of PFOS in soil. Samples will be analyzed for PFAS in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued. • Collect additional surface water and sediment samples. Samples will be analyzed in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued. Although PFOS, PFOA and PFBS were not identified as COPCs in sediment based on the SI data set, additional sediment sampling will be conducted to further refine the presence of PFAS in sediment. • Install and sample permanent monitoring wells to further refine the lateral and vertical extent of PFOA and PFOS in the unconfined surficial aquifer beneath NRL-CBD and beyond the installation boundary and monitor migration.
Further refine the lateral and vertical extents of PFOS, PFOA, and PFBS in groundwater in the surficial aquifer and determine whether current concentrations exceed screening levels	• PFOA and PFAS were detected at concentrations exceeding screening levels at wells screened at the water table within the unconfined surficial aquifer beneath Site 10 and at downgradient monitoring wells located at the installation boundary.	

Table 6-1. Summary of Site Inspection Objectives, Findings/Conclusions, and Recommendations
Site 10 Site Inspection Report
NRL-CBD, Chesapeake Beach, Maryland

Site Inspection Objective	Investigation Findings/Conclusions	Recommendations for Additional Characterization during RI
	• PFBS was detected in the surficial aquifer; however, all detected concentrations were below the screening level. • Based on the HHRS, PFOS and PFOA were identified as COPCs for groundwater from the surficial aquifer.	Samples will be analyzed for PFAS in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued. • Perform a quantitative human health risk assessment (HHRA). The HHRA will evaluate potential risks to human health associated with exposure to PFOS, PFOA, PFBS in soil, groundwater, surface water, and sediment. • Perform an ecological risk screening (ERS). The ERS should be conducted using the most up to date science available in the literature at the time of performance and in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued.
Determine the current concentrations of PFAS in the Piney Point aquifer, and if present, whether current concentrations exceed screening levels	• PFOA, PFOS, and PFBS were detected in the Piney Point aquifer; however, all detected concentrations were below screening levels. • Based on the HHRS, no COPCs were identified for Piney Point groundwater.	• Collect groundwater samples from monitoring wells screened within the Piney Point Aquifer on Base, which is a source of drinking water to nearby private wells, to provide data in support of temporal trend analysis.
Determine the PFOS, PFOA, and PFBS (if present) in groundwater and surface water to migrate off-Base	• In the stream north of the site, PFOA and PFOS were detected at concentrations exceeding human health screening levels throughout the stream. • In the stream south of the site, PFOS was detected at concentrations exceeding human health screening levels at the two most downgradient locations immediately downgradient of the wastewater treatment plant. • Based on the HHRS, PFOS was identified as a COPC for surface water. • Based on results of the staff gauges, both streams north and south of Site 10 are gaining streams indicating	• Collect water samples from the wastewater treatment plant, located downgradient of Site 10, to determine if the wastewater treatment plant is contributing to PFAS in surface water. • Collect surface water samples in down-gradient drainages to define the extent of PFOS in surface water. Samples will be analyzed for PFAS in accordance with Navy guidance, which will be updated as new USEPA and DoD guidance and directives are issued.

Table 6-1. Summary of Site Inspection Objectives, Findings/Conclusions, and Recommendations
Site 10 Site Inspection Report
NRL-CBD, Chesapeake Beach, Maryland

Site Inspection Objective	Investigation Findings/Conclusions	Recommendations for Additional Characterization during RI
	groundwater contributes to surface water. • Exceedances of human health screening levels for PFOS and PFOA are present in groundwater and surface water near the Base boundary and there is potential for PFOS and PFOA to migrate off-Base.	
Further characterize the nature of TPH impacts from kerosene, diesel, gasoline, and jet propulsion fuel burning in the surficial aquifer at the site	• TPH-DRO and TPH-GRO were detected at concentrations exceeding the screening level in the surficial aquifer. Concentrations of TPH were relatively similar to those detected in 2009 with the exception of groundwater at CBD-AOA-MW02 where the concentration of TPH-DRO is 810 µg/L.	• Collect groundwater samples to define the extent of fuel-related constituents in the surficial aquifer.

SECTION 7

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Appendix A
Soil Boring Logs and Monitoring Well Construction Diagrams

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	MW-15	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/9/20

WEATHER : 52°F, sunny | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~6'2"-10' bgs | START : | END : | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
5	0-5'	3"		0-3" CLAYEY SAND (SC), dark grayish brown (10YR 5/2), moist, very fine to fine sand with organic material (roots), dense 3"-5' No recovery	No PID readings due to nonfunctioning PID
10	5-10'	1'6"		5-5'6" Same as 0-3" above except yellowish brown (10YR 5/4) 5'6"-6'2" FAT CLAY (CH), very dark grayish brown (2.5Y 3/2), moist, fat clay with many very fine sand, soft, high plasticity 6'2"-9'8" No recovery 9'8"-10' SILT AND SAND (SP-ML), very dark grayish brown (2.5Y 3/2), very fine sand and silt, soft, nonplastic	
15	10-15'	3'4"		10-12'2" FAT CLAY (CH), dark gray (5Y 4/1), wet, fat clay with many silt and very fine sand, very soft to soft, high plasticity 12'2"-12'5" Same as 0-2'2" above except very dark gray (10YR 3/1), very soft 12'5"-13' FAT CLAY (CH), gray (GLEY 1 N 5/), wet, fat clay with some very fine sand and silt, very soft, high plasticity 13-13'2" FAT CLAY (CH), greenish gray (GLEY 1 10GY 5/1), moist, fat clay with trace silt, medium stiff, high plasticity 13'2"-13'4" SANDY CLAY (SC), greenish gray (GLEY 1 10GY 6/1), moist, fat clay with very fine sand and shell fragments, medium stiff, high plasticity End of boring at 15' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	MW-16	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/8/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~6'2"-10' bgs | START : 1235 | END : 1250 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0	0-5'	2'10"		0-2" Topsoil 2-8" CLAYEY SAND (SC), light brownish gray (10YR 6/2), moist, very fine to fine sand with clay and trace rounded quartz gravel, dense 8"-1' CLAYEY SAND AND GRAVEL (SC-GW), yellowish brown (10YR 5/6), moist, very fine to very coarse sand and subrounded to rounded quartz gravel with clay, loose 1'-1'11" CLAYEY SAND (SC), olive gray (5Y 5/2), moist, very fin e to medium san d with clay and some black organic matter, medium dense	No PID readings due to nonfunctioning PID
5	5-10'	3'8"		1'11"-2'10" SAND AND SILT (SP-ML), yellowish brown (10YR 5/4), moist, very fine sand and silt, loose 2'10"-5' No recovery 5-5'10" Same as 1'11"-2'10" interval above except wet below 8' 5'10'-6'7" SANDY CLAY (SC), grayish brown (10YR 5/2), wet, very fine to fine sand with clay, very soft 6'7"-7'9" POORLY GRADED SAND (SP), dark grayish brown (2.5Y 4/2), wet, fine sand with trace rounded quartz gravel and organic material (wood), medium dense	
10	10-15'	5'		7'9"-8'8" Same as 6'7"-7'9" interval above except very dark gray (2.5Y 3/1) 8'8"-10' No recovery 10-10'4" Same as 7'9"-8'8" interval above 10'4"-10'5" SILT (ML), grayish green (GLEY 1 5G_/2 5/2), moist, with some clay, medium stiff, nonplastic 10'5"-14'10" SILT (ML), olive gray (5Y 4/2), moist, micaceous silt with trace shells, hard 14'10"-15' Same as 10'5"-14'10" interval above except with many white shells	
15				End of boring at 15' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	MW-17	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/7/20

WEATHER : 72°F, sunny | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~5' bgs | START : 1130 | END : 1145 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0	0-5'	1'11"		0-1" Topsoil 1"-7" CLAYEY SAND (SC), brown (10YR 5/3), moist, very fine to fine sand with trace gravel, loose 7"-1'6" Same as 1"-7" inerval above except brownish yellow (10YR 1'6"-1'11" POORLY GRADED SAND (SP), yellow (2.5Y 8/6), dry to moist at 1'11", very fine sand, very loose 1'11"-5' No recovery	No PID readings due to nonfunctioning PID
5	5-10'	5'		0-3' SAND AND SILT (SP-ML), light gray (5Y 7/2), moist to wet, very fine sand and silt, medium dense 3-5' FAT CLAY (CH), pale yellow (5Y 7/3), moist, with some silt, medium stiff, high to medium plasticity	
10	10-15'	5'		10-11'10" LEAN CLAY (CL), moist, mottled white (5Y 8/1) and reddish yellow (7.5YR 6/8), moist, with some very fine sand and silt, soft to medium stiff, low plasticity 11'10"-13'5" LEAN CLAY (CL), olive yellow (2.5Y 6/8), moist, with some very fine sand and silt, medium stiff to soft, low plasticity 13'5"-15' LEAN CLAY (CL), mottled light olive gray (5Y 6/2) and yellowish brown (10YR 5/8), dry, with trace silt, hard, low plasticity	
15				End of boring at 15' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	MW-18	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/7/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~11'6" bgs | START : 0900 | END : 0920 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0	0-5'	2'9"	Fill Material	0-1" Topsoil 1"-1'2" CLAYEY SAND (SC), yellowish brown (10YR 5/4), moist, very fine to coarse sand with clay and trace subangular quartz and micaceous gravel and asphalt, dense 1'2"-2'9" SANDY CLAY (SC), strong brown (7/5YR 5/8), moist, fat clay with fine to coarse sand and trace gravel, fibers, and inclusions of other soils (white, ellow, and red clays), stiff, high plasticity 2'9"-5' No recovery	No PID readings due to nonfunctioning PID
5	5-10'	4'7"	Fill Material	5-9'7" Same as 1'2"-2'9" interval above 9'7"-10' No recovery	
10	10-15'	3'6"		10-11'6" Same as 1'2"-2'9" interval above 11'6"-12'11" WELL GRADED SAND (SW), light brownish gray (2.5Y 6/2), wet, very fine to very coarse angular sand, dense 12'11"-13'6" SILT AND SAND (SP-ML), dark gray (2.5Y 4/1), wet, very fine sand and silt, dense 13'6'-15' No recovery	
15	15-20'	4'6"		15-17' POORLY GRADED SAND (SP), dark grayish brown (2.5Y 4/2), wet, very fine to fine sand, very loose 17-17'5" SILT AND SAND (SP-ML), dark gray (2.5Y 4/1), wet, very fine sand and silt, loose 17'5"-18' Same as 15-17' interval above except medium dense 18-18'8" CLAYEY SAND (SC), grya (2.5Y 5/1), wet, very fine to fine sand with clay, medium dense 18'8"-18'11" CLAYEY SAND AND GRAVEL (SC-GW), graysih brown (2.5Y 5/2), wet, very fine to fine sand and rounded quartz gravel with clay, dense 18'11"-19'6" SANDY CLAY (SC), mottled light gray (10YR 7/2) and gray (10YR 5/1), moist, fat clay with very fine to fine sand and trace angular gravel, medium stiff, high plasticity 19'6"-20' No recovery End of boring at 20' bgs	
20					

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
708207CH	MW-19	

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/8/20

WEATHER : 55°F, sunny | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~17" bgs | START : 0920 | END : 0945 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
5	0-5'	3'6"		0-2'10" CLAYEY SAND (SC), reddish yellow (7.5YR 6/6), dry to moist, very fine to fine sand with clay and trace rounded quartz gravel, dense 2'10"-3'3" Same as 0-2'10" interval above except strong brown (2.5YR 5/6) 3'3"-3'6" POORLY GRADED SAND (SP), reddish yellow (7.5YR 7/8), dry, very fine to fine sand, very loose 3'6"-5' No recovery	No PID readings due to nonfunctioning PID
10	5-10'	2'8"		5-5'5" POORLY GRADED SAND (SP), reddish yellow (7/5YR 6/8), dry, very fine to fine sand, loose 5'5"-5'8" CLAYEY SAND (SC), brown (7.5YR 4/3), moist, very fine to fine sand with clay, medium dense 5'8"-7'8" POORLY GRADED SAND (SP), reddish yellow (7/5YR 7/8), moist, very fine sand, medium dense 7'8"-10' No recovery	
15	10-15'	3'9"		10-13'9" POORLY GRADED SAND (SP), yellow (10YR 7/6), dry to moist, very fine to fine sand, loose to medium dense 13'9"-15' No recovery	
20	15-20'	4'6"		15-17' POORLY GRADED SAND (SP), reddish yellow (7.5YR 7/6), moist, very fine to fine sand, medium dense 17-17'6" POORLY GRADED SAND (SP), pale brown (2.5Y 8/3), wet, very fine to fine sand, medium dense 17'6"-19'2" SAND Y CLAY (SC), mottled reddish yellow (7.5YR 6/8) and pale brown (2.5Y 8/2), fat clay with very fine sand, soft, high plasticity 19'2"-19'6" LEAN CLAY (CL), mottled reddish yellow (7.5YR 6/8) and pale brown (2.5Y 8/2), moist, with some very fine sand, stiff, low plasticity 19'6'-20' No recovery	
25	20-25'	5'		20-21' Same as 19'2"-19'6" interval above except very soft 21-21'10" FAT CLAY (CH), mottled pale yellow (5Y 8/2) and yellow (10YR 7/8), wet, with trace very fine sand and silt, medium stiff, high plasticity 21'10"-25' LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, with many silt, stiff to hard, low plasticity	
				End of boring at 25' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	CBD-AOA-SO01	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/1/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~19' bgs | START : 1015 | END : 1045 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
	0-5'	2'10"		0-2" Topsoil		204.5
				2"-1'2" CLAYEY SAND (SC), yellowish brown (10YR 5/8), dry, very fine sand with lean clay, loose		352.8
				1'2"-2'10" POORLY GRADED SAND (SP), pale brown (2.5Y 8/3), dry, very fine sand, medium dense		30.0
				2'10"-5' No recovery		2.4
						N/A
5						0.0
	5-10'	5'		5-8' Same as 1'2"-2'10" above		157.9
				8-10' CLAYEY SAND (SC), mottled pale brown (2.5Y 8/2) and reddish yellow (7.5YR 6/8), dry to moist, very fine sand and silt with lean clay, loose		371.6
						379.7
						383.3
10						19.9
	10-15'	5'		10-12'3" Same as 8-10' except SANDY CLAY (SC)		20.2
				12'3"-15' FAT CLAY (CH), mottled light gray (5Y 7/2) and yellowish red (5YR 4/6), moist, with some silt, soft, high plasticity	Soil sample collected 7-9'	0.0
						94.0
						52.6
15						323.2
	15-20'	5'		15-19' Same as 12'3"-15' above except moist to dry, stiff		14.8
				19-20' LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, with many silt, very stiff, high plasticity		218.8
						21.7
						12.6
20					No visible water on liner	11.6
	20-25'	5'		20-25' Same as 15-20' above	Visible water on liner, no PID reading taken	
25						
				End of boring at 25' bgs		

	PROJECT NUMBER	BORING NUMBER	SHEET
ch2m: SM	708207CH	CBD-AOA-SO02	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 9/30/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~10' bgs | START : 0950 | END : 1020 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	(ppm)
	0-5'	3'8"		0-2" Topsoil 2"-10" SANDY CLAY (SC), mottled light gray (5Y 7/2) and yellowish red (5YR 5/8), moist, fat clay with very fine sand, stiff, high plasticity		0.0
				10"-1' Same as 2"-10" above except gray (10YR 5/1), soft		0.0
				1'-3'8" LEAN CLAY (CL), mottled pale brown (2.5Y 8/2) and red (2.5YR 4/8) and brownsh yellow (10YR 6/8), dry, soft, low plasticity		0.0
					PID reading at 3'8" ->	0.0
5				3'8"-5' No recovery		0.0
	5-10'	3'2"		5'-6'10" Slough 6'10"-10' FAT CLAY (CH), mottled light gray (5Y 7/2) and red (2.5YR 4/6), dry to moist,soft, high plasticity		N/A
						0.0
						0.0
						0.0
10						0.0
	10-15'	5'		10'-15' LEAN CLAY (CL), pale brown (2.5Y 7/3) with trace yellowish red (5Y 5/1) mottles 10-12'11"; gray (5Y 5/1) 12'11"-14'; light olive gray (5Y 6/2) 14-15', moist, with many silt, stiff, medium plasticity		0.0
						0.0
						0.0
						0.0
15						0.0
	15-19.5'	3'11"		15-15'7" Slough 15'7"-19'6" SANDY CLAY (SC), dark greenish gray (GLEY 1 5GY 4/1), moist, lean clay with very fine sand and silt, very stiff, low plasticity		0.0
						0.0
						0.0
19.5						0.0
				Refusal at 19.5', End of boring.		

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
708207CH	CBD-AOA-SO03	

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 9/30/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~10' bgs | START : 1115 | END : 1145 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
0	0-5'	4'6"		0-2" Topsoil 2"-10" SANDY CLAY (SC), brown (10YR 5/3), moist, lean clay with very fine sand, soft 10"-3'10" POORLY GRADED SAND (SP), olive yellow (2.5Y 6/6), dry, very fine sand with little clay and silt, medium dense 3'10"-4'6" SANDY CLAY (SC), olive yellow (2.5Y 6/8), moist, fat clay with very fine sand, soft 4'6"-5' No recovery		0.0 0.0 0.0 0.0 0.0
5	5-10'	5'		5'-5'10" Same as 3'10"-4'6" above with grading from sandy clay to fat clay 5'10"-7'2" FAT CLAY (CH), mottled light gray (5Y 7/2) and yellowish brown (10YR 5/8), moist, soft, high plasticity 7'2"-10' FAT CLAY (CH), mottled light greenish gray (GLEY 2 10G 7/1) and pale olive (5Y 6/4), moist to dry, soft to stiff, high plasticity	Collect sample 8-10'	0.0 0.0 0.0 0.0 0.0
10	10-15'	5'		10-15' LEAN CLAY (CL), grayish green (5GY 5/2), moist, with many silt, stiff, low plasticity		0.0 0.0 0.0 0.0 0.0
15	15-20'	5'		15'-20' SANDY CLAY (SC), grayish green (5GY 5/2), moist, with very fine sand and silt, stiff to very stiff, low plasticity		0.0 0.0 0.0 0.0 0.0
20	20-20.5'	0.5'		20-25' Same as 15-20' above		0.0
20.5				Refusal at 20.5' bgs. End of boring.		

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
708207CH	CBD-AOA-SO04	

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/1/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~20' bgs | START : 0845 | END : 0915 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
				0-3" Topsoil		336.6
	0-5'	4'4"		3"-2'9" SANDY CLAY (SC), brownish yellow (10YR 6/6), dry, lean clay with very fine sand, very stiff, nonplastic		345.3
				2'9"-4'4" POORLY GRADED SAND (SP), pale brown (10YR 8/3), very fine sand, medium dense		342.8
				4'4"-5' No recovery		239.7
						45.9
5						78.3
	5-10'	4'4"		5-5'5" Same as 2'9"-4'4" above		
				5'5"-7'8" Same as 2'9"-4'4" above except yellow (10YR 7/6), with trace clay		373.3
				7'8"-9'4" POORLY GRADED SAND (SP), mottled white (10YR 8/1) and reddish yellow (7.5YR 6/8), dry, with some clay and silt, loose		388.9
				9'4"-10' No recovery		20.4
						2.8
10						392.1
	10-15'	5'		10-11'7" Same as 7'8"-9'4" above		
				11'7"-12'9" CLAYEY SAND AND SILT (SC), very pale brown (10YR 7/3), moist, very fine sand and silt with lean clay, medium dense, low plasticity		369.2
				12'9"-15' FAT CLAY (CH), mottled pale brown (2.5Y 8/3) and yellowish red(5YR 5/6), moist, with some silt, soft, high plasticity		307.2
						57.1
						59.6
15						44.8
	15-20'	5'		15'-20' Same as 12'9"-15' above except dry, stiff		
					Collect sample 16-18'	393.5
						338.0
						171.7
						20.2
20						384.7
	20-25'	5'		20-25' LEAN SILTY CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, stiff, low plasticity	Visible water on liner, no PID reading taken	
25						
				End of boring at 25' bgs		

	PROJECT NUMBER	BORING NUMBER	
ch2m.	708207CH	CBD-AOA-SO05	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/6/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~12'8" bgs | START : 1140 | END : 1155 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
0	0-5'	2'8"		0-3" Topsoil 3"-1'7" CLAYEY SAND (SC), yellowish brown (10YR 5/8), moist, very fine to fine sand, medium dense 1'7"-2'5" POORLY GRADED SAND (SP), yellow (10YR 7/8), dry, very fine sand, medium dense 2'5"-2'8" Same as 1'7"-2'5" above except pale brown (2.5Y 8/3) 2'8"-5' No recovery	No PID - broken
5	5-10'	3'6"		5-8'6" Same as 2'5"-2'8" above except with trace brownish yellow (10YR 6/8) mottles, loose 8'6"-10' No recovery	
10	10-15'	3'7"		10-12'8" POORLY GRADED SAND (SP), moist, pale brown (2.5Y 8/3) with trace brownish yellow (10YR 6/8) mottles, very fine sand, loose 12'8"-13'7" POORLY GRADED SAND (SP), mottled white (10YR 8/1) and yellow (10YR 8/8), wet, very fine sand with many silt, dense 13'7"-15' No recovery	
15	15-20'	5'		15-15'5" Same as 12'8"-13'7" above 15'5"-16' SANDY CLAY (SC), mottled light gray (10YR 7/1) and yellow (2.5Y 7/8), wet, fat clay with very fine sand, very soft, high plasticity 16'-17'9" FAT CLAY (CH), pale brown (2.5Y 7/4) with few brownish yellow (10YR 6/8) mottles, moist, with some very fine sand and silt, high plasticity 17'9"-19'3" LEAN CLAY (CL), mottled yellow (5Y 7/3) and yellowish brown (10YR 5/8), dry to moist, with trace silt, hard, low plasticity	
20				19'3"-20' LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, with some silt, hard, low plasticity End of boring at 20' bgs	

	PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
ch2m.	708207CH	CBD-AOA-SO06	

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 9/30/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~9'3" bgs | START : 1400 | END : | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
				0-3" Topsoil	0.0
	0-5'	4'6"		3"-9" CLAYEY SAND (SC), yellowish brown (10YR 6/8), moist, very fine sand with lean clay, medium dense	0.0
				9"-4'6" SANDY CLAY (SC), mottled light gray (2.5Y 7/2) and brownish yellow (10YR 6/8), dry to moist, fat clay with very fine sand, stiff, medium plasticity	0.0
				4'6"-5' No recovery	0.0
5					0.0
	5-10'	5'		5-9'3" FAT CLAY (CH), mottled light gray (2.5Y 7/2) and olive yellow (2.5Y 6/8), dry to moist, very stiff to medium stiff, high plasticity	0.0
				9'3"-10' LEAN CLAY (CL), grayish green (5GY 5/2), with many silt, very stiff, low plasticity	0.0
					0.0
					0.0
10					0.0
	10-15'	5'		10-15' Same as 9'3"-10' above	0.0
					0.0
					0.0
					0.0
15					0.0
				End of boring at 15' bgs	

ch2m.	PROJECT NUMBER 708207CH	BORING NUMBER CBD-AOA-SO07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/5/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~13'4" bgs | START : 0845 | END : | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
				0-2" Topsoil	0.0
	0-5'	3'		2"-3' CLAYEY SAND (SC), strong brown (7.5YR 5/8), moist, very fine to coarse sand with trace quartz gravel, medium dense 3'-5' No recovery	0.0 0.0 0.0 0.0
5					0.0
	5-10'	3'9"		5'-6'3" Same as 2"-3' above except wet 1'-1'3" 6'3"-8'9" FAT CLAY (CH), light greenish gray (GLEY 1 10GY 7/1), moist, with trace very fine sand and silt, medium stiff, high plasticity 8'9"-10' No recovery	0.0 0.0 0.1 0.0
10					0.0
	10-15'	5'		10-12'9" Same as 6'3"-8'9" above 12'9"-13'4" LEAN CLAY (CL), yellowish brown (10YR 5/8), dry, with trace very fine sand and silt, stiff, low plasticity 13'4'-13'9" LEAN CLAY (CL), light brownish gray (2.5Y 6/2), moist, with many silt, stiff, low plasticity 13'9"-15' SILT AND LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, stiff, low plasticity	0.0 0.0 0.0 0.0
15					0.0
	15-20'	5'		15-20' Same as 13'9"-15' above	Visible water on outside of liner, no PID reading taken
20					
				End of boring at 20' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	CBD-AOA-SO08	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 9/30/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~10' bgs | START : 1440 | END : 1500 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
	0-5'	4'10'		0-6" Topsoil 6"-1'2" POORLY GRADED SAND (SP), light yellowish brown (2.5Y 6/4), moist, very fine sand with trace silt and 1'2"-4'10" SANDY CLAY (SC), light gray (2.5Y 7/2) 1'2"-1'4"; brownish yellow (10YR 6/8) 1'4"-2'8"; pale brown (2.5Y 7/3) 2'8"-4'; mottled pale brown and reddish yellow (7.5YR 6/8) 4-4'10", moist to dry, lean clay with very fine sand soft, low plasticity 4'10"-5' No recovery		0.0 0.0 0.0 0.0 0.0 0.0
5	5-10'	5'		5-10' FAT CLAY (CH), mottled white (GLEY 1 N 8/1) and reddish yellow (7.5YR 6/8) and dark reddish brown (5YR 3/4), dry, medium dense to stiff, high plasticity	Collect sample 8-10' bgs	0.0 0.0 0.0 0.0 0.0 0.0
10	10-15'	4'4"		10-12' FAT CLAY (CH), light yellowish brown (2.5Y 6/3), wet to moist, with many silt, very soft to stiff, high plasticity 12'-14'4" LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, with many silt, very stiff, medium plasticity 14'4"-15' No recovery		0.0 0.0 0.0 0.0
15				End of boring at 15' bgs		

	PROJECT NUMBER	BORING NUMBER	
ch2m:	708207CH	CBD-AOA-SO09	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/1/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~10' bgs | START : 1140 | END : 1155 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
				0-8" Topsoil		0.0
				8"-1' SANDY CLAY (SC), light yellowish brown (10YR 6/4), dry, lean clay with very fine sand and silt, stiff, low plasticity		0.0
				1-3'5" CLAYEY SAND (SC), brown (10YR 5/3), moist, very fine sand grading to very fine to fine sand with lean clay, loose to medium dense	Collect sample 1'5"-3'5" (0103)	14.3
	0-5'	3'5"		3'5"-5' No recovery		138.8
						N/A
5						0.4
				5-5'7" Same as 1-3'5" above except very fine sand	Collect sample 5'6"-7'6" (0608)	93.6
				5'7"-5'9" SAND AND GRAINY MATERIAL, black (2.5Y 2.5/1), moist, loose, with petroleum odor		24.7
				5'9"-7'9" FAT CLAY (CH), greenish gray (GLEY 10GY 6/1) with trace yellowish brown (10YR 5/8) mottles, moist, soft to medium stiff, high plasticity		3.6
	5-10'	5'		7'9"-10' Same as 5'9"-7'9" above except dry, stiff		11.2
						3.5
10						7.4
				10-11'8" FAT CLAY (CH), light yellowish brown (2.5Y 6/3) with trace reddish brown (5YR 3/4) mottles, moist, with some silt, stiff, high plasticity	Visible water on outside of liner	3.1
				11'8"-15' LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, with many silt, very stiff to hard, low plasticity		1.4
	10-15'	5'				1.3
						0.4
15						0.4
				End of boring at 15' bgs		

	PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
ch2m. SM	708207CH	CBD-AOA-SO10	

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/1/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~10' bgs | START : 1400 1415 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
				0-5" Topsoil	0.0
				5"-2' SANDY CLAY (SC), brown (10YR 5/3), dry, very fine sand, stiff	0.0
	0-5'	4'2"		2-4'2" Fill Material - sandy clay with gravel, light olive brown (2.5Y 5/4), dry, very fine to course sand with rounded quartz gravel and concrete fragments, stiff	0.4
				4'2"-5' No recovery	1.4
					1.2
5					0.0
				5-5'4" Same as 2-4'2" above	
				5'4"-6' CLAYEY SAND (SC), greenish gray (GlEY 1 5GY 6/1), moist, grades to sandy clay, loose	4.8
	5-10'	4'3"		6-9'3" FAT CLAY (CH), light greenish gray (GLEY 1 5GY 7/1) with trace yellowish brown (10YR 5/6) mottles, moist, with trace silt and very fine sand, soft, high plasticity	13.2
				9'3"-10' No recovery	2.0
					0.0
10					1.2
				10-11'3" Same as 6-9'3" above except wet, very soft	
				11'3"-12'2" FAT CLAY (CH), light gray (5Y 7/2) with trace reddish yellow (5YR 6/8) mottles, wet, with trace silt and very fine sand, very soft, high plasticity	4.5
	10-15'	4'6"		12'2"-13' FAT CLAY (CH), laminated light gray (5Y 7/2) and reddish yellow (5YR 6/8), moist, with trace silt, stiff, high plasticity	0.0
				13-14'6" LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, with many silt, very stiff, low plasticity	0.0
15				14'6"-15' No recovery	0.0
				End of boring at 15' bgs	N/A

	PROJECT NUMBER	BORING NUMBER	
ch2m.	708207CH	CBD-AOA-SO11	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/5/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~15' bgs | START : 1315 | END : 1340 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
				0-4" Topsoil		370.4
	0-5'	3'3"		4"-1'8" CLAYEY SAND (SC), yellowish brown (10YR 5/4), moist to wet below 1', very fine to fine sand with lean clay,		381.7
				1'8"-3'3" SANDY CLAY (SC), light yellowish brown (10YR 6/4), moist, lean clay with very fine to fine sand with trace quartz gravel and wood fragments, very stiff		386.7
				3'3"-5' No recovery		373.5
						N/A
5						326.2
	5-10'	3'		5-7' POORLY GRADED SAND (SP), light olive gray (5Y 6/2), moist, very fine to fine sand with trace clay and quartz gravel (0.5 cm), loose to medium dense		380.7
				7-8' Same as 5-7' above except brownish yellow (10YR 6/6), medium dense		349.9
				8-10' No recovery		376.1
						N/A
10						102.8
	10-15'	5'		10-10'7" Same as 7-8' above		369.0
				10'7"-11'6" POORLY GRADED SAND (SP), moist, mottled light gray (5Y 7/1) and strong brown (7.5YR 5/8) with black streaks 3'5"-3'7", very fine to fine sand with trace clay and quartz gravel (0.5), medium dense		41.0
				11'6"-13'7" FAT CLAY (CH), mottled light greenish gray (GLEY 1 10GY 7/1) and strong brown 97.5 YR 4/6), moist, with some very fine sand and silt, soft, high plasticity		341.5
				13'7"-15' LEAN CLAY (CL), olive yellow (5Y 6/6), dry, with little silt, stiff, low plasticity		389.8
15						41.7
	15-20'	5'		15-15'10" FAT CLAY (CH), mottled greenish gray (10GY 6/1) and light olive brown (2.5Y 5/6), wet, with little silt and very fine sand, very soft, high plasticity		85.6
				15'10'-15'11" LEAN CLAY (CL), light yellowish brown (2.5Y 6/3), dry, with some silt, stiff, low plasticity	Saturated below 17' bgs, no PID readings taken	
				15'11"-20' LEAN CLAY (CL), dark greenish gray (GLEY 1 10GY 4/1), dry to moist, with many silt, hard, low plasticity		
20						
				End of boring at 20' bgs		

	PROJECT NUMBER	BORING NUMBER	
ch2m. SM	708207CH	CBD-AOA-SO12	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/5/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~20' bgs | START : 1420 | END : 1440 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
	0-5'	3'		0-3" Topsoil		394.0
				3"-2'3" CLAYEY SAND (SC), brownish yellow (10YR 6/6), moist, very fine sand with clay and trace coarse sand and gravel, loose to medium dense	Collect Sample 1-3'	161.5
				(10YR 5/6) to dark yellowish brown (10YR 4/4), medium dense		52.9
				3-5' No recovery		17.7
						N/A
5						79.7
	5-10'	3'6"		5-5'6" CLAYEY SAND (SC), brownish yellow (10YR 6/8), moist, very fine sand with clay and trace coarse sand and gravel, medium dense		148.0
				5'6"-6'10" Same as 5-5'6" above except brownish yellow		37.2
				6'10"-7'6" Same as 5-5'6" above except yellow (10YR 7/6)		45.2
				7'6"-8'6" POORLY GRADED SAND (SP), yellow (2.5Y 7/6), moist, very fine to fine sand with trace clay, loose		13.5
				8'6"-10' No recovery		8.1
10						
	10-15'	5'		10-10'6" Same as 7'6"-8'6" above		22.5
				10'6"-10'8" CLAYEY SAND (SC), dark yellowish brown (10YR 4/4), moist, very fine sand with clay, medium dense		20.2
				10'8"-12'4" POORLY GRADED SAND (SP), pale brown (2.5Y 8/4), moist, very fine sand with some clay, loose to medium dense		13.1
				12'4"-15' SANDY CLAY (SC), mottled light gray (2.5Y 7/2) and reddish yellow (7.5YR 6/8), moist, fat clay with very fine sand, medium stiff to stiff, high plasticity		19.7
15						1.5
	15-20'	5'		15-20' FAT CLAY (CH), mottled light gray (2.5Y 7/2) and reddish yellow (7.5YR 6/8), moist, with trace very fine sand and silt, medium stiff, high plasticity		31.1
						5.9
						7.4
						3.7
20						1.1
	20-25'	5'		20-21'4" FAT CLAY (CH), light yellowish brown (10YR 6/4), wet, with trace very fine sand and silt, very soft, high	Saturated below 20' bgs, no PID readings taken	
				21'4"-21'9" FAT CLAY (CH), white (10YR 8/1) with trace reddish yellow 7.5YR 6/8) mottles, moist, with trace very fine sand and silt, soft, high plasticity		
				21'9"-22' FAT CLAY (CH), mottled light gray (10YR 7/2) and brownish yellow (10YR 6/8), moist, with trace silt, stiff, high plasticity		
				22'-25' LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, with many silt, very stiff, low plasticity		
25						
				End of boring at 25' bgs		

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	CBD-AOA-SO13	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/6/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~3' bgs | START : 0845 | END : 0900 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0	0-5'	2'9"		0-1" Topsoil 1-10" CLAYEY SAND (SC), yellowish brown (10YR 5/8), very fine to fine sand with clay and trace coarse sand, medium dense 10"-2'7" Same as 1-10" above except yellowish brown (10YR 5/6), with trace gravel 2'7"-2'9" POORLY GRADED SAND (SP), very pale brown (10YR 8/2), wet, very fine sand, medium dense 2'9"-5' No recovery	No PID - broken
5	5-10'	2'		5-5'1" Same as 2'7"-2'9" above 5'1"-7' CLAYEY SAND (SC), mottled pale brown (2.5Y 8/2) and reddish yellow (7.5YR 6/8), wet, very fine sand with clay, medium dense 7'-10' No recovery	
10	10-15'	4'3		10-11'3" Same as 5'1"-7' above 11'3"-14'3" FAT CLAY (CH), mottled pale brown 92.5Y 8/2) and yellowish red (5YR 5/6), moist, with trace very fine sand and silt, soft to medium stiff, high plasticity 14'3"-15' No recovery	
15	15-20'	4'1"		15-16'9" FAT CLAY (CH), mottled pale brown 92.5Y 8/2) and yellowish red (5YR 5/6), wet, with trace very fine sand and silt, very soft, high plasticity 16'9"-17'8" FAT CLAY (CH), mottled pale brown 92.5Y 8/2) and yellowish red (5YR 5/6), moist, with trace very fine sand and silt, soft to medium stiff, high plasticity 17'8"-18'3" LEAN CLAY (CL), yellow (10YR 7/6), moist, with some silt, stiff, low plasticity 18'3"-19'1" FAT CLAY (CH), dark greenish gray (GLEY 1 10Y 4/1), moist, with some silt, stiff, medium plasticity 19'1"-20' No recovery	
20				End of boring at 20' bgs	

	PROJECT NUMBER	BORING NUMBER	
ch2m: SM	708207CH	CBD-AOA-SO14	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/6/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~11'6' bgs | START : 1330 | END : 1340 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
	0-5'	2'6"		0-1" Topsoil 1-7" CLAYEY SAND (SC), brown (10YR 5/3), dry to moist, very fine to very coarse sand with lean clay and little rounded quartz gravel, dense 7"-1' CLAYEY SAND AND GRAVEL (SC-GW), dark yellowish brown (10YR 4/4), dry, very fine to very coarse sand and rounded quartz gravel (2 cm), dense 1-1'5" POORLY GRADED SAND (SP), yellowish brown (10YR 5/4), moist, very fine sand, loose	No PID - broken
5				1'5"-2'6" WELL GRADED SAND (SW), yellow (10YR 7/8), moist, very fine to very coarse sand with some rounded to subangular quartz gravel, very loose 2'6"-5' No recovery	
	5-10'	2'1"		5-5'11" Same as 1'5"-2'6" above 5'11"-6'4" CLAYEY SAND (SC), brownish yellow (10YR 6/8), moist very fine to very coarse sand with clay and few subrounded quartz gravel, very loose 6'4"-7'1" SAND AND SILT (SP-ML), laminated yellow (10YR 7/8) and very pale brown 910YR 8/2), moist, very fine sand and silt, dense/stiff	
10				7'1"-10' No recovery	
	10-15'	3'6"		10-11'6" Same as 6'4"-7'1" above except yellow (10YR 7/6) 11'6"-11'8" Same as 10-11'6" above except wet 11'8"-12' POORLY GRADED SAND (SP), yellow (2.5Y 7/6), wet, very fine sand, loose 12-12'10" Same as 11'8"-12' above except brownish yellow 910YR 5/8) 12'10"-13'6" POORLY GRADED SAND (SP), white (10YR 8/1), wet, very fine sand with trace clay	
15				13'6"-15' No recovery	
				End of boring at 15' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	CBD-AOA-SO15	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/6/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~13'3" bgs | START : 1410 | END : | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0	0-5'	2'2"		0-1" Topsoil 1-6" CLAYEY SAND (SC), brown (10YR 5/3), dry, very fine to very coarse sand with clay and trace quartz gravel, dense 6"-1'5" CLAYEY SAND AND GRAVEL (SC-GW), brown (7.5YR 5/3), moist, fine to very coarse sand and rounded quartz gravel (2 cm), dense 1'5"-2'2" SAND AND SILT (SP-ML), brown (10YR 4/3), moist, very fine sand and silt, medium dense	No PID - broken
5	5-10'	3'7"		5-5'8" POORLY GRADED SAND (SP), brown (10YR 4/3), moist, very fine sand, medium dense 5'8"-6'7" Same as 5-5'8" above except yellow (2.5Y 7/8), loose 6'7"-8'7" POORLY GRADED SAND (SP), brownish yellow (10YR 6/6), moist, very fine sand with trace clay, dense 8'7"-10' No recovery	
10	10-15'	4'7"		10-12'6" POORLY GRADED SAND (SP), mottled brownish yellow (10YR 6/8) and pale brown (2.5Y 8/2), moist, very fine sand, loose 12'6"-13'3" Same as 10-12'6" above except brownish yellow (10YR 6/6) 13'3"-14' POORLY GRADED SAND (SP), brownish yellow (10YR 6/6), wet, very fine sand, medium dense 14-14'7" SAND AND SILT (SP-ML), mottled light gray (5Y 7/2) and reddish yellow (7.5YR 6/8), wet, very fine to fine sand and silt with trace clay, medium dense 14'7"-15' No recovery	
15	15-20'	5'		15-17'2" SANDY CLAY (SC), mottled light gray (5Y 7/2) and brownish yellow (10YR 6/8), wet, fat clay with very fine sand and trace silt, soft, high plasticity 17'2"-18'9" LEAN CLAY (CL), pale brown (2.5Y 7/3), dry, with many silt, very stiff, low plasticity 18'9"-20' LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, with many wilt, very stiff, low plasticity	
20				End of boring at 20' bgs	

	PROJECT NUMBER	BORING NUMBER	
ch2m: SM	708207CH	CBD-AOA-SO16	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/6/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~10' bgs | START : 0955 | END : 1015 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
	0-5'	3'9"		0-2" Topsoil 2-8" CLAYEY SAND (SC), yellowish brown (10YR 5/4), dry, very fine sand with clay, medium dense 8"-1'9" POORLY GRADED SAND (SP), very pale brown (10YR 7/3), dry, very fine sand, loose 1'9"-2'10" SANDY CLAY (SC), light yellowish brown (10YR 6/4), moist, lean clay with very fine sand, stiff, low plasticity 2'10"-3'9" POORLY GRADED SAND (SP), mottled yellow (10YR 7/6) and white (10YR 8/1), moist, very fine sand, medium dense	No PID - broken
5				3'9"-5' No recovery	
	5-10'	3'5"		5-5'3" Same as 2'10"-3'9" above 5'3"-8'5" CLAYEY SAND (SC), mottled white (10YR 8/1) and reddish yellowish (7.5YR 7/8), moist, very fine sand with clay, medium dense 8'5"-10' No recovery	
10					
	10-15'	5'		10-10'6" Same as 5'3"-8'5" above except wet 10'6"-12' SANDY CLAY (SC), white (10YR 8/1), wet, fat clay with very fine sand, soft, high plasticity 12-12'11" FAT CLAY (CH), white (10YR 8/1), moist, fat clay with some very fine sand and silt, soft, high plasticity 12'11"-15' FAT CLAY (CH), mottled plae brown 92.5Y 8/2) and reddish yellow (7.5YR 6/8), moist, with some silt, stiff to very stiff, high plasticity	
15					
	15-20'	4'5"		15-16' LEAN CLAY (CL), mottled pale brown (2.5Y 8/2) and reddish yellow (7.5YR 6/8), dry, stiff, nonplastic 16-16'6" LEAN CLAY (CL), reddish yellow (7.5YR 6/6), moist, hard, low plasticity 16'6"-19'5" FAT CLAY (CH), greenish gray (GLEY 1 10GY 5/1), moist, with manyt silt, hard, high plasticity 19'5"-20' No recovery	
20					
				End of boring at 20' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
708207CH	CBD-AOA-SO17	

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/5/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~10' bgs | START : 1150 | END : 1205 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
				0-2" Topsoil	101.9
				2-9" CLAYEY SAND (SC), strong brown (7.5YR 5/8), dry, fine to coarse sand with clay and trace angular quartz gravel, medium dense	103.0
	0-5'	2'5"		9"-1' CLAYEY SAND AND GRAVEL (SC-GP), reddishyellow (7.5YR 6/6), moist, fine to coarse sand with clay and angular to subrounded quartz gravel, loose	380.5
				1'-1'10" CLAYEY SAND (SC), mottled light gray (2.5Y 7/1) and brownish yellow (10YR 6/8), moist, very fine to fine sand with clay and trace coarse sand and subrounded quartz gravel, dense	N/A
5					N/A
				1'10"-2'5" SAND AND GRAVEL (SW-GW), yellow (2.5Y 7/6), moist, fine to coarse sand and subrounded to rounded quartz gravel with trace clay, medium dense	18.8
				2'5"-5' No recovery	391.4
	5-10'	4'7"		5-8'2" SANDY CLAY (SC), mottled light gray (5Y 7/1) and reddish yellow (7.5YR 6/8), moist to dry, clay with sand and trace rounded quartz gravel, medium stiff	395.5
				8'2"-9' FAT CLAY (CH), mottled light gray (5Y 7/2) and reddish yellow (7.5YR 6/8), moist, with some very fine sand and silt, soft, high plasticity	397.1
				9-10' No recovery	267.4
10					7.7
				10-10'5" FAT CLAY (CH), mottled reddish yellow (7.5YR 6/6) and light gray (5Y 7/2), wet, very soft, high plasticity	378.5
				10'5"-10'11" CLAYEY SAND (SC), light yellowish brown (2.5Y 6/3), wet, very fine to coarse sand with clay, very loose	15.9
	10-15'	3'10"		10'11"-13'4" LEAN CLAY (CL), mottled light gray (2.5Y 7/2) and brownish yellow (10YR 6/8), moist, stiff, low plasticity	294.3
				13'4"-13'9" Same as 10'11"-13'4" above except light brownish gray (2.5Y 6/8)	371.9
15					17.1
				13'9"-13'10" Same as 13'4"-13'9" above except greenish gray (GLEY 1 5GY 5/1)	N/A
				13'10"-15' No recovery	
				End of boring at 15' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
708207CH	CBD-AOA-SO18	

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/5/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS 5'3"/~10' bgs | START : 0920 | END : 0935 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
				0-6" Asphalt	0.0
				6"-1' SANDY CLAY (SC), yellowish brown (10YR 5/4), dry, clay with very fine sand, very stiff	0.0
					397.3
	0-5'	4'2"		1-4' FAT CLAY (CH), strong brown (7.5YR 5/8) to mottled very pale brown (10YR 8/2) and reddish yellow (5YR 6/8) below 3'2", dry, with some very fine to fine sand, very stiff, high plasticity	389.9
					64.0
5				4-4'2" CLAYEY SAND (SC), mottled very pale brown and reddish yellow (5YR 6/8), very fine and fine sand with clay, dense	323.6
				4'2"-5' No recovery	
				5-5'3" CLAYEY SAND (SC), mottled very pale brown (20YR 8/2) and brownish yellow (10YR 6/8), moist, very fine sand with clay, medium dense	388.5
					296.2
	5-10'	3'10"		5'3"-6'4" POORLY GRADED SAND (SP), pale brown (2.5Y 8/2) 5'3"-5'8" and light yellowish brown (10YR 6/4) 5'8"-6'4", wet, very fine to fine sand, dense	395.5
					7.5
10				6'4"-7'3" SAND AND GRAVEL (SW-GW), very pale brown (10YR 7/4) 6'4"-6'7" and strong brown (7.5YR 5/6) 6'7"-7'3", wet, fine to coarse sand and subangular to rounded quartz gravel	107.2
				7'3"-7'6" FAT CLAY (CH), mottled reddish yellow (7.5YR 6/8) and pale brown (2.5Y 7.3), wet, with trace very fine sand snd silt, soft, high plasticity	385.7
					0.0
	10-15'	5'		7'6"-8'10" FAT CLAY (CH), mottled pale brown (2.5Y 8/2) and reddish yellow (7.5YR 6/8) with black stains at 3', moist, soft to medium dense	Saturated
				10-10'8" LEAN CLAY (CL), light yellowish brown (2.5Y 6/4), moist, with trace silt, stiff, low plasticity	
15				10'8"-15' LEAN CLAY (CL), greenish gray (GLEY 1 10GY 5/1), moist, with many silt, very stiff to hard, low plasticity	
				End of boring at 15' bgs	

	PROJECT NUMBER	BORING NUMBER	
ch2m:	708207CH	CBD-AOA-SO19	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/5/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~10'2" bgs | START : 1015 | END : 1030 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
	0-5'	3'8"		0-2" Topsoil	2.3
				2"-1'1" SANDY CLAY (SC), yellowish brown (10YR 5/6), moist to dry, clay with very fine to fine sand, medium stiff	67.5
				1'1"-1'5" SAND AND GRAVEL AND CLAY (SC-GW), strong brown (7.5YR 5/6), dry, fine to coarse sand and angular gravel and clay, very loose	33.9
				1'5"-2'6" CLAYEY SAND (SC), pale brown (2.5Y 7/4), moist, very fine sand with clay, loose to medium dense	9.2
				2'6"-3'8" SANDY CLAY (SC), mottled yellow (2.5Y 7/6) and reddish yellow (7.5YR 6/8), moist, clay with fine sand and trace coarse sand, stiff to soft	6.5
5					361.4
	5-10'	3'3"		3'8"-5' No recovery	338.8
				5-6'3" Same as 2'6"-3'8" above except medium stiff	380.8
				6'3"-6'9" POORLY GRADED SAND (SP), light yellowis brown (2.5Y 6/4), moist, very fine to fine sand with trace angular gravel, very loose	378.2
				6'9"-8'3" SANDY CLAY (SC), mottled pale brown (2.5Y 7/3) and brownish yellow (10YR 6/8), moist, clay with very fine sand and silt, soft	N/A
10				8'3"-10' No recovery	269.9
	10-15'	4'3"		10-10'2" Same as 6'9"-8'3" above	
				10'2"-10'5" POORLY GRADED SAND (SP), light yellowish brown (2.5Y 6/3), wet, fine sand with some clay, very loose	136.0
				10'5"-11'7" CLAYEY SAND (SC), light yellowish brown (2.5Y 6/4), wet, fine to medium sand with clay, very loose	366.7
				11'7"-13'1" FAT CLAY (CH), mottled light gray (2.5Y 7/1) and olive yellow (2.5Y 6/8), moist, soft to stiff	324.5
				13'1"-13'6" LEAN CLAY (CL), strong brown (7.5YR 5/8), moist, with some silt, very stiff	107.3
15				13'6"-14'3" Same as 13'1"-13'6" above except dark greenish gray (GLEY 1 5GY 4/1)	N/A
				14'3"-15' No recovery	
				End of boring at 15' bgs	

	PROJECT NUMBER	BORING NUMBER	
ch2m:	708207CH	CBD-AOA-SO20	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/5/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~15' bgs | START : 1105 | END : 1125 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
	0-5'	3'4"		0-3" Topsoil		56.6
				3-9" CLAYEY SAND (SC), strong brown (7.5YR 5/6), moist, fine to coarse sand with clay and trace angular gravel, loose		385.0
				9"-2'2" SANDY CLAY (SC), mottled light gray (2.5Y 7/2) and light yellowish brown (2.5Y 6/4), dry, clay with very fine sand, hard		62.3
				2'2"-3'4" POORLY GRADED SAND (SP), yellow (2.5Y 7/8), dry, very fine sand with trace clay, dense		32.7
				3'4"-5' No recovery		N/A
5						46.5
	5-10'	4'10"		5-5'6" Same as 2'2"-3'4" above except moist		
				5'6"-6'6" SANDY CLAY (SC), pale brown (2.5Y 7/4) with trace brownish yellow (10YR 6/8) mottles, moist, clay with very fine sand, stiff		358.2
				6'6"-9'10" FAT CLAY (CH), mottled pale brown (2.5Y 7/4) and brownish yellow (10YR 6/8), moist, with little very fine sand and silt, medium stiff, high plasticity		57.7
				9'10"-10' No recovery		94.6
						385.2
10						20.2
	10-15'	5'		10-12'5" Same as 6'6"-9'10" above		
				12'5"-13'1" LEAN CLAY (CL), light yellowish brown (2.5Y 6/3), dry, with trace silt, very stiff, low plasticity		4.3
				13'1"-15' LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), moist, with some silt, stiff, low plasticity		7.3
						4.3
						398.6
15					Saturated	1.3
	15-20'	5'		15-16'8" LEAN CLAY (CL), greenish gray (GLEY 1 5GY 5/1), wet, with some silt, very soft, low plasticity		
				16'8"-20' FAT CLAY (CH), greenish gray (GLEY 1 5GY 5/1), moist, with some silt, stiff, high plasticity		
20						
				End of boring at 20' bgs		

	PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
ch2m. SM	708207CH	CBD-AOA-SO21	

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/5/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~15' bgs | START : 1105 | END : 1125 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
	0-5'	3'2"		0-2" Topsoil		26.8
				2"-3' CLAYEY SAND (SC), brown (10YR 5/3), moist to wet from 2-2'6", very fine sand with clay, loose		262.5
				3-3'2" Same as 2'-3' above except yellowish brown (10YR		435.4
				3'2"-5' No recovery		314.5
						N/A
5						241.3
	5-10'	3'7"		5-5'3" Same as 3-3'2" above		
				5'3"-7'8" POORLY GRADED SAND (SP), brownish yellow (10YR 6/8), moist, very fine sand, loose		259.8
				7'8"-8'7" POORLY GRADED SAND (SP), yellow (2.5Y 7/6), moist, very fine sand, medium dense		233.4
				8'7"-10' No recovery		306.1
						N/A
10						357.7
	10-15'	3'		10-10'7" Same as 7'8"-8'7" above		
				10'7"-10'8" CLAYEY SAND (SC), dark grayish brown (2.5Y 4/2), moist, very fine sand with clay, medium dense		311.8
				10'8"-13' POORLY GRADED SAND (mottled brownish yellow (10YR 6/8) and pale brown (2.5Y 8/2), moist, very fine sand with trace clay and silt, medium dense		343.3
				13-15' No recovery		378.8
						N/A
15						379.2
	15-20'	5'		15-16' Same as 10'8"-13' above except loose		
				16-17'1" Same as 15-16' above except wet, very loose	Collect Sample 15-16'	Saturated
				17'1"-17'5" SANDY CLAY (SC), mottled brownish yellow (10YR 6/8) and pale brown (2.5Y 8/2), wet, clay with very fin e sand and some silt, very soft		
				17'5"-20' Same as 17'1"-17'5" above except moist, soft to stiff with depth		
20						
				End of boring at 20' bgs		

ch2m	PROJECT NUMBER 708207CH	BORING NUMBER CBD-AOA-SO22	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/2/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~13' bgs | START : 0835 | END : | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
0	0-5'	3'8"		0-2" Topsoil		0.0
				2"-2' CLAYEY SAND (SC), brown (10YR 5/3), moist, very fine to fine sand with clay, medium dense		392.4
				2-3'8" SANDY CLAY (SC), pale brown (10YR 6/3), moist to wet from 2-2'3", clay with very fine to fine sand and trace rounded quartz gravel, soft (2-2'3") to stiff		3.8
				3'8"-5' No recovery		4.3
						N/A
5						4.1
	5-10'	5'		5-5'11" SANDY CLAY (SC), pale brown (10YR 6/3), moist, clay with very fine to fine sand and trace rounded quartz gravel, stiff		343.3
				5'11"-10' SANDY CLAY (SC), mottled light brownish gray (2.5Y 6/2) and brownish yellow (10YR 6/8), moist, clay with very fine to fine sand and trace rounded quartz gravel, stiff		31.6
						30.6
						398.5
10						360.4
	10-15'	4'5"		10-11' Same as 5'11"-10' above except CLAYEY SAND (SC), loose		30.6
				11-14'5" POORLY GRADED SAND (SP), mottled pale brown (2.5Y 7/3) and reddish yellow (7.5YR 6/8), moist ot wet below 13', very fine sand with trace clay, medium dense		4.5
				14'5"-15' No recovery	Saturated	5.0
15						
	15-20'	5'		15-17'7" POORLY GRADED SAND (SP), mottled pale brown (2.5Y 7/3) and reddish yellow (7.5YR 6/8), wet, fine sand grading to very fine sand with depth, very soft		
				17'7"-18'10" FAT CLAY (CH), mottled white (2.5Y 8/1) and brownish yellow (10YR 5/8), moist, with many very fine sand and silt, medium stiff, high plasticity		
				18'10"-19'4" FAT CLAY (CH), light yellowish brown (2.5Y 6/3), moist, with some very fine sand and silt, stiff, high plasticity		
				19'4"-20' LEAN CLAY (CL), greenish gray (GLEY 1 10GY 5/1), moist, with many silt, stiff, low plasticity		
20						
				End of boring at 20' bgs		

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	CBD-AOA-SO23	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/9/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~16' bgs | START : 1140 | END : 1210 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0	0-5'	2'2"		0-2" Topsoil 2"-1'7" CLAYEY SAND (SC), brownish yellow (10YR 6/6), moist, very fine to coarse sand with clay and some rounded quartz gravel, medium dense 1'7"-2'2" POORLY GRADED SAND (SP), brownish yellow (10YR 6/6), moist to wet below 2', very fine sand, medium dense 2'2"-5' No recovery	PID broken
5	5-10'	3'		5-8' Same as 1'7"-2'2" above except moist 8-10' No recovery	
10	10-15'	3'		10-13' POORLY GRADED SAND (SP), mottled light gray (5Y 7/2) and yellow (2.5Y 7/8), moist, very fine sand, medium dense 13-15' No recovery	
15	15-20'	5'		15-16' Same as 10-13' above 16-20' SANDY CLAY (SC), mottled light gray (5Y 7/2) and yellowish brown (10YR 5/8), wet, clay with many very fine sand and silt grading to little with depth, soft	
20				End of boring at 20' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	CBD-AOA-SO24	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/2/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~15'11" bgs | START : 1200 | END : 1220 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
				0-1" Topsoil		0.0
	0-5'	3'8"		1-8" CLAYEY SAND (SC), yellowish brown (10YR 5/6), moist, very fine sand with clay, medium dense	Collect Sample 1-3'	348.2
				8"-3'8" POORLY GRADED SAND (SP), brownish yellow (10YR 6/6), very fine to fine sand, medium dense		266.9
				3'8"-5' No recovery		0.0
						0.4
5						110.4
	5-10'	3'7"		5-7'10" Same as 8"-3'8" above except loose		33.3
				7'10"-8'7" POORLY GRADED SAND (SP), mottled very pale brown (10YR 8/2) and yellow (10YR 7/8), very fine to fine sand, moist, loose		8.6
				8'7"-10' No recovery		3.1
						2.0
10						5.0
	10-15'	3'4"		10-11'11" Same as 7'10"-8'7" above		94.2
				11'11"-13'4" SAND AND SILT (SP), mottled pale brown (2.5Y 7/3) and reddish yellow (7.5YR 6/8), moist to wet below 13', very fine sand and silt, loose		17.8
				13'4"-15' No recovery		1.6
						N/A
15						0.9
	15-20'	5'		15-16' POORLY GRADED SAND (SP), mottled pale brown (2.5Y 7/3) and reddish yellow (7.5YR 6/8), moist, very fine to fine sand with many silt, loose	Saturated	6.0
				16-17'5" POORLY GRADED SAND (SP), mottled light gray (7.5YR 7/1) and brownish yellow (10YR 6/8), wet, fine sand, medium dense		
				17'5"-18'7" SANDY CLAY (SC), mottled light gray (7.5YR 7/1) and brownish yellow (10YR 6/8), wet, very fine sand with clay and trace silt, medium stiff		
20				18'7"-20' Same as 17'5"-18'7" above except moist, stiff		
				End of boring at 20' bgs		

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	CBD-AOA-SO25	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/1/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~16'8" bgs | START : 1250 | END : 1315 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
	0-5'	3'		0-2" Topsoil		0.0
				2"-3' CLAYEY SAND (SC), yellowish brown (10YR 5/6), dry, very fine sand with clay, loose		0.0
				3-5' No recovery		0.0
						0.0
						N/A
5						0.0
	5-10'	4'10"		5-5'2" Same as 2"-3' above		
				5'2"-6'8" SANDY CLAY (SC), dark grayish brown (10YR 4/2), moist, clay with very fine sand, soft		0.0
				6'8"-8'10" LEAN CLAY (CL), light yellowish brown (10YR 6/4), dry to moist, with trace silt, stiff, low plasticity		0.0
				8'10"-9'10" POORLY GRADED SAND (SP), pale brown (2.5Y 7/4), moist, very fine sand, loose		0.0
				9'10"-10' No recovery		0.0
10						0.0
	10-15'	5'		10-13'6" SAND Y CLAY (SC), pale brown (2.5Y 8/2) with trace brownish yellow (10YR 6/8) mottles, moist, clay with very fine sand, medium stiff		0.0
				13'6'-14'5" Same as 10-13'6" except dry, hard		0.0
				14'5"-15' FAT CLAY (CH), greenish gray (GLEY 1 10GY 6/1) with yellowish brown (10YR 5/8) laminations, dry, stiff to very stiff		0.0
						0.0
15						0.0
	15-20'	5'		15-15'11" SANDY CLAY (SC), pale brown (2.5Y 7/4), moist to dry, clay with very fine sand, soft to medium stiff	Collect sample 14'8"-16'8"	0.0
				15'11"-16'3" SANDY CLAY (SC), mottled light greenish gray (GLEY 1 5GY 7/1) and reddish yellow (7.5YR 6/8), dry, clay with very fine sand, stiff		0.0
				16'3"-16'8" LEAN CLAY (CL), pale olive (5Y 6/3), dry, with some silt, very stiff, low plasticity		0.0
				16'8"-20' LEAN CLAY (CL), greenish gray (GLEY 1 10GY 5/1), moist, stiff to hard, low plasticity		0.0
20						0.0
				End of boring at 20' bgs		

	PROJECT NUMBER	BORING NUMBER	
ch2m.	708207CH	CBD-AOA-SO26	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation LOCATION : NRL-CBD DATE : 10/6/20

WEATHER : DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~12' bgs START : 1040 END : LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0	0-5'	3'7"		0-3" Topsoil 3"-1'2" CLAYEY SAND (SC), brown (10YR 4/3), dry, very fine sand with clay and trace angular gravel (1cm), medium dense 1'2"-2'2" POORLY GRADED SAND (SP), brown (10YR 5/3), dry to moist, very fine to fine sand with trace clay, loose 2'2"-2'6" SILT AND CLAY (CH), dark grayish brown (2.5Y 4/2), moist to wet from 2'5"-2'6", soft, high plasticity 2'6"-3'2" Same as 2'2"-2'6" except light yellowish brown (2.5Y 6/8), moist 3'2"-3'7" LEAN CLAY (CL), light yellowish brown (2.5Y 6/4), moist, with some silt, stiff, low plasticity	PID broken
5				3'7'-5' No recovery	
	5-10'	3'7"		5-6'1" Same as 3'2"-3'7" above 6'1"-6'9" SANDY CLAY (SC), light yellowish brown (2.5Y 6/4), moist, clay with very fine to fine sand, stiff, high plasticity 6'9"-8'7" POORLY GRADED SAND (SP), mottled white (2.5Y 8/1) and yellow (10YR 7/6), moist, very fine sand, dense 8'7"-10' No recovery	
10	10-15'	3'6"		10-12' Same as 6'9"-8'7" above 12-13'6" SANDY CLAY (SC), mottled pale brown (2.5Y 7/4) and yellow (10YR 7/8), wet, clay with very fine sand and silt, soft to medium stiff, high plasticity 13'6"-15' No recovery	
15	15-20'	5'		15-16'7" SANDY CLAY (SC), mottled pale brown (2.5Y 7/4) and yellow (10YR 7/8), wet, clay with very fine sand and silt, soft, high plasticity 16'7'-19'2" LEAN CLAY (CL), mottled white (10YR 8/1) and yellow (10YR 7/8), moist, with trace silt, stiff to very stiff, medium to low plasticity 19'2"-20' FAT CLAY (CH), greenish gray (GLEY 1 5GY 5/1), moist, with trace silt, very stiff, high to medium plasticity	
20				End of boring at 20' bgs	

PROJECT NUMBER	BORING NUMBER	SHEET
708207CH	CBD-AOA-SO27	1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/6/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~12'5" bgs | START : 1255 | END : 1310 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0	0-5'	3'6"		0-1" Topsoil 1"-1' CLAYEY SAND (SC), yellowish brown (10YR 5/4), dry, very fin e to fine sand with clay and trace gravel, dense 1-2'5" CLAYEY SAND (SC), brownish yellow (10YR 6/8), moist, very fine sand with clay, medium dense 2'5"-3'5" POORLY GRADED SAND (SP), yellow (10YR 7/8), dry to moise, very fine sand, medium dense to loose 3'5"-3'6" POORLY GRADED SAND (SP), very pale brown (10YR 8/2), dry, very fine sand, loose 3'6"-5' No recovery	PID broken
5	5-10'	3'8"		5-5'6" Same as 3'5"-3'6" above 5'6"-5'8" Same as 5-5'6" above except brownish yellow (10YR 6/8) with some clay 5'8"-8'8" POORLY GRADED SAND (SP), very pale brown (10YR 8/2) with trace yellow (10YR 7/8) mottles, dry to moist, very fine sand, loose 8'8"-10' No recovery	
10	10-15'	4'2"		10-12'5" Same as 5'8"-8'8" above except moist 12'5"-12'8" Same as 10-12'5" above except wet 12'8"-14'2" SAND AND SILT (SP), mottled white (10YR 8/1) and yellow (10YR 7/8), wet, very fine sand and silt, loose 14'2'-15' No recovery	
15	15-20'	4'5"		15-17' SANDY CLAY (SC), mottled white (10YR 8/1) and yellow (10YR 7/8), wet, clay with very fine to fine sand, soft 17-19'5" FAT CLAY (CH), mottled white (10YR 8/1) and strong brown (7.5YR 5/8), moist, with many very fine sand and silt, soft to stiff 19'5"-20' No recovery	
20				End of boring at 20' bgs	

	PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
ch2m.	708207CH	CBD-AOA-SO28	

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/9/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

WATER LEVELS ~15'10" bgs | START : 1055 | END : 1125 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
	0-5'	2'1"		0-3" Topsoil 3-6" SAND AND GRAVEL (GW), light gray (10YR 7/2), dry, very fine to very coarse sand with rounded quartz gravel, very loose 6"-1'1" CLAYEY SAND (SC), yellowish brown (10YR 5/6) 6-9" and light olive brown (2.5Y 5/4) 9"-1'1", moist, fine sand with clay and trace rounded quartz gravel, medium dense 1'1"-2'1" WELL GRADED SAND (WG), light yellowish brown (10YR 6/4), moist, very fine to coarse sand with some subangular to rounded gravel, very loose	PID broken
5				2'1"-5' No recovery	
	5-10'	3'7"		5-8'7" Same as 1'1"-2'1" above 8'7"-10' No recovery	
10					
	10-15'	3'		10-11'3" Same as 5-8'7" above 11'3"-13' POORLY GRADED SAND (SP), pale brown (2.5Y 7/3) with few reddish yellow (7.5YR 7/6) laminations, dry to moist, very fine sand, medium dense 13-15' No recovery	
15					
	15-20'	4'2"		15-15'3" SILT (MH), pale brown (2.5Y 7/3) with few reddish yellow (7.5YR 7/6) laminations, moist, medium stiff 15'3"-15'10" CLAYEY SAND (SC), light olive brown (2.5Y 5/4), moist, very fine to very coarse sand with clay and trace quartz gravel, medium stiff 15'10"-19' FAT CLAY (CH), mottled light gray (2.5Y 7/2) and yellowish brown (10YR 5/8), wet to moist below 18', with trace silt, medium stiff, high plasticity 19-19'2" FAT CLAY (CH), dark greenish gray (GLEY 1 10GY 4/1), moist, with trace silt, medium stiff, high plasticity	
20				19'2"-20' No recovery	
				End of boring at 20' bgs	

	PROJECT NUMBER	BORING NUMBER	
ch2m: SM	708207CH	CBD-AOA-SO29	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 10 Site Investigation | LOCATION : NRL-CBD | DATE : 10/2/20

WEATHER : | DRILLING CONTRACTOR : Ground Zero

DRILLING METHOD AND EQUIPMENT USED : DPT/HSA Geoprobe 7822DT

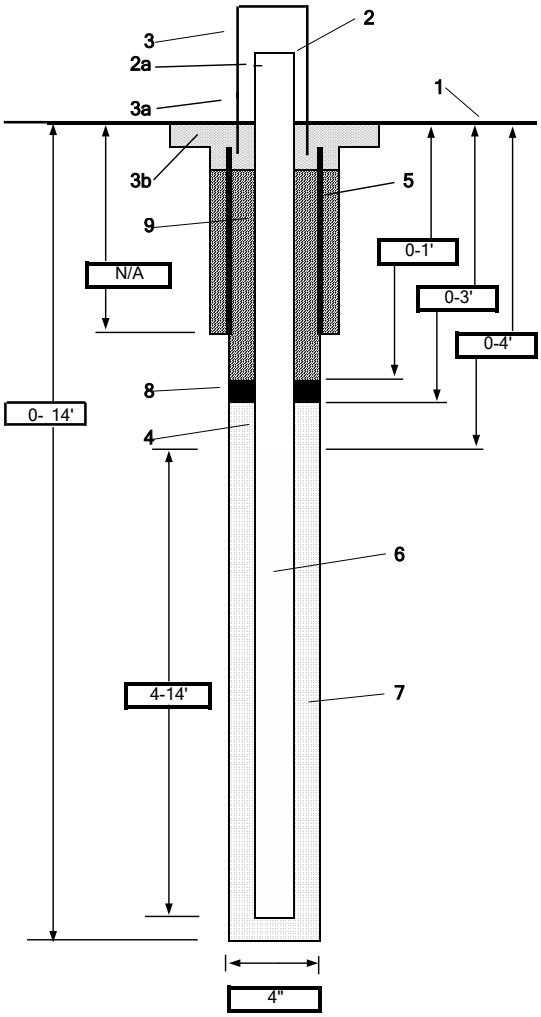
WATER LEVELS ~12'6" bgs | START : 1200 | END : 1200 | LOGGER : C. Dronfield

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	PID (ppm)
				0-1" Topsoil		67. 6
				1"-4' CLAYEY SAND (SC), yellowish brown (10YR 5/6), moist, very fine sand with clay, dense		53.4
				4-5' No recovery		42.5
	0-5'	4'				5.0
						32.1
5						15.0
				5-7'9" WELL GRADED SAND (WG), yellow (10YR 7/6), moist to dry, very fine to coarse sadn with trace rounded quartz gravel, loose		376.1
					Collect Sample 6-8'	41.6
	5-10'	4'		7'9"-9' POORLY GRADED SAND (SP), yellow (10YR 6/8), moist, very fine sand with trace clay, dense		6.0
				9-10' No recovery		
					Collect Sample 8-10'	1.1
10						15.1
				10-10'3" Same as 7'9"-9' above		8.5
				10'3"-12'6" POORLY GRADED SAND (SP), mottled white (10YR 8/1) and reddish yellow (7.5YR 6/8), moist, very fine sand with trace clay, dense		5.4
	10-15'	3'10"		12'6"-13'10" CLAYEY SAND AND SILT (SC), mottled white (10YR 8/1) and reddish yellow (7.5YR 6/8), wet, very fine sand and silt with clay, medium stiff	Sautrated	2.5
				13'10"-15' No recovery		0.1
15						N/A
				End of boring at 15' bgs		

ch2m.	PROJECT NUMBER: 708207CH	WELL NUMBER: CBD-AOA-MW15

WELL COMPLETION DIAGRAM

PROJECT : Site 10 SI	LOCATION : NRL-CBD		
DRILLING CONTRACTOR : Ground Zero			
DRILLING METHOD AND EQUIPMENT USED : DPT/HAS Geoprobe 7822 DT			
WATER LEVELS: 6'2" bgs	START: 10/9/20 @ 0915	END: 10/9/20 @ 0955	LOGGER: C. Dronfield



1- Ground elevation at well: TBD

2- Top of casing elevation: TBD
a) vent hole?

3- Wellhead protection cover type: Steel Stickup
a) weep hole?: N/A
b) concrete pad dimensions: 2'X2'

4- Dia./type of well casing: Schedule 40 PVC

5- Dia./type of surface casing: N/A

6- Type/slot size of screen: 0.010" Slot PVC

7- Type screen filter: FilPro WG #2
a) Quantity used: 6.5 50-lb bags

8- Type of seal: 3/8" Bentonite Chips Holeplug
a) Quantity used: 0.5 50-lb bag

9- Grout
a) Grout mix used: Portland Type I/II Cement and Bentonite
b) Method of placement: hand pour
c) Vol. of surface casing grout: N/A
d) Vol. of well casing grout: 3 gal

Development method: surge/purge

Development time:

Estimated development volume:

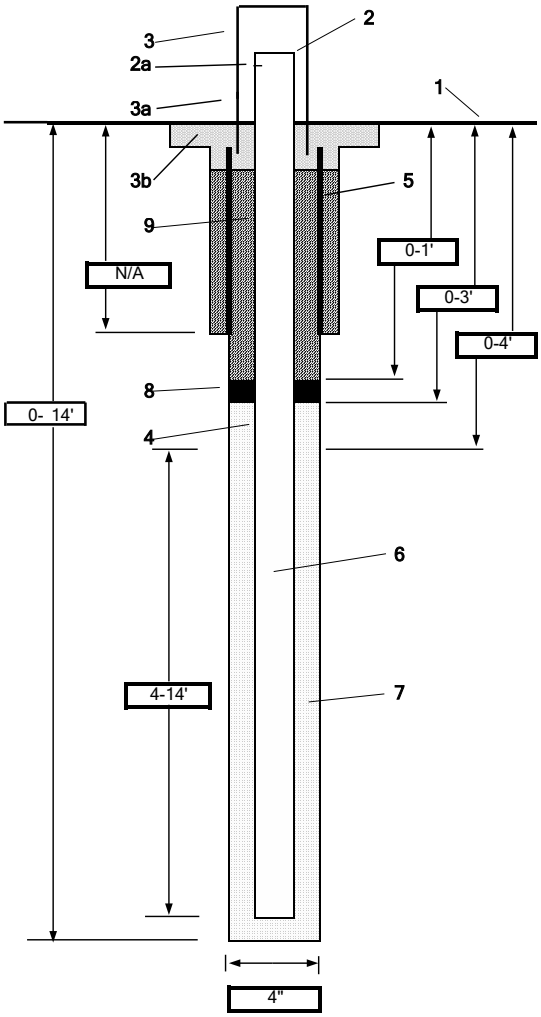
Comments:

Time	pH	Conductivity	Turbidity	Temperature	Salinity

	PROJECT NUMBER: 708207CH	WELL NUMBER: CBD-AOA-MW16

WELL COMPLETION DIAGRAM

PROJECT : Site 10 SI	LOCATION : NRL-CBD		
DRILLING CONTRACTOR : Ground Zero			
DRILLING METHOD AND EQUIPMENT USED : DPT/HAS Geoprobe 7822 DT			
WATER LEVELS: 5'3" bgs	START: 10/8/20 @ 1250	END: 10/8/20 @ 1345	LOGGER: C. Dronfield



1- Ground elevation at well: TBD

2- Top of casing elevation: TBD
a) vent hole?

3- Wellhead protection cover type: Steel Stickup
a) weep hole?: N/A
b) concrete pad dimensions: 2'X2'

4- Dia./type of well casing: Schedule 40 PVC

5- Dia./type of surface casing: N/A

6- Type/slot size of screen: 0.010" Slot PVC

7- Type screen filter: FilPro WG #2
a) Quantity used: 6 50-lb bags

8- Type of seal: 3/8" Bentonite Chips Holeplug
a) Quantity used: 1 50-lb bag

9- Grout
a) Grout mix used: Portland Type I/II Cement and Bentonite
b) Method of placement: hand pour
c) Vol. of surface casing grout: N/A
d) Vol. of well casing grout: 1 gal

Development method: surge/purge

Development time:

Estimated development volume:

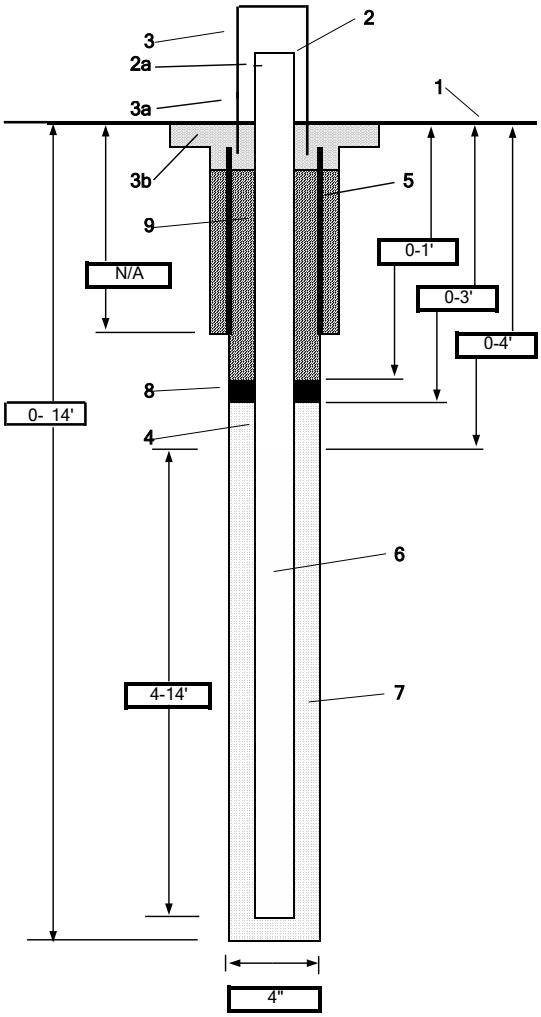
Comments:

Time	pH	Conductivity	Turbidity	Temperature	Salinity

ch2m.	PROJECT NUMBER: 708207CH	WELL NUMBER: CBD-AOA-MW17

WELL COMPLETION DIAGRAM

PROJECT : Site 10 SI		LOCATION : NRL-CBD	
DRILLING CONTRACTOR : Ground Zero			
DRILLING METHOD AND EQUIPMENT USED : DPT/HAS Geoprobe 7822 DT			
WATER LEVELS: 5' bgs	START: 10/7/20 @ 1250	END: 10/7/20 @ 1340	LOGGER: C. Dronfield



1- Ground elevation at well: TBD

2- Top of casing elevation: TBD
a) vent hole?

3- Wellhead protection cover type: Steel Stickup
a) weep hole?: N/A
b) concrete pad dimensions: 2'X2'

4- Dia./type of well casing: Schedule 40 PVC

5- Dia./type of surface casing: N/A

6- Type/slot size of screen: 0.010" Slot PVC

7- Type screen filter: FilPro WG #2
a) Quantity used: 6 50-lb bags

8- Type of seal: 3/8" Bentonite Chips Holeplug
a) Quantity used: 1 50-lb bag

9- Grout
a) Grout mix used: Portland Type I/II Cement and Bentonite
b) Method of placement: hand pour
c) Vol. of surface casing grout: N/A
d) Vol. of well casing grout: 1 gal

Development method: surge/purge

Development time:

Estimated development volume:

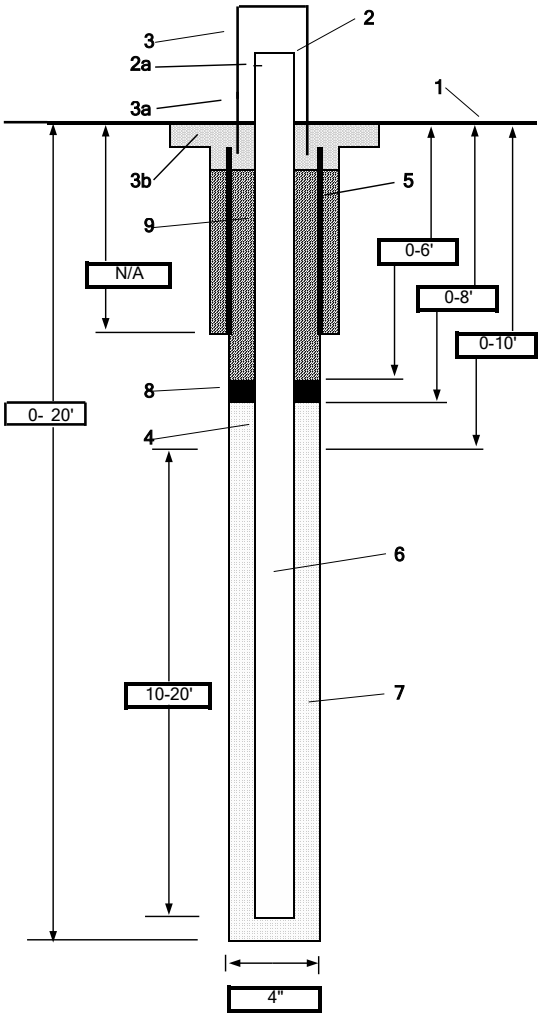
Comments:

Time	pH	Conductivity	Turbidity	Temperature	Salinity

ch2m.	PROJECT NUMBER: 708207CH	WELL NUMBER: CBD-AOA-MW18

WELL COMPLETION DIAGRAM

PROJECT : Site 10 SI	LOCATION : NRL-CBD		
DRILLING CONTRACTOR : Ground Zero			
DRILLING METHOD AND EQUIPMENT USED : DPT/HAS Geoprobe 7822 DT			
WATER LEVELS: 11'6" bgs	START: 10/7/20 @ 0940	END: 10/7/20 @ 1040	LOGGER: C. Dronfield



1- Ground elevation at well: TBD

2- Top of casing elevation: TBD
a) vent hole?

3- Wellhead protection cover type: Steel Stickup
a) weep hole?: N/A
b) concrete pad dimensions: 2'X2'

4- Dia./type of well casing: Schedule 40 PVC

5- Dia./type of surface casing: N/A

6- Type/slot size of screen: 0.010" Slot PVC

7- Type screen filter: FilPro WG #2
a) Quantity used: 6.5 50-lb bags

8- Type of seal: 3/8" Bentonite Chips Holeplug
a) Quantity used: 1 50-lb bag

9- Grout
a) Grout mix used: Portland Type I/II Cement and Bentonite
b) Method of placement: hand pour
c) Vol. of surface casing grout: N/A
d) Vol. of well casing grout: 3 gal

Development method: surge/purge

Development time:

Estimated development volume:

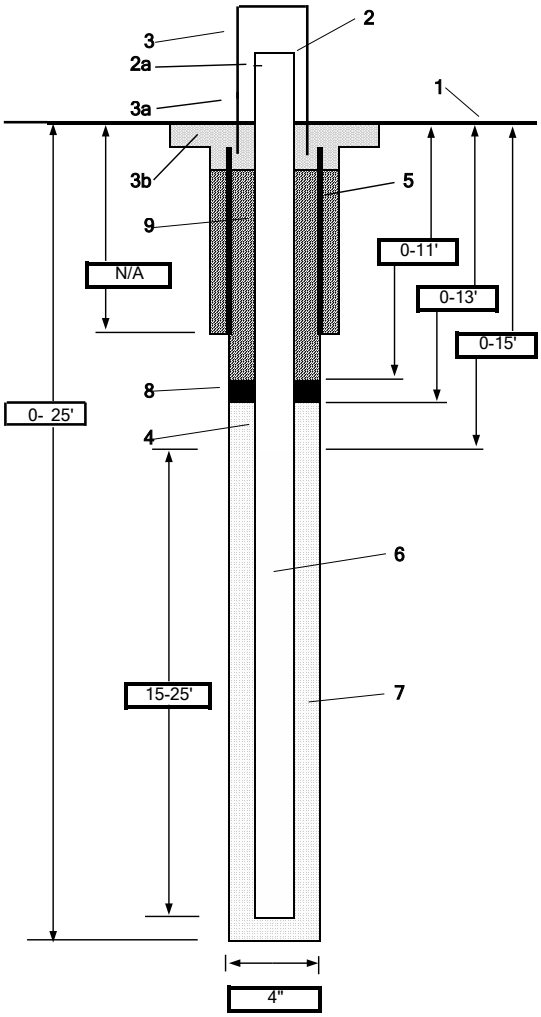
Comments:

Time	pH	Conductivity	Turbidity	Temperature	Salinity

ch2m.	PROJECT NUMBER: 708207CH	WELL NUMBER: CBD-AOA-MW19

WELL COMPLETION DIAGRAM

PROJECT : Site 10 SI	LOCATION : NRL-CBD		
DRILLING CONTRACTOR : Ground Zero			
DRILLING METHOD AND EQUIPMENT USED : DPT/HAS Geoprobe 7822 DT			
WATER LEVELS: 17' bgs	START: 10/8/20 @ 0945	END: 10/8/20 @ 1050	LOGGER: C. Dronfield



1-	Ground elevation at well	TBD
2-	Top of casing elevation	TBD
	a) vent hole?	
3-	Wellhead protection cover type	Flush Mount
	a) weep hole?	N/A
	b) concrete pad dimensions	2'X2'
4-	Dia./type of well casing	Schedule 40 PVC
5-	Dia./type of surface casing	N/A
6-	Type/slot size of screen	0.010" Slot PVC
7-	Type screen filter	FilPro WG #2
	a) Quantity used	6 50-lb bags
8-	Type of seal	3/8" Bentonite Chips Holeplug
	a) Quantity used	1 50-lb bag
9-	Grout	
	a) Grout mix used	Portland Type I/II Cement and Bentonite
	b) Method of placement	tremie
	c) Vol. of surface casing grout	N/A
	d) Vol. of well casing grout	20 gal
	Development method	surge/purge
	Development time	
	Estimated development volume	

Comments

Time	pH	Conductivity	Turbidity	Temperature	Salinity

Appendix B
Monitoring Well Development and Groundwater Purge Logs

ch2m:

PROJECT NUMBER | WELL NUMBER MW15 | SHEET 1 OF 1

Purge Log Well Development

PROJECT: Site 10 SI | DATE: 10/15/20

LOCATION: NRL CBD | WEATHER:

PUMP TYPE (circle one): PERISTALTIC (SUBMERSIBLE) OTHER: | FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): LOW-FLOW (VOLUMETRIC)

TOTAL DEPTH OF WELL: 17.00 (FT BTOC) — monsoon pump

INITIAL DEPTH OF WATER: 9.21 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 2 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: ~20 (GAL)

START TIME: 0950

END TIME: 1049

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: _____

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: _____

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: _____

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	~~Salinity~~ notes	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
0955	15.53	3.48	5.43	0.579	37	17.92	light brown	7/000	~2 gal/min	
0958	Well purged dry. Allow to recharge.									
1015	12.34	1.77	5.93	0.607	-12	17.64	" "	823	" "	
1020	below meter	4.22	5.82	0.575	-10	17.66	clear	627	" "	
Well purged dry. Allow to recharge.							~~clear~~ (CO)			
1043	12.33	1.78	6.00	0.605	-22	17.59	clear	188	" "	
1048	15.86	4.10	6.09	0.560	-35	17.67	" "	244	" "	
1049	Well purged dry. Development Complete.									

SAMPLE INFORMATION

NOTES:

ch2m:

PROJECT NUMBER	WELL NUMBER MW16	SHEET 1 OF 1

Purge Log well Development

PROJECT: Site 10 ST — DATE: 10/15/20

LOCATION: NRL CBD — WEATHER:

PUMP TYPE (circle one): PERISTALTIC (SUBMERSIBLE) OTHER: — FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): LOW-FLOW (VOLUMETRIC)

TOTAL DEPTH OF WELL: 16.85 (FT BTOC)* " " monsoon pump — START TIME: 1245

INITIAL DEPTH OF WATER: 8.86 (FT BTOC)* steel casing, PVC too far down to see — END TIME: 1340

WATER COLUMN: ____ (FT) — WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: ____

INSIDE DIAMETER OF WELL: 2 (IN) — WATER QUALITY INSTRUMENT SERIAL #: ____

WELL VOLUME: ____ (GAL) — TURBIDITY METER MANUFACTURER & MODEL: ____

TURBIDITY METER SERIAL #: ____

TOTAL PURGE VOLUME: ~20 (GAL) — WATER LEVEL INDICATOR SERIAL #: ____

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	~~Salinity~~ notes	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	—	± 10%	100-500 mL/min	--
1250	13.95	1.98	6.38	1.08	30	21.63	light brown	>1000	~2gal/min	
1255	below meter	10.56	6.42	1.30	5	21.53	clearing	907	" "	
1300	well purged dry. Allow to recharge									
1315	11.60	8.57	6.67	0.955	-20	22.88	clear	398	" "	
1320	below meter	4.61	6.70	0.982	-21	21.91	" "	320	" "	
well purged dry. Allow to recharge										
1335	12.57	4.33	6.83	0.925	-6	22.34	brown	>1000	" "	
1340	below meter	6.72	9.32	0.932	0	21.90	clear	91.4	" "	
well purged dry.				Development complete.						

SAMPLE INFORMATION

NOTES:

ch2m:

PROJECT NUMBER	WELL NUMBER MW17	SHEET 1 OF 1

Purge Log Well Development

PROJECT: Site 10 SI — DATE: 10/15/20

LOCATION: NRL CBP — WEATHER:

PUMP TYPE (circle one): PERISTALTIC (SUBMERSIBLE) OTHER: — FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): LOW-FLOW (VOLUMETRIC)

TOTAL DEPTH OF WELL: 16.47 (FT BTOC) — monsoon pump — START TIME: 1400

INITIAL DEPTH OF WATER: 13.55 (FT BTOC) — END TIME: 1440

WATER COLUMN: ____ (FT) — WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: ____

INSIDE DIAMETER OF WELL: 2 (IN) — WATER QUALITY INSTRUMENT SERIAL #: ____

WELL VOLUME: ____ (GAL) — TURBIDITY METER MANUFACTURER & MODEL: ____

TURBIDITY METER SERIAL #: ____

TOTAL PURGE VOLUME: ~2 (GAL) — WATER LEVEL INDICATOR SERIAL #: ____

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	[redacted] notes	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	–	± 10%	100-500 mL/min	--
1400	Below meter	4.69	6.83	0.313	105	23.20	cloudy/white	>1000	~1gal/min	
Well purged dry immediately, <1 min. Allow to recharge										
1420	14.09	8.06	7.16	0.297	101	21.24	cloudy/clear	>1000	" "	
Well purged dry after <1 min. Allow to recharge 2										
1440	15.44	Not enough vol. to collect parameters.					light cloudy			
Well purged dry after <1 min.										

SAMPLE INFORMATION

NOTES:

ch2m:

PROJECT NUMBER | WELL NUMBER MW18 | SHEET 1 OF 1

Purge Log Well Development

PROJECT: | DATE:

LOCATION: | WEATHER:

PUMP TYPE (circle one): PERISTALTIC (SUBMERSIBLE) OTHER: | FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): LOW-FLOW (VOLUMETRIC)

TOTAL DEPTH OF WELL: 22.74 (FT BTOC)

INITIAL DEPTH OF WATER: 11.01 (FT BTOC)

WATER COLUMN: ____ (FT)

INSIDE DIAMETER OF WELL: 2 (IN)

WELL VOLUME: ____ (GAL)

TOTAL PURGE VOLUME: ~20 (GAL)

START TIME: ____

END TIME: ____

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: ____

WATER QUALITY INSTRUMENT SERIAL #: ____

TURBIDITY METER MANUFACTURER & MODEL: ____

TURBIDITY METER SERIAL #: ____

WATER LEVEL INDICATOR SERIAL #: ____

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Notes ~~Quality~~	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	<0.5 ft	±0.10 mg/L or 10% of	+/-0.1 SU	±3%	±10 mV	+/- 1.0 °C	–	±10% (2+)	100-500 mL/min	–
1535	–	0.77	6.50	0.444	-54	23.45	Light brown	~~23.45~~ >1000	~2 gal/min	
1540	20.14	1.74	6.47	0.326	-26	21.59	" "	>1000	" "	
1545	Well purged dry. clear @ end.									

SAMPLE INFORMATION

NOTES:

ch2m:

PROJECT NUMBER	WELL NUMBER	SHEET 1 OF 1
	MW19	

Purge Log Well Development

PROJECT: Site 10 S1
DATE: 10/17/20
LOCATION: NRL CBD
WEATHER: rain, 57°F
PUMP TYPE (circle one): PERISTALTIC (SUBMERSIBLE) OTHER:
FIELD TEAM: S Dronfield, A. Overman
PURGING/SAMPLING METHOD (circle one): LOW-FLOW (VOLUMETRIC)

TOTAL DEPTH OF WELL: 25.10 (FT BTOC)
INITIAL DEPTH OF WATER: 17.08 (FT BTOC)
WATER COLUMN: _____ (FT)
INSIDE DIAMETER OF WELL: 2 (IN)
WELL VOLUME: _____ (GAL)
TOTAL PURGE VOLUME: _____ (GAL)

START TIME: 0820
END TIME: _____
WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: _____
WATER QUALITY INSTRUMENT SERIAL #: _____
TURBIDITY METER MANUFACTURER & MODEL: _____
TURBIDITY METER SERIAL #: _____
WATER LEVEL INDICATOR SERIAL #: _____

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	<0.5 ft	±0.10 mg/L or 10% of	+/-0.1 SU	±3%	±10 mV	+/-1.0 °C	--	±10%	100-500 mL/min	--
0825	22.27	5.34	6.82	0.201	208	19.11		1000+		
0830	Purge dry wait for recharge									
0845	23.52	6.29	6.81	0.175	207	16.80		>1000		
0847	Well purged dry, allow to recharge.									
0900	22.60	6.25	6.19	0.172	221	16.69	Clear & end	>1000		
Well purged dry 3rd time, purged clear.										

SAMPLE INFORMATION

NOTES:

GROUNDWATER SAMPLING DATA SHEET

WELL ID: AOA-MW01

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	16.9 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	13.3 ft btoc
Project Number:	708207CH.FI.FK	Weather:	61°F, Clear + Sunny	Water Column:	3.6 ft
Start Date:	10/19/20			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield			Volume per foot:	0.163 gal/ft
				Well Volume:	0.58 gal
Purge Method:	Low Flow			Start Time:	0950
Equipment:	Monsoon (Peristaltic)			End Time:	1110
Tubing Materials:				Screened Interval:	7-17 ft btoc
				Pump/Tubing Intake:	16 ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
0950	0	13.61	300								Start pump turbid
0955		13.82	200	19.26	5.89	127	0.153	786	0.79		Turbid but clearing
1000		13.66		19.87	6.06	21	0.164	50.7	2.25		Clear
1005		13.66		20.32	6.13	10	0.163	47.8	1.34		
1010		13.66		20.76	6.16	-3	0.161	40.9	0.86		
1015		13.66		20.96	6.17	-5	0.160	41.4	0.69		
1020		13.66		21.27	6.18	-6	0.159	36.4	0.45		
1025		13.66		21.61	6.18	-6	0.158	33.4	0.35		
1030		13.66		21.81	6.17	-6	0.157	35.2	0.37		
1035		Collect	CBD-AOA-MW01-1025								
1040	4	Collect	CBD-AOA-MW01D-1025								

SAMPLE INFORMATION

Sample ID:	CBD-AOA-MW01-1025 + MW01D	Field Test:	N/A
Analyses:	PFAS18, TPH-GRO+DRO	Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/19/20	Shipment Method:	Fed-Ex
Collection Time:	1035 + 1040	Well Condition/Comments:	Good
Field Filter? (Y/N):	N		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

ch2m:

PROJECT NUMBER 708207CH | WELL NUMBER AOA-MW02 | SHEET 1 OF 1

Purge Log

PROJECT: Site 10 SI | DATE: 10/19/20

LOCATION: NRL CBD | WEATHER: sunny, 70°F

PUMP TYPE (circle one): (PERISTALTIC) SUBMERSIBLE OTHER: | FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): (LOW-FLOW) VOLUMETRIC

TOTAL DEPTH OF WELL: 18.30 (FT BTOC)

INITIAL DEPTH OF WATER: 7.51 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 2 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: ~3 (GAL)

START TIME: 1230

END TIME: 1310

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: N/A

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity N/A	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
1235	7.63	0.64	6.55	0.494	-57	21.18		44.2	200	
1240	7.63	0.13	6.54	0.481	-55	20.95		38.4	250	
1245	7.64	0.03	6.50	0.469	-51	20.95		20.4	" "	
1250	7.66	0.00	6.43	0.464	-44	20.91		21.5	" "	
1255	7.66	0.00	6.38	0.455	-38	21.01		2.8	" "	
1300	7.67	0.00	6.29	0.449	-30	20.97		0.2	" "	
1305	7.67	0.00	6.28	0.448	-29	21.04		0.0	" "	~3
1310	Collect sample									

SAMPLE INFORMATION

NOTES: CBD-AOA-MW02-1020 for PFAS, TPH DRO, TPH GRO

ch2m:

PROJECT NUMBER: 708207CH | WELL NUMBER: AOA-MW03 | SHEET 1 OF

Purge Log

PROJECT: Site 10 SI | DATE: 10/19/20

LOCATION: NRL CBD | WEATHER: Sunny, 64°F

PUMP TYPE (circle one): (PERISTALTIC) SUBMERSIBLE OTHER: | FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): (LOW-FLOW) VOLUMETRIC

TOTAL DEPTH OF WELL: 12.10 (FT BTOC)

INITIAL DEPTH OF WATER: 9.35 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 2 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: ~2 (GAL)

START TIME: 1055

END TIME: _____

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: _____

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: _____

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: _____

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity N/A	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
1100	9.85	0.51	5.34	0.105	151	20.57		2.8	200	
1105	10.09	0.68	4.84	0.067	257	20.54		0.0	" "	
1110	10.53	0.23	4.91	0078	268	20.50		0.0	" "	
1115	11.34	0.05	5.26	0.118	227	20.45		0.2	300	2
1120	Well purged dry. Allow to recharge									
1125	↓									
1130	↓									
1135	Well recharged. Collect CBD-AOA-MW03-1020									

SAMPLE INFORMATION

NOTES: CBD-AOA-MW03-1020 for PFAS, TPH DRO, TPH GRO

ch2m:

PROJECT NUMBER	WELL NUMBER	SHEET
708207CH.FI.FS	AOA-MW04	1 OF 1

Purge Log

PROJECT: SHELOSI

DATE: 10/19/20

LOCATION: NEL CBD

WEATHER: Sunny, 57°F

PUMP TYPE (circle one): (PERISTALTIC) SUBMERSIBLE OTHER:

FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): (LOW-FLOW) VOLUMETRIC

TOTAL DEPTH OF WELL: 12.90 (FT BTOC) 9.8 (historical)

INITIAL DEPTH OF WATER: 4.92 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 2 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: ~2 (GAL)

START TIME: 0940

END TIME: 1020

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: N/A

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity N/A	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	—	± 10%	100-500 mL/min	—
0945	6.05	0.27	6.39	0.195	154	19.17		61.3	200	
0950	6.04	0.18	6.39	0.194	146	19.22		36.81	" "	
0955	6.02	0.07	6.38	0.191	133	19.39		29.7	" "	
1000	6.05	0.00	6.37	0.191	131	19.49		23.1	" "	
1005	6.11	0.00	6.35	0.189	128	19.46		17.4	" "	
1010	6.10	0.00	6.33	0.187	122	19.56		16.3	" "	
1015	6.06	0.00	6.30	0.185	118	19.56		9.8	" "	~2 gal
1020	Collect sample									

SAMPLE INFORMATION

NOTES: CBD-AOA-MW04-1020 for PFAS, TPH GRO, TPH DRO

GROUNDWATER SAMPLING DATA SHEET

WELL ID: CBD-AOA-MW05

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	39.10 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	32.00 ft btoc
Project Number:	708207CH.FI.FK	Weather:	Partly Cloudy, 65°F	Water Column:	7.10 ft
Start Date:	10/21/20			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield K. Voss			Volume per foot:	0.163 gal/ft
Purge Method:	Low Flow			Well Volume:	1.16 gal
Equipment:	(Monsoon) Peristaltic			Start Time:	0850
Tubing Materials:				End Time:	1027
				Screened Interval:	25-35 ft btoc
				Pump/Tubing Intake:	37.10 ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
0855	1	35.10	500	15.01	6.14	58	0.306	>1000	0.77	0.14	light brown, cloudy
0900		35.75		15.48	6.44	-20	0.292	>1000	0.21	0.14	
0905		35.96		16.07	6.22	-10	0.289		1.12	0.14	
0910	↓	36.52		16.33	6.29	-13	0.291	↓	1.41	0.14	↓
0915	3	37.23	↓	16.29	6.30	-10	0.290	695	0.30	0.14	clearing up
0920	Purged Dry. Wait for recharge.										
1025	SAMPLE COLLECTED										

SAMPLE INFORMATION

Sample ID:	CBD-AOA-MW05-1020	Field Test:	
Analyses:		Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/21/20	Shipment Method:	Fed-Ex
Collection Time:	1025	Well Condition/Comments:	90ft bottom
Field Filter? (Y/N):	No		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

ch2m: SM

PROJECT NUMBER	WELL NUMBER	SHEET / OF
	A-A-MW06	1 / 1

Purge Log

PROJECT: Site 10 SI

LOCATION: NRL CBP

DATE: 10/20/20

PUMP TYPE (circle one): ~~PERISTALTIC~~ SUBMERSIBLE OTHER:

WEATHER: fog, 61°F

PURGING/SAMPLING METHOD (circle one): LOW-FLOW VOLUMETRIC

FIELD TEAM: C. Dronfield, K. Voss

TOTAL DEPTH OF WELL: 39.00 (FT BTOC)

INITIAL DEPTH OF WATER: 32.07 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 2 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: ~2 (GAL)

Monsoon

START TIME: 1035

END TIME:

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

WATER QUALITY INSTRUMENT SERIAL #:

TURBIDITY METER MANUFACTURER & MODEL: N/A

TURBIDITY METER SERIAL #:

WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	~~Salinity~~ N/A	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	Notes	± 10%	100-500 mL/min	–
1040	* N/A	1.52	6.38	0.417	90	17.18	gray	7/000	~250	
1045		0.84	6.54	0.403	69	17.21	clear	208	" "	
1050		0.51	6.64	0.403	51	17.25	" "	96.8	" "	
1055		4.35	6.78	0.410	54	17.30	gray	7/000	400	~2
1100	well purged dry. Allow to recharge									
1105										
1110										
1130	No recharge									

SAMPLE INFORMATION

NOTES: * obstruction in well casing. Unable to fit water level meter past ~18' btoc w/ tubing/pump wire in well.

GROUNDWATER SAMPLING DATA SHEET

WELL ID: CBD-AOA-MW07

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	29.22 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	22.89 ft btoc
Project Number:	708207CH.FI.FK	Weather:	Sunny, 62°F	Water Column:	6.33 ft
Start Date:	10/20/20			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield K. Voss			Volume per foot:	0.163 gal/ft
Purge Method:	Low Flow			Well Volume:	1.03 gal
Equipment:	Monsoon (Peristaltic)			Start Time:	1010
Tubing Materials:				End Time:	1555
				Screened Interval:	2' off bottom ft btoc
				Pump/Tubing Intake:	~~23.5~~ ft btoc 27.22

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
1015		23.46	200	19.01	5.30	251	0.137	0.6	1.07	0.06	clear
1020		23.90		17.30	5.14	253	0.080	0.0	2.55	0.04	clear
1025		24.26		17.11	5.00	274	0.074	2.6	3.28	0.03	
1030		24.66		17.29	5.15	261	0.078	82.6	3.30	0.04	
1035		25.10		17.42	5.12	258	0.072	97.6	3.26	0.03	
1040		25.53		17.63	5.22	255	0.073	221	2.89	0.03	cloudy
1045		25.84		17.73	5.33	245	0.075	290	2.67	0.03	
1050		26.29		17.69	5.41	232	0.077	361	2.22	0.04	
1055		26.63	↓	17.46	5.62	204	0.085	271	1.91	0.04	
1100		26.79	50	17.70	5.70	190	0.092	232	1.18	0.04	
1105		26.89	↓	18.57	5.78	151	0.099	237	1.15	0.05	
1110		27.00	100	18.74	5.79	149	0.105	212	0.89	0.05	
1115		27.33		18.99	5.98	108	0.113	174	0.65	0.05	
1120		27.84		19.91	5.99	134	0.105	308	0.54	0.05	
1125	↓	28.36		18.89	5.93	129	0.114	530	0.56	0.05	
1130	2.75	28.93	↓	18.99	6.10	86	0.139	478	0.43	0.06	↓
1135		Purged Dry. Wait for recharge.									
1550	SAMPLE COLLECTED										

SAMPLE INFORMATION

Sample ID:	CBD-AOA-MW07-1020	Field Test:	
Analyses:		Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/20/20	Shipment Method:	Fed-Ex
Collection Time:	1550	Well Condition/Comments:	
Field Filter? (Y/(N))	NO		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

GROUNDWATER SAMPLING DATA SHEET

WELL ID: AOA - MW08

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	25.60 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	9.41 ft btoc
Project Number:	708207CH.FI.FK	Weather:	640 F, Partly Sunny	Water Column:	16.19 ft
Start Date:	10/19/20			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield			Volume per foot:	0.163 gal/ft
				Well Volume:	2.64 gal
Purge Method:	Low Flow			Start Time:	1140
Equipment:	Monsoon (Peristaltic)			End Time:	1320
Tubing Materials:				Screened Interval:	15-25 ft btoc
				Pump/Tubing Intake:	~~20~~ 20' ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
1140	0	9.40	300	—	—	—	—	—	—	—	Start pump
1145	↓	10.12	200	20.08	7.03	-102	0.527	535	0.31		Turbid - clearing
1150		12.35	150	16.80	7.12	-107	0.572	207	0.62		Clear flow thru cell
1155		12.21	100	16.76	7.31	-115	0.559	149	0.42		Clearing
1200		14.72	↓	16.48	7.30	-115	0.565	139	0.01		↓
1205		15.91		16.54	7.36	-106	0.567	83.1	0.67		
1210		17.48		16.65	7.42	-96	0.567	50.1	2.48		DO not correct
1215		18.00		16.64	7.44	-96	0.566	39.0	—		↓
1220		18.81		16.55	7.45	-97	0.564	30.0	—		
1225		19.02		16.52	7.45	-98	0.562	24.1	—		
1230		19.02		16.51	7.46	-98	0.561	21.3	—		
1235		19.02		16.35	7.46	-98	0.560	18.9	—		
1240		19.02		16.32	7.45	-99	0.560	14.6	—		
1245	↓	19.02		16.25	7.41	-101	0.560	14.1	—		
1250	4	19.02	↓	16.24	7.40	-101	0.560	14.3	—		↓
1255	Collect	CBD-AOA-MW08-1620 + MS+MSD									

SAMPLE INFORMATION

Sample ID:	CBD-AOA-MW08-1620 + MS+MSD	Field Test:	NA
Analyses:	PFAS 18, TPH-GRO+DRO	Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/19/20	Shipment Method:	Fed-Ex
Collection Time:	1255	Well Condition/Comments:	Good
Field Filter? (Y/N):	N		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

GROUNDWATER SAMPLING DATA SHEET

WELL ID: CBD-AOA-mw09

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	28.57 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	25.44 ft btoc
Project Number:	708207CH.FI.FK	Weather:	Sunny, 71°F	Water Column:	3.13 ft
Start Date:	10/20/20			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield K. Voss			Volume per foot:	0.163 gal/ft
Purge Method:	Low Flow			Well Volume:	0.51 gal
Equipment:	Monsoon (Peristaltic)			Start Time:	1435
Tubing Materials:				End Time:	
				Screened Interval:	2' off bottom ft btoc
				Pump/Tubing Intake:	26.57 ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
1445	↓	26.17	200	19.29	7.40	-19	2.04	73.0	1.02	1.00	cloudy, white
1450		26.71	75	19.34	7.37	22	1.21	5.0	2.76	0.60	clear
1455		26.89	100	20.37	7.29	31	2.31	61.6	1.34	1.22	cloudy
1500		27.10	↓	20.04	7.39	4	1.61	58.3	1.72	0.81	↓
1505		27.31		21.37	7.40	7	1.56	75.3	1.73	0.79	
1510		27.56		21.32	7.39	11	1.67	68.4	1.27	0.85	
1515	↓	27.86		21.29	7.37	-1	1.94	153	0.85	1.00	
1520	2	28.30	↓	21.34	7.34	-8	2.28	335	0.55	1.18	↓
1524	Purged Dry										

SAMPLE INFORMATION

Sample ID:	CBD-AOA-mw09-1020	Field Test:	
Analyses:		Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/20	Shipment Method:	Fed-Ex
Collection Time:		Well Condition/Comments:	
Field Filter? (Y/N)	No		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

GROUNDWATER SAMPLING DATA SHEET

WELL ID: AOA-MW10

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	20.3 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	7.72 ft btoc
Project Number:	708207CH.FI.FK	Weather:	61°F, Sunny + Clear	Water Column:	12.58 ft
Start Date:	10/15/2020			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield			Volume per foot:	0.163 gal/ft
				Well Volume:	2.05 gal
Purge Method:	Low Flow			Start Time:	0945
Equipment:	Monsoon (Peristaltic)			End Time:	1035
Tubing Materials:				Screened Interval:	10-20 ft btoc
				Pump/Tubing Intake:	18 ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
0945	0	7.70	150								Start Pumping
0950		8.51	100	17.02	6.54	-38	0.984	0	0.26		
0955		9.55		17.09	6.90	-60	0.970	0	0.19		
1000		10.30		17.20	7.01	-61	0.881	0	0.06		
1005		10.66		17.26	7.04	-66	0.875	0	0.05		
1010		11.34		17.29	7.06	-66	0.875	0	0.02		
1015	↓	11.50		17.30	7.07	-70	0.872	0	0.00		
1020	2	11.66	↓	17.35	7.07	-73	0.870	0	0		
1025	Collect	CBD-AOA-MW10-1025									

SAMPLE INFORMATION

Sample ID:	CBD-AOA-MW10-1025	Field Test:	N/A
Analyses:	PFAS 18	Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/15/2020	Shipment Method:	Fed-Ex
Collection Time:	1025	Well Condition/Comments:	Good
Field Filter? (Y/N):	N		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

ch2m:

PROJECT NUMBER

WELL NUMBER AOA-MW11

SHEET 1 OF 1

Purge Log

PROJECT: Site 10 SI

LOCATION: NRL CBD

DATE: 10/28/20

WEATHER: 70°F, cloudy

PUMP TYPE (circle one): PERISTALTIC SUBMERSIBLE OTHER: Waterra

PURGING/SAMPLING METHOD (circle one): LOW-FLOW VOLUMETRIC

FIELD TEAM: C. Dronfield, A. Overman

TOTAL DEPTH OF WELL: 287.5 (FT BTOC)

INITIAL DEPTH OF WATER: 124.25 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 4 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: 2 (GAL)

START TIME: 1405 - 1450 for water

END TIME: _____

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: none / NA

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
* 1455	124.25	5.88	12.29	1.81	30	18.63	0.92	0.0	200	
1500		5.53	12.36	1.88	-14	17.62	0.96	0.0	"	"
1505		5.77	12.36	1.89	-22	17.37	0.96	0.0	"	"
1510		4.92	12.35	1.86	-34	17.28	0.94	0.0	"	"
1515		4.35	12.31	1.82	-26	17.17	0.92	0.0	"	"
1520		4.33	12.24	1.82	-30	17.06	0.92	0.0	"	"
1525		4.24	12.27	1.85	-35	16.73	0.93	0.0	"	"
1530	Collect sample									2
1535	Collect duplicate									

SAMPLE INFORMATION

NOTES: CBD-AOA-MW11-1020 + Dup for PFAS

* parameters collected in cup, not flow through cell

ch2m:

PROJECT NUMBER 708207 GH | WELL NUMBER AOA-MW12 | SHEET 1 OF 1

Purge Log

PROJECT: Site 10 SI | DATE: 10/28/20

LOCATION: NRL CBD | WEATHER:

PUMP TYPE (circle one): PERISTALTIC | SUBMERSIBLE | OTHER: Waterra | FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): LOW-FLOW | VOLUMETRIC

TOTAL DEPTH OF WELL: 293.7 (FT BTOC)

INITIAL DEPTH OF WATER: 160.50 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 4 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: 4 (GAL)

START TIME: 1210 (1300 - CBD)

END TIME: 1345

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: N/A

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
* 1305	162.85	3.23	10.41	0.602	84	18.51	0.29	0.0	400	
1310	↓	4.08	11.40	0.528	76	17.26	0.26	0.0	" "	
1315		3.45	11.38	0.525	71	17.29	0.25	19.3	" "	
1320		4.07	11.19	0.501	68	17.14	0.24	270	" "	
1325		3.67	11.03	0.490	59	17.07	0.24	135	" "	
1330		3.25	11.01	0.486	36	16.81	0.23	80.2	" "	
1335	↓	3.16	10.98	0.479	30	16.58	0.23	61.9	" "	
(CBD) 1345	Collect sample									
1340	↓	3.21	10.94	0.472	25	16.64	0.23	41.7	" "	4

SAMPLE INFORMATION

NOTES: CBD-AOA-MW12-1020 for PFAS

* Parameters collected in cup, not flow through cell - stabilization for turb

ch2m:

PROJECT NUMBER 708207CH | WELL NUMBER AOA-MW13 | SHEET 1 OF 1

Purge Log

PROJECT: Site 10 SI | DATE: 10/28/20

LOCATION: NRL CBD | WEATHER: 40°F, cloudy

PUMP TYPE (circle one): PERISTALTIC | SUBMERSIBLE | OTHER: Waterra | FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): LOW-FLOW | VOLUMETRIC

TOTAL DEPTH OF WELL: 219.1 (FT BTOC)

INITIAL DEPTH OF WATER: 122.89 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: _____ (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: _____ (GAL)

START TIME: 1650

END TIME: 1710

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: _____

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: _____

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: _____

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
1655		3.81	10.50	0.494	-52	17.05	0.24	153	4000 mL/min (4L)	
1700		3.44	10.92	0.584	-112	16.59	0.28	37.8	" "	
1705		3.27	10.51	0.525	-83	16.26	0.25	50.8	" "	
1710	127.05	4.24	9.88	0.461	-59	16.24	0.22	46.9	" "	
1710	Collect Sample									

SAMPLE INFORMATION

NOTES:

ch2m:

PROJECT NUMBER: 708207CH | WELL NUMBER: AOA-MW14 | SHEET 1 OF 1

Purge Log

PROJECT: Site 10 SI | DATE: 10/28/20

LOCATION: NRL CBD | WEATHER: 70°F, cloudy

PUMP TYPE (circle one): PERISTALTIC | SUBMERSIBLE | OTHER: Waterra | FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): LOW-FLOW | VOLUMETRIC

TOTAL DEPTH OF WELL: 158.1 (FT BTOC)

INITIAL DEPTH OF WATER: 53.49 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 4 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: 4 (GAL)

START TIME: 1545 - 1600 water

END TIME: _____

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: N/A

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity ppt	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
1600	53.49	5.44	12.18	1.84	17	18.18	0.93	0.0	500	0
1605	—	4.56	12.26	1.86	-5	17.58	0.94	0.0	"	"
1610	—	4.59	12.31	1.87	-22	17.02	0.94	0.0	"	"
1615	54.20	4.65	12.25	1.78	-30	17.08	0.90	0.0	"	"
1620	—	4.68	12.27	1.77	-40	17.00	0.90	0.0	"	"
1625	54.25	4.56	12.23	1.72	-39	17.08	0.87	0.0	"	"
1630	54.26	4.45	12.24	1.72	-45	16.90	0.87	0.0	"	~4
1635	Collect sample									

SAMPLE INFORMATION

NOTES: CBD-AOA-MW14-1020 for PFAS

*Collect parameters in cup, not flow through cell

ch2m:

PROJECT NUMBER | WELL NUMBER MW15 | SHEET 1 OF

Purge Log

PROJECT: Site 70 SL | DATE: 10/16/20

LOCATION: NRL CBD | WEATHER: rain 55°F

PUMP TYPE (circle one): (PERISTALTIC) SUBMERSIBLE OTHER: | FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): (LOW-FLOW) VOLUMETRIC

TOTAL DEPTH OF WELL: 17.00 (FT BTOC) | START TIME: 1000

INITIAL DEPTH OF WATER: 9.18 (FT BTOC) | END TIME:

WATER COLUMN: (FT) | WATER QUALITY INSTRUMENT MANUFACTURER & MODEL:

INSIDE DIAMETER OF WELL: (IN) | WATER QUALITY INSTRUMENT SERIAL #:

WELL VOLUME: (GAL) | TURBIDITY METER MANUFACTURER & MODEL:

TURBIDITY METER SERIAL #:

TOTAL PURGE VOLUME: ~2 (GAL) | WATER LEVEL INDICATOR SERIAL #:

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
1005	9.69	0.31	6.06	0.603	-35	16.62		45.3	~200	
1010	9.85	0.23	6.12	0.607	-45	16.77		0.4	" "	
1015	9.92	0.17	6.15	0.614	-53	16.35		0.0	" "	
1020	10.00	0.13	6.17	0.623	-60	16.54		0.0	" "	
1025	10.11	0.07	6.18	0.626	-64	16.58		0	" "	
1030	10.24	0.04	6.19	0.637	-71	16.49		0	" "	
1035	10.32	0.01	6.19	0.640	-72	16.54		0.0	" "	
1040	Collect sample CBD-AOA-GW15-1020									

SAMPLE INFORMATION

NOTES:

ch2m:

PROJECT NUMBER	WELL NUMBER	SHEET	OF
	MW16	1	1

Purge Log

PROJECT: Site 10 SI

DATE: 10/16/20

LOCATION: NRL (CB)

WEATHER: rain, 55°F

PUMP TYPE (circle one): PERISTALTIC | SUBMERSIBLE | OTHER:

FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): LOW-FLOW | VOLUMETRIC

TOTAL DEPTH OF WELL: 16.85 (FT BTOC)

INITIAL DEPTH OF WATER: 8.98 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 2 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: ~9.5 (GAL)

START TIME: 1100

END TIME: _____

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: _____

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: _____

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: _____

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
1105	9.35	1.18	6.34	1.13	87	18.47		2.8	200	
1110	9.47	0.57	6.12	1.22	108	19.15		0.0	" "	
1115	9.62	0.90	6.19	1.26	63	19.14		0.0	" "	
1120	9.72	1.35	6.27	1.28	41	19.25		0.0	" "	
1125	9.75	1.60	6.31	1.28	35	19.18		0.0	" "	
1130	9.86	1.67	6.34	1.28	26	19.32		0.0	" "	
1135	9.89	1.41	6.36	1.27	12	19.42		0.0	" "	
1140	9.96	1.19	6.38	1.25	0	19.26		0.0	" "	
1145	9.96	1.09	6.39	1.24	-7	19.44		0.0	" "	
1150	10.02	0.98	6.40	1.24	-14	19.48		0.0	" "	
1155	10.03	0.94	6.40	1.24	-18	19.25		0.0	" "	
1200	10.05	0.88	6.41	1.22	-21	19.33		0.0	" "	
1205	Collect sample + MS/MSD									

SAMPLE INFORMATION

NOTES:

ch2m:

PROJECT NUMBER: 708207CH | WELL NUMBER: AOA-MW17 | SHEET 1 OF 1

Purge Log

PROJECT: Site 10 CI | DATE: 10/20/20

LOCATION: NRL (BD) | WEATHER: sunny, 70° F

PUMP TYPE (circle one): (PERISTALTIC) SUBMERSIBLE OTHER: | FIELD TEAM: C. Dronfield, K. Voss

PURGING/SAMPLING METHOD (circle one): (LOW-FLOW) VOLUMETRIC

TOTAL DEPTH OF WELL: 16.48 (FT BTOC) | START TIME: 1225

INITIAL DEPTH OF WATER: 13.32 (FT BTOC) | END TIME:

WATER COLUMN: (FT) | WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

INSIDE DIAMETER OF WELL: 2 (IN) | WATER QUALITY INSTRUMENT SERIAL #:

WELL VOLUME: (GAL) | TURBIDITY METER MANUFACTURER & MODEL: N/A

TURBIDITY METER SERIAL #:

TOTAL PURGE VOLUME: ~2.5 (GAL) | WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity N/A	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	notes	± 10%	100-500 mL/min	--
1230	13.86	3.75	7.33	0.340	115	20.15	clear	9.1	200	
1235	14.14	3.81	7.31	0.319	117	20.22		6.2	" "	
1240	14.38	4.66	7.28	0.314	120	20.38		0.0	400	
1245	14.61	5.23	7.28	0.311	125	20.40		0.0	300	
1250	15.14	5.05	7.27	0.310	130	20.48		19.5	" "	
1255	15.90	5.13	7.29	0.311	132	20.54		14.4	" "	2.5
1300	well purged dry. Allow to recharge								400	
1320	Little recharge.									

SAMPLE INFORMATION

NOTES:

GROUNDWATER SAMPLING DATA SHEET

WELL ID: AOA-MW18

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	14.00 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	11.06 ft btoc
Project Number:	708207CH.FI.FK	Weather:	68°F, Partly Cloudy	Water Column:	2.94 ft
Start Date:	10/19/20			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield			Volume per foot:	0.163 gal/ft
				Well Volume:	0.48 gal
Purge Method:	Low Flow			Start Time:	1350
Equipment:	Monsoon (Peristaltic)			End Time:	1440
Tubing Materials:				Screened Interval:	4-14 ft btoc
				Pump/Tubing Intake:	13.5 ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
1350	0	11.06	300								start pump clear
1355		11.64	150	20.77	6.57	-87	0.553	23.7	0.32		clear
1400		11.91	150	20.42	6.53	-90	0.550	21.9	0.08		
1405		12.21	150	20.58	6.52	-92	0.548	22.3	0.01		
1410		12.51	100	20.65	6.52	-91	0.541	21.9	0		
1415		12.52	100	21.29	6.50	-84	0.517	21.3	0		
1420		12.52	100	21.00	6.45	-69	0.483	10.6	0		
1425	↓	12.52	100	21.07	6.43	-63	0.483	9.7	0		↓
1430	3	12.52	100	21.30	6.43	-62	0.494	6.5	0		
1435	Collect	CBD-AOA-MW18-1020									

SAMPLE INFORMATION

Sample ID:	CBD-AOA-MW18-1020	Field Test:	N/A
Analyses:	PFAS 18	Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/19/20	Shipment Method:	Fed-Ex
Collection Time:	1435	Well Condition/Comments:	Good - New
Field Filter? (Y/N):	N		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

GROUNDWATER SAMPLING DATA SHEET

WELL ID: CBD-AOA-MW19

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	25.00 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	17.04 ft btoc
Project Number:	708207CH.FI.FK	Weather:	Sunny, 66°F	Water Column:	7.96 ft
Start Date:	10/20/20			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield K. Voss			Volume per foot:	0.163 gal/ft
				Well Volume: (N)	1.330 gal
Purge Method:	Low Flow			Start Time:	1238
Equipment:	Monsoon (Peristaltic)			End Time:	1352
Tubing Materials:				Screened Interval:	2' off bottom ft btoc
				Pump/Tubing Intake:	23 ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
1245		17.56	220	19.15	6.43	155	0.148	0.0	4.32	0.07	slightly cloudy
1250		17.74		19.15	6.46	153	0.153	0.0	4.16	0.07	clear
1255		17.89		19.10	6.49	153	0.160		4.07	0.08	
1300		17.97		19.04	6.61	151	0.179		4.20	0.08	
1305		18.05	↓	19.03	6.54	155	0.169		4.05	0.08	
1310		18.03	150	19.23	6.51	159	0.168		4.05	0.08	
1315		18.00		19.35	6.49	160	0.162		3.98	0.08	
1320		17.97		19.28	6.46	164	0.154		4.12	0.07	
1325		18.02		19.26	6.40	167	0.144		4.12	0.07	
1330		18.13		18.92	6.31	173	0.137		4.10	0.06	
1335	↓	18.12		19.11	6.33	174	0.139		4.08	0.06	
1340	2.75	18.11	↓	19.17	6.30	176	0.137	↓	4.05	0.06	↓
1345	SAMPLE COLLECTED										

SAMPLE INFORMATION

Sample ID:	CBD-AOA-MW19-1020	Field Test:	
Analyses:		Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/20/20	Shipment Method:	Fed-Ex
Collection Time:	1345	Well Condition/Comments:	
Field Filter? (Y/N)	No		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

ch2m:

PROJECT NUMBER: 708267CH | WELL NUMBER: BKG-MW01 | SHEET 1 OF 1

Purge Log

PROJECT: Site 10 SI
LOCATION: NEL CBD
DATE: 10/20/20
WEATHER: Sunny, 70°F
PUMP TYPE (circle one): PERISTALTIC (SUBMERSIBLE)
PURGING/SAMPLING METHOD (circle one): (LOW-FLOW) VOLUMETRIC
OTHER:
FIELD TEAM: C. Dronfield, K. Voss

TOTAL DEPTH OF WELL: 37.79 (FT BTOC)
INITIAL DEPTH OF WATER: 27.93 (FT BTOC)
WATER COLUMN: ____ (FT)
INSIDE DIAMETER OF WELL: 2 (IN)
WELL VOLUME: ____ (GAL)
TOTAL PURGE VOLUME: 5 (GAL)

monsoon

START TIME: 1340
END TIME: 1420
WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52
WATER QUALITY INSTRUMENT SERIAL #: ____
TURBIDITY METER MANUFACTURER & MODEL: N/A
TURBIDITY METER SERIAL #: ____
WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity N/A	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
1345	28.50	4.13	4.26	0.113	322	18.73		231	500	
1350	30.30	4.55	4.17	0.101	340	17.25		68.9	500	
1355	30.51	4.72	4.12	0.094	361	17.23		20.4	500	
1400	30.63	4.44	4.13	0.094	368	17.11		0.0	"	
1405	30.44	3.79	4.09	0.096	375	17.70		0.0	"	
1410	30.35	3.65	4.06	0.098	379	17.67		0.0	"	
1415	30.24	3.59	4.08	0.100	383	17.72		0.0	"	5
1420	Collect Sample									

SAMPLE INFORMATION

NOTES: CBD-BKG-MW01H020 for PFAS

ch2m:

PROJECT NUMBER	WELL NUMBER	SHEET
	BKG-MW02	1 OF 1

Purge Log

PROJECT: Site 10 SI — DATE: 10/20/20

LOCATION: NRL CBD — WEATHER:

PUMP TYPE (circle one): PERISTALTIC | (SUBMERSIBLE) | OTHER: — FIELD TEAM: C. Dronfield, K. Voss

PURGING/SAMPLING METHOD (circle one): | (LOW-FLOW) | VOLUMETRIC

TOTAL DEPTH OF WELL: 46.89 (FT BTOC) — monsoon pump — START TIME: 1445

INITIAL DEPTH OF WATER: 36.90 (FT BTOC) — END TIME:

WATER COLUMN: (FT) — WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

INSIDE DIAMETER OF WELL: 2 (IN) — WATER QUALITY INSTRUMENT SERIAL #:

WELL VOLUME: (GAL) — TURBIDITY METER MANUFACTURER & MODEL: N/A

TOTAL PURGE VOLUME: ~6 (GAL) — TURBIDITY METER SERIAL #:

WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity N/A	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10% or ± 10	100-500 mL/min	--
1450	37.87	3.60	4.39	0.170	331	15.54		388	500	
1455	37.65	3.33	4.31	0.162	336	15.76		114	" "	
1500	37.41	3.14	4.28	0.157	340	15.81		50.1	" "	
1505	37.49	9.27	2.98	0.156	343	15.70		3.2	" "	
1510	37.58	3.03	4.25	0.152	348	15.61		0.0	" "	
1515	37.42	2.88	4.29	0.147	350	15.44		0.0	" "	
1520	37.66	2.91	4.28	0.149	352	15.62		0.0	" "	6
1525	Collect sample									

SAMPLE INFORMATION

NOTES: CBD-BKG-MW02-1020 for PFAS

GROUNDWATER SAMPLING DATA SHEET

WELL ID: BKG-MW03

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	28.7 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	22.55 ft btoc
Project Number:	708207CH.FI.FK	Weather:	71°F, Clear Sunny	Water Column:	6.15 ft
Start Date:	10/15/2020			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield			Volume per foot:	0.163 ~~1.00~~ gal/ft
				Well Volume:	1.00 gal
Purge Method:	Low Flow			Start Time:	1305
Equipment:	Monsoon (Peristaltic)			End Time:	1405
Tubing Materials:				Screened Interval:	19-29 ft btoc
				Pump/Tubing Intake:	27' ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
1305	0	22.55	200								Begin Pumping
1310		23.31	150	17.94	3.69	488	0.187	0	1.68		
1315		23.64	100	17.72	3.57	500	0.187	0	1.96		
1320		23.67		18.28	3.64	486	0.185	0	1.44		
1325		23.98		16.87	3.48	476	0.209	0	1.46		
1330		24.17		16.66	3.45	462	0.221	0	1.10		
1335		24.61		16.70	3.45	447	0.240	0	0.74		
1340		24.83		16.75	3.46	435	0.250	0	0.55		
1345		25.12		16.72	3.50	425	0.259	0	0.42		
1350		25.34		16.70	3.51	422	0.263	0	0.40		
1355	2	25.48		16.75	3.53	415	0.265	0	0.36		
1400	Collect	CBD-BKG-MW03-1020									

SAMPLE INFORMATION

Sample ID:	CBD-BKG-MW03-1020	Field Test:	N/A
Analyses:	PFAS 18	Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/15/2020	Shipment Method:	Fed-Ex
Collection Time:	1400	Well Condition/Comments:	Good
Field Filter? (Y/N):	N		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

ch2m:

PROJECT NUMBER 708207CH | WELL NUMBER S03-MW01 | SHEET 1 OF 1

Purge Log

PROJECT: Site 10 SI | DATE: 10/19/20

LOCATION: NRLCBD | WEATHER: Sunny, 75°F

PUMP TYPE (circle one): PERISTALTIC | SUBMERSIBLE | OTHER: | FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): LOW-FLOW | VOLUMETRIC

TOTAL DEPTH OF WELL: 25.23 (FT BTOC)

INITIAL DEPTH OF WATER: 16.10 (FT BTOC)

WATER COLUMN: _____ (FT)

INSIDE DIAMETER OF WELL: 2 (IN)

WELL VOLUME: _____ (GAL)

TOTAL PURGE VOLUME: ~4 (GAL)

START TIME: 1420

END TIME: 1520

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

WATER QUALITY INSTRUMENT SERIAL #: _____

TURBIDITY METER MANUFACTURER & MODEL: N/A

TURBIDITY METER SERIAL #: _____

WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity N/A	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10% or ≤10	100-500 mL/min	--
1425	16.29	5.06	4.65	0.214	263	20.57		196	300	
1430	16.30	4.10	4.57	0.215	293	20.30		185	" "	
1435	16.34	3.75	4.61	0.208	317	20.35		147	" "	
1440	16.36	4.05	4.64	0.192	329	20.34		135	" "	
1445	16.37	4.25	4.64	0.190	333	20.41		80.9	" "	
1450	16.38	4.41	4.63	0.179	347	20.46		55.0	" "	
1455	16.39	4.63	4.63	0.172	354	20.54		26.2	" "	
1500	16.40	4.59	4.63	0.171	362	20.58		14.6	" "	
1505	16.41	4.55	4.62	0.170	371	20.63		8.1	" "	
1510	16.42	4.54	4.62	0.169	373	20.65		7.0	" "	
1515	16.43	4.57	4.61	0.168	375	20.64		7.8	" "	~4
1520	Collect sample									

SAMPLE INFORMATION

NOTES: CBD-S03-MW01-1020 for PFAS, TPH DRO, TPH GRO

Scanned with CamScanner

GROUNDWATER SAMPLING DATA SHEET

WELL ID: S03-MW62

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	[redacted] ft btoc 28.22
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	[redacted] ft btoc 22.25
Project Number:	708207CH.FI.FK	Weather:	69°F, Partly Cloudy	Water Column:	[redacted] ft 5.97
Start Date:	10/19/20			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield			Volume per foot:	0.163 gal/ft
				Well Volume:	[redacted] gal 0.97
Purge Method:	Low Flow			Start Time:	1455
Equipment:	Monsoon (Peristaltic)			End Time:	
Tubing Materials:				Screened Interval:	19-29 ft btoc
				Pump/Tubing Intake:	[redacted] 28 ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate, (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
1455	0	22.20	300								Start Pump Clear
1500		22.60	150	19.30	7.16	18	0.420	305	0.27		Slightly turbid
1505		23.15	150	17.51	7.35	17	0.423	176	0.03		Clearing up
1510		23.71	150	16.31	7.33	31	0.401	18.3	1.69		
1515		24.21	100	16.15	7.10	58	0.341	9.4	4.31		
1520		24.86		15.95	7.10	63	0.388	9.5	2.68		
1525		25.36		15.88	7.19	61	0.415	8.5	1.35		
1530		25.95		15.72	7.22	59	0.427	39.1	0.78		
1535		26.42		15.59	7.22	45	0.433	43.5	0.46		
1540		27.00		15.43	7.19	15	0.444	79.6	0.15		
1545		~~27.69~~				~~46~~	~~0~~				
1600 [redacted]		27.54	Slow	recharge	will	sample	10/20/20	once	recharged.		Purge dry wait for recharge

SAMPLE INFORMATION

Sample ID:	CBD-S03-MW62-1620	Field Test:	N/A
Analyses:	PFAS18, TPH-GRO+DRO	Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/20/20	Shipment Method:	Fed-Ex
Collection Time:		Well Condition/Comments:	
Field Filter? (Y/N):	N		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

GROUNDWATER SAMPLING DATA SHEET

WELL ID: SO4-MW01

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	25.6 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	19.81 ft btoc
Project Number:	708207CH.FI.FK	Weather:	73°F, Clear + Sunny	Water Column:	5.79 ft
Start Date:	10/15/2020			Well Diameter:	2 in
Sampling Team:	A. Overman, C. Dronfield			Volume per foot:	0.163 gal/ft
				Well Volume:	0.94 gal
Purge Method:	Low Flow			Start Time:	1445
Equipment:	Monsoon (Peristaltic)			End Time:	1535
Tubing Materials:				Screened Interval:	15-25 ft btoc
				Pump/Tubing Intake:	24 ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
1445	0	19.81	200								
1450	↓	19.50	100	20.26	4.75	358	0.074	45.2	3.20		Start pumping
1455		19.75	↓	20.12	4.72	379	0.067	0	4.35		
1500		19.87		19.82	4.71	380	0.063	0	4.81		
1505		20.13		19.13	4.65	377	0.057	0	5.59		
1510		20.36		18.72	4.59	367	0.056	0	5.67		
1515	↓	20.51		18.93	4.57	362	0.057	0	5.81		
1520	2	20.72	↓	18.80	4.54	358	0.059	0	5.65		
1525	Collect CBD-SO4-MW01-1020										

SAMPLE INFORMATION

Sample ID:	CBD-SO4-MW01-1020 + MW01D	Field Test:	N/A
Analyses:	PFAS 18	Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/15/20	Shipment Method:	Fed-Ex
Collection Time:	1525 + 1530	Well Condition/Comments:	Good
Field Filter? (Y/N):	N		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

ch2m:

PROJECT NUMBER	WELL NUMBER	SHEET	OF
	HVG-GW09	1	

Purge Log

PROJECT: Site 10 SE

DATE: 10/14/20

LOCATION: NELCBD

WEATHER: Sunny, 70°F

PUMP TYPE (circle one): (PERISTALTIC) SUBMERSIBLE OTHER:

FIELD TEAM: C. Dronfield, A. Overman

PURGING/SAMPLING METHOD (circle one): (LOW-FLOW) VOLUMETRIC

TOTAL DEPTH OF WELL: 25.0 (historical) (FT BTOC) 28.40' btoc (measured)

START TIME: 1445

INITIAL DEPTH OF WATER: 9.09 (FT BTOC)

END TIME:

WATER COLUMN: (FT)

WATER QUALITY INSTRUMENT MANUFACTURER & MODEL: Horiba U-52

INSIDE DIAMETER OF WELL: 4 (IN)

WATER QUALITY INSTRUMENT SERIAL #:

WELL VOLUME: (GAL)

TURBIDITY METER MANUFACTURER & MODEL: N/A

TURBIDITY METER SERIAL #:

TOTAL PURGE VOLUME: (GAL)

WATER LEVEL INDICATOR SERIAL #: Solinst

WATER QUALITY PARAMETERS

Time	Depth to Water ft	DO mg/L	pH SU	Specific Conductivity mS/cm	ORP mV	Temp °C	Salinity	Turbidity NTU	Flow Rate mL/min	Cummulative Volume Purged gal
Stability Criterion:	< 0.5 ft	± 0.10 mg/L or 10% of	+/- 0.1 SU	± 3%	± 10 mV	+/- 1.0 °C	--	± 10%	100-500 mL/min	--
1450	10.04	0.01	6.39	0.552	-16	18.49	—	0.0	400	
1455	10.44	0.00	6.39	0.551	-16	18.47		0.0	300	
1500	10.79	0.00	6.45	0.551	-18	18.43		0.0	200	
1505	11.02	0.00	6.51	0.551	-21	18.40		0.0	200	
1510	11.35	0.00	6.63	0.551	-26	18.38		0.0	" "	
1515	11.60	0.00	6.67	0.552	-25	18.29		0.0	150	
1520	11.79	0.00	6.70	0.552	-25	18.29		0.0	150	~2 gal
1525	12.08	0.00	6.74	0.551	-24	18.05		0.0	" "	
1530	Collect Sample									

SAMPLE INFORMATION

NOTES: Sample ID: CBD-HGVGW09-1020

GROUNDWATER SAMPLING DATA SHEET

WELL ID: HVG GW10

Project Name:	NRL-CBD Site 10	Casing Materials:	PVC	Well Depth:	29.8 ft btoc
Location:	Chesapeake Beach, MD	PID Reading:	N/A	Start Water Level:	12.58 ft btoc
Project Number:	708207CH.FI.FK	Weather:	70°F, Clear + Sunny	Water Column:	17.22 ft
Start Date:	10/14/2020			Well Diameter:	4 in
Sampling Team:	A. Overman, C. Dronfield			Volume per foot:	0.653 gal/ft
				Well Volume:	11.24 gal
Purge Method:	Low Flow			Start Time:	1435
Equipment:	Monsoon (Peristaltic)			End Time:	1525
Tubing Materials:				Screened Interval:	20 - 30' ft btoc
				Pump/Tubing Intake:	25' ft btoc

Diam. (in)	Vol. (gal/ft)
1	0.041
1.25	0.064
2	0.163
4	0.653

WELL STABILIZATION DATA

Time	Volume Removed	Depth to Water (ft)	Flow rate (mL/min)	Temp. (°C)	pH	ORP (mV)	SPCOND. (mS/cm)	Turbidity (NTU)	D.O. (mg/L)	Salinity (ppt)	Appearance/Notes
Stability Criterion:	(gallons)	< 0.5 ft	100-500 mL/min	+/- 3%	+/- 0.1	+/- 10 mV	+/- 3%	+/- 0.1 mg/l or 10% of	+/- 10%	N/A	
1435	0	12.58	400								Start pump
1440		13.50	200	21.03	6.44	-137	0.822	0	0.30		Clear
1445		13.68	150	20.34	6.46	-141	0.812	0	0.09		
1450		13.96	150	19.71	6.41	-137	0.811	0	0.09		
1455		14.20	150	19.29	6.38	-137	0.808	0	0.01		
1500		14.39	150	18.93	6.36	-137	0.808	0	0		
1505		14.58	150	18.77	6.35	-136	0.807	0	0		
1510		14.80	150	18.40	6.34	-136	0.808	0	0		
1515	Collect	CBD-	HVGGW	10-1020							

SAMPLE INFORMATION

Sample ID:	CBD-HVGGW10-1020	Field Test:	N/A
Analyses:	PFAS 18	Primary Laboratory:	Battelle-Norwell and AEL, Inc.
Collection Date:	10/14/2020	Shipment Method:	Fed-Ex
Collection Time:	1515	Well Condition/Comments:	Good
Field Filter? (Y/N):	N		

[1] Sampling standards adapted from USEPA Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, 2017

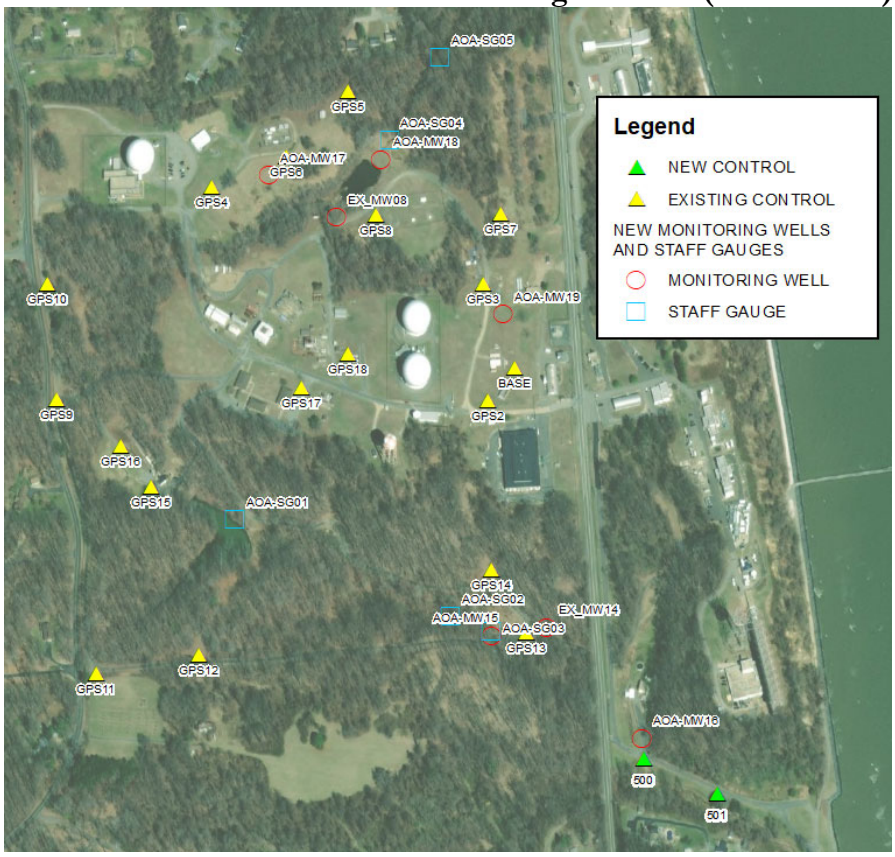
Appendix C
Survey Data

Surveyors Report
Monitoring Well Elevations and Positions
CLEAN 9000 – CTO JU23
Naval Research Laboratory – Chesapeake Bay Detachment
Chesapeake Beach, Maryland

Project Overview

This project consists of establishing survey control and locating five (5) monitoring wells and five (5) Stream Gauges. The field work was conducted on 01-27 to 29 2021 for horizontal location and on 02-23-2021 for vertical locations. (See the pictures below).

Site map with the location of MW and Stream Gauges on site (FromCH2M) Exhibit 1



Equipment Used

For this project, the equipment used were Topcon GR5, Topcon PS103 (a robotic total station), and Trimble DiNi digital level. All equipment had been previously calibrated based on the manufacturer specifications (DiNi Certificate is attached on this report).

Datum Note

The data for this project was collected and processed in SPC83(2011) MD State Plane, North American Datum of 1983, and NAVD88 vertical datum, US feet to be consistent and comparable to past projects in the same area done on April 25, 2018 (See the report for the project "CH2m-Navy Clean 9000-CTO JU23" and existing control established by Bowman on March 21-24, 2018 at the address 5813 Bayside RD, Chesapeake RD, Chesapeake Beach MD, 20732. (See Report Attached)

Survey Control set By Bowman on March 2018 (SPC83(2011) NAVD88
Table 1

Name	North(Usfeet)	East(Usfeet)	ELV(Usfeet)	CODE
1	361481.1770	1446230.1160	125.7460	BASE
2	361356.4810	1446128.7350	129.2750	GPS2
3	361797.8200	1446113.6340	123.1100	GPS3
4	362162.1380	1445090.0430	124.9720	GPS4
5	362520.4640	1445603.5840	119.8110	GPS5
6	362273.2310	1445373.4320	119.1520	GPS6
7	362058.5490	1446177.2810	122.0520	GPS7
8	362056.2920	1445707.5940	96.1490	GPS8
9	361361.5440	1444505.7600	155.0450	GPS9
10	361795.1600	1444471.1540	156.6670	GPS10
11	360331.2310	1444656.6200	132.7080	GPS11
12	360399.6470	1445041.7890	111.5860	GPS12
13	360485.8560	1446277.4990	41.7990	GPS13
14	360721.4600	1446143.8870	55.1740	GPS14
15	361031.8560	1444863.5510	94.3910	GPS15
16	361187.6800	1444749.2000	117.1980	GPS16
17	361406.9880	1445430.7160	118.3830	GPS17
18	361532.1440	1445602.4650	121.4310	GPS18

1)Verification of Horizontal and Vertical Datum

Bowman set two new control on site close to AOA-MW16 using GPS static methods. These two new points are set as part of the verification and for location of the MW16. Point GPS2 is used as primary control for RTK Local base and processing static observations. Point 500 is used for verification of the accuracy of vertical datum based on the comparing static result to digital level result. (See Loop 30056J5) **Note static points 500 and 501 were not used for well locations. We located Well 16 using only RTK local base set on GPS2. Point 500 is used only as check point for comparison two survey method (RTK to Static on this area for horizontal verification) and vertical datum verification between existing control GPS2, GPS13 and 500 between DiNi digital level to static observation methods, 501 was not part of the digital level loop*

New control set on site (Points500 and 501) Exhibit 2



Verification of Horizontal datum using RTK local base, Conventional instrument (TS) and Static

30056-01-012 NAVFAC (CHESAPEAKE BAY) SPC83(2010)-MD Verification of Existing Control (Table 2)

From	To	Forward Azimuth	Geodetic Distance (USft)	Ground Distance (USft)	Grid Distance (USft)	dN (USft)	dE (USft)	Delev (USft)	SURVEYING METHOD
1034	13	211°24'01.9371"	0.0200	0.0200	0.0200	-0.0170	-0.0100	0.0230	RTK
2000	14	148°32'42.2127"	0.0400	0.0400	0.0400	0.0340	-0.0210	0.0150	TS
1035	7	12°27'43.4125"	0.0010	0.0010	0.0010	0.0010	0.0000	0.0010	RTK
500RTK	500	227°28'21.9429"	0.017	0.017	0.017	-0.0115	-0.0125	0.023	STATIC

.

Note Control point 500RTK is based on RTK survey method and control point 500 is based on static survey method. Points 1034, 2000 and 1035 are check points to existing control from previous survey campaign. (see report dated 05/04/2018)

Verification Of vertical datum using DiNi Trimble between EX-Control Table 3

Verification of vertical datum DiNi Trimble			
	CONTROL	CHECKED	Usfeet
GPS3	123.1100	123.1085	0.0015
GPS6	119.1520	119.1514	0.0006
GPS14	55.1740	55.1795	-0.0055
GPS500	23.9653	23.9884	-0.0231

Points GPS3, GPS6 and GPS14 are from 2018 control values and GPS500 is from 2021 static observations just for verification. GPS500 doesn't have any effect on the vertical datum of MW16, because we ran a level loop from GPS14, GPS13, GPS500 and MW16. Final answer is these differences are from static observations (2018 existing control or 2021 (point500) vs to DiNi values this survey campaign in 2021

Based on the result of this verification for existing control used on this surveying campaign and methods used for the location of Monitoring Wells and Stream Gauges average differential values of accuracy is +/- 0.020' horizontal and +/- 0.01' for vertical. This accuracy fits on the requirements of SOW (See the paragraph Accuracy on SOW).

Methodology used for horizontal and vertical locations of monitoring wells and Stream Gauges

BCG used RTK local base surveying method for the horizontal location only on the area where GPS has the best sky view and total station Topcon Robotic was used only in woods area. The vertical location was done based on the requirement of SOW on the paragraph "Survey Method". There are four digital loops for the location of 5 new monitoring wells, two existing monitoring wells (MW14 and MW08) and 5 stream gauges. The elevation and horizontal location of these stream gauges are at top of iron rod and cap set by Jacobs. Each digital level loop was closed less than 0.026', We adjusted all digital level loops. For more details see file "30056 loop closures". The table below has the final horizontal and vertical values of field location. The elevation of highlighted points with green and blue color are based of digital level loops.

Field location of 7 MW and 5 Stream Gauges (Table 4)

Points 2 through 14 are from 2018 survey, while point 500 is from static with elevation from DiNi, and 501 is from static for horizontal and vertical, points from 1000 are from RTK or Total Station.

Name	Grid Northing (USft)	Grid Easting (USft)	Elevation (USft)	Code	
2	361356.4810	1446128.7350	129.2750	GPS2	
4	362162.1380	1445090.0430	124.9720	GPS4	
8	362056.2920	1445707.5940	96.1490	GPS8	
13	360485.8560	1446277.4990	41.7990	GPS13	
14	360721.4600	1446143.8870	55.1795	GPS14	
500	360009.6975	1446717.9005	23.9884	GPS500	
501	359878.4899	1446994.5624	20.2137	GPS501	
1000	361797.8350	1446113.6700	123.0920	CHK 3	
1001	360085.1780	1446708.6900	24.3620	CON S	
1002	360087.0440	1446708.5090	24.4190	CON	
1003	360087.3380	1446710.4000	24.4420	CON	
1004	360085.4180	1446710.6380	24.4560	CON C	
1005	360085.0220	1446709.7450	24.4639	GR MW16	
1006	360086.2000	1446709.5580	27.1620	AOA-MW16 TOP PVC	
1007	360086.0890	1446709.5330	27.4125	MW AOA-MW16 RIM	
1008	361682.9280	1446185.6020	123.8870	CON S	
1009	361683.2220	1446187.4320	123.9190	CON	
1010	361681.3010	1446187.7110	123.9030	CON	
1011	361681.0460	1446185.8290	123.8840	CON C	
1012	361680.9670	1446186.7620	123.8134	GR MW19	
1013	361682.1900	1446186.5380	123.4129	AOA-MW19 TOP PVC	
1014	361682.1730	1446186.5940	123.9202	MW AOA-MW19 RIM	

1015	362262.2000	1445728.0840	91.9580	CON S	
1016	362263.6960	1445729.2710	92.0000	CON	
1017	362264.7660	1445727.7420	92.0620	CON	
1018	362263.1990	1445726.6080	92.0230	CON C	
1019	362262.4270	1445727.1940	91.9639	GR MW18	
1020	362263.4280	1445727.8640	94.4541	AOA-MW18 TOP PVC	
1021	362263.3990	1445727.9370	94.8388	RIM AOA-MW18 TOP	
1022	362337.5910	1445761.4440	76.5446	AOA-SG04 REBAR CAP	
1023	362337.1050	1445761.4100	80.1120	POST AOA SG04 TOP	
1024	362649.4170	1445950.3430	75.1248	AOA-SG05 REBAR CAP	
1025	362649.4010	1445950.1970	78.5200	POST AOA SG05 TOP	
1026	362056.2730	1445707.6020	96.1330	CHK 8	
1027	362204.0400	1445306.1310	113.1430	CON S	
1028	362204.0760	1445304.2040	113.0170	CON	
1029	362202.1840	1445304.2530	112.8380	CON	
1030	362202.1580	1445306.1760	112.9010	CON C	
1031	362203.1680	1445305.2870	115.3967	AOA-MW17 TOP PVC	
1032	362202.9720	1445305.2720	115.6886	AOA-MW17 RIM	
1035	362058.5480	1446177.2810	122.0510	CHK 7	
1036	360721.4740	1446143.8560	55.1800	CHK 14	
1043	360908.4040	1445179.3120	77.5950	POST AOA-SG01 TOP	
1044	360909.9740	1445180.5560	75.2432	AOA-SG01 REBAR CAP	
2000	360721.4940	1446143.8660	55.1890	CHK 14	
2001	360487.1360	1446145.1430	38.6831	AOA-SG03 REBAR W/CAP	
2002	360487.0210	1446144.9970	42.7310	POST SG03 TOP	
2003	360470.8830	1446145.8770	45.1830	CON	
2004	360470.6180	1446144.0360	45.3000	CON	
2005	360472.5050	1446143.8210	45.2980	CON	
2006	360471.8270	1446145.1000	47.6775	WELL TOP PVC MW15	
2007	360471.7000	1446144.8230	47.8383	RIM TOP WELL CAP MW15	
2008	360471.7470	1446145.9000	44.8756	GR MW15	
2009	360721.4980	1446143.8710	55.1880	CHK 14	
2010	360485.8110	1446277.5140	41.7810	CHK 13	
2011	360545.7550	1445989.8820	40.6346	AOA-SG02 REBAR W/CAP	
2012	360546.1070	1445989.4520	44.5910	POST SG-02 TOP	
2013	360485.8030	1446277.5120	41.7710	CHK 13	
2014	360721.4820	1446143.8650	55.1940	CHK 14	
2015	360503.9210	1446351.0420	44.0673	MW14 GR	
2016	360502.4330	1446350.5940	47.0203	MW14 RIM	

2017	360502.3410	1446350.6020	47.1587	MW14 PVC	
2018	360503.8040	1446350.2040	44.1050	CON	
2019	360501.7870	1446348.7180	44.1050	CON	
2020	360500.2320	1446350.8250	44.1220	CON	
2021	360721.5000	1446143.8690	55.1920	CHK	
2022	362162.1640	1445090.0000	124.8540	CHK	
2023	362044.6120	1445558.0130	91.6960	CON	
2024	362047.1410	1445556.9990	91.5270	CON	
2025	362048.1370	1445559.6490	91.6530	CON	
2026	362046.9530	1445560.2780	91.7974	GR MW08	
2027	362046.7120	1445559.0360	94.8632	MW08 RIM	
2028	362046.7100	1445558.9340	94.9719	MW08 PVC	

The table below has the horizontal and vertical location of top PVC, RIM and ground.

030056-01-012

Naval Research Laboratory – Chesapeake Bay Detachment

CHESAPEAKE BAY DETACHMENT (NAVFC) 5813 Bayside Rd, Chesapeake Beach, MD 20732 (Table 5)

Monitoring Well(Name)	Northing (SPC83 MD, US Survey Feet)	Easting (SPC83 MD, US Survey Feet)	Top of Inner PVC Casing Elevation NAVD88 (US Survey Feet)	Top of Outer Steel Casing Elevation NAVD88 (US Survey Feet)	Ground Surface Elevation NAVD88 (US Survey Feet)
AOA-MW16	360086.2000	1446709.5580	27.1620	27.4125	24.4639
AOA-MW19	361682.1900	1446186.5380	123.4129	123.9202	123.8134
AOA-MW18	362263.4280	1445727.8640	94.4541	94.8388	91.9639
AOA-MW17	362203.1680	1445305.2870	115.3967	115.6886	112.9792
AOA-MW15	360471.8270	1446145.1000	47.6775	47.8383	44.8756
EX_MW14	360502.3410	1446350.6020	47.1587	47.0203	44.0673
EX_MW08	362046.7100	1445558.9340	94.9719	94.8632	91.7974

Ground surface elevations and top of inner casing elevations of permanent monitoring wells were surveyed by Bowman on NOV 02/23/2021.

During location our surveying crew did hand taped measurement for QC from RIM to top PVC.

Hand Taped Measurements (Table 6)

Field Hand Taped Measurements		Number	
RIM TO PVC	Direction		
0.26	DWN	AOA-MW16	1006
0.48	DWN	AOA-MW19	1013
0.38	DWN	AOA-MW18	1020
0.23	DWN	AOA-MW17	1031
0.15	DWN	AOA-MW15	2006
0.14	UP	EX_MW14	2017
0.10	UP	EX_MW08	2028

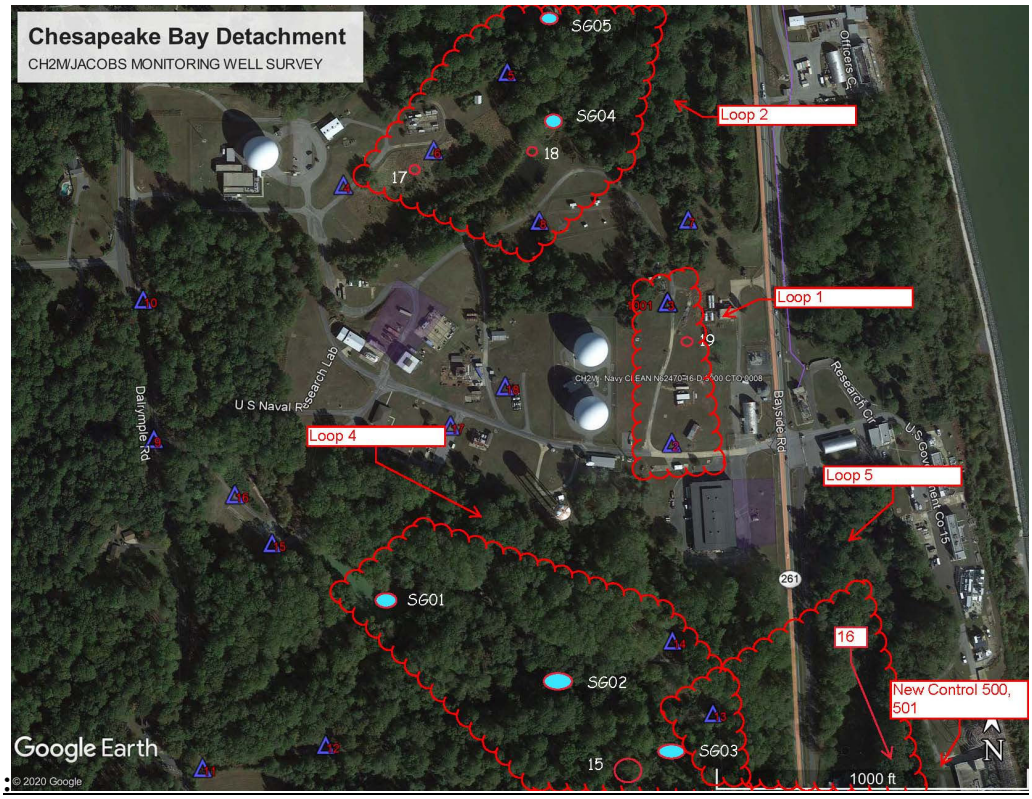
Horizontal and vertical location of 5 Stream Gauges on NAD83 NAVD88 (Table 7)

STREAM GAUGES (REBAR WITH PLASTIC CAP ON TOP)				
Name	Northing (SPC83 MD, US Survey Feet)	Easting (SPC83 MD, US Survey Feet)	NAVD88 Rebar/Cap Elevation	Top of Post Elevation
AOA-SG04	362337.591	1445761.444	76.5446	80.112
AOA-SG05	362649.4170	1445950.3430	75.1248	78.520
AOA-SG01	360909.9740	1445180.5560	75.2432	77.595
AOA-SG03	360487.1360	1446145.1430	38.6831	42.731
AOA-SG02	360545.7550	1445989.8820	40.6346	44.591

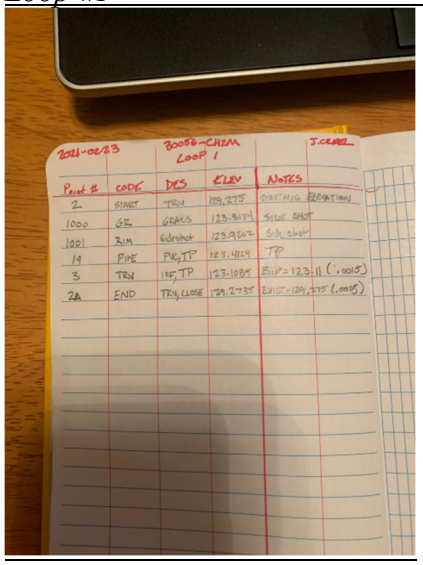
The location on Google Map (Exhibit 3)


Calvert Ave
AOA-SG05
AOA-SG04
AOA-MW18
AOA-MW17
EX_MW08
AOA_MW19
Navy Ct
Bayside Rd
AOA-SG01
AOA-SG02
EX_MW14
AOA-SG03
AOA-MW15
AOA-MW16

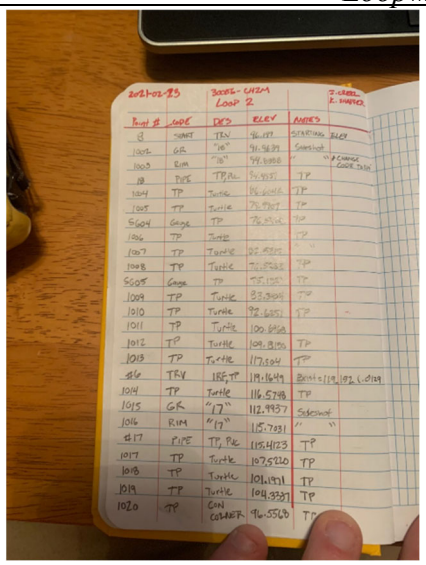
Field Notes



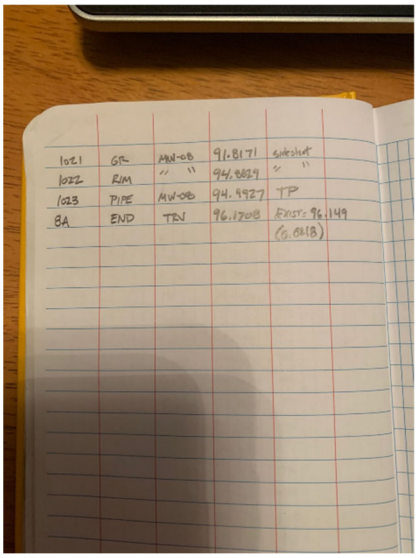
Loop #1 *Loop#2*



2021-02-23	30056-CH2M Loop 1			J.CREEL
Point #	CODE	DES	ELEV	NOTES
2	START	TRV	129.275	STARTING ELEVATION
1000	GR	GRASS	123.9134	SIDE SHOT
1001	RIM	Sideshot	123.9362	Side Shot
19	PIPE	PK, TP	123.4124	TP
3	TRV	PK, TP	123.1084	Exist=123.11 (.0015)
2A	END	TRV, CLOSE	129.2735	Exist=129.275 (.0015)

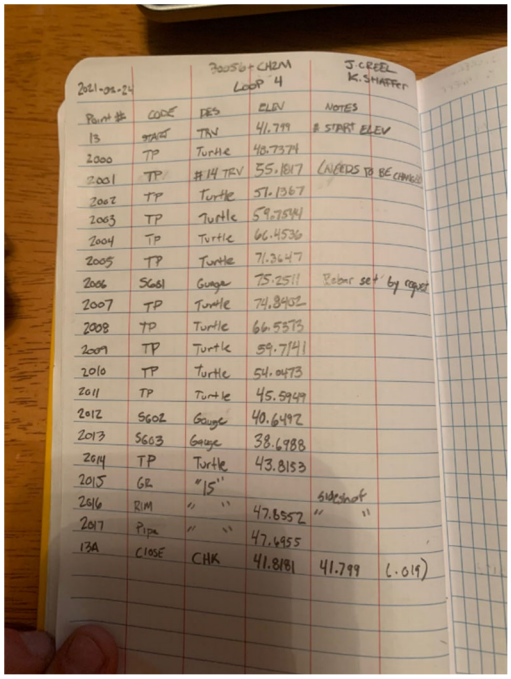


2021-02-23	30056-CH2M Loop 2			J.CREEL K.SHIPLEY
Point #	CODE	DES	ELEV	NOTES
2	START	TRV	96.127	STARTING ELEV
1001	GR	"16"	94.5839	Sideshot
1002	RIM	"16"	94.8008	" " CHANGE CODE TO TP
18	PIPE	TP, PK	94.4057	TP
1004	TP	Turtle	96.6046	TP
1005	TP	Turtle	96.8307	TP
SG04	Gage	TP	96.2106	TP
1006	TP	Turtle	95.8202	TP
1007	TP	Turtle	92.9325	TP
1008	TP	Turtle	90.2288	TP
SG05	Gage	TP	93.1324	TP
1009	TP	Turtle	93.3304	TP
1010	TP	Turtle	92.6652	TP
1011	TP	Turtle	100.6858	
1012	TP	Turtle	109.8170	TP
1013	TP	Turtle	117.1014	TP
16	TRV	18F, TP	119.1649	Exist=119.102 (.0119)
1014	TP	Turtle	116.5748	TP
1015	GR	"17"	112.9937	Sideshot
1016	RIM	"17"	115.7931	" "
17	PIPE	TP, PK	115.4123	TP
1017	TP	Turtle	107.5240	TP
1018	TP	Turtle	101.4931	TP
1019	TP	Turtle	104.3787	TP
1020	TP	CAN CORNER	96.5560	TP

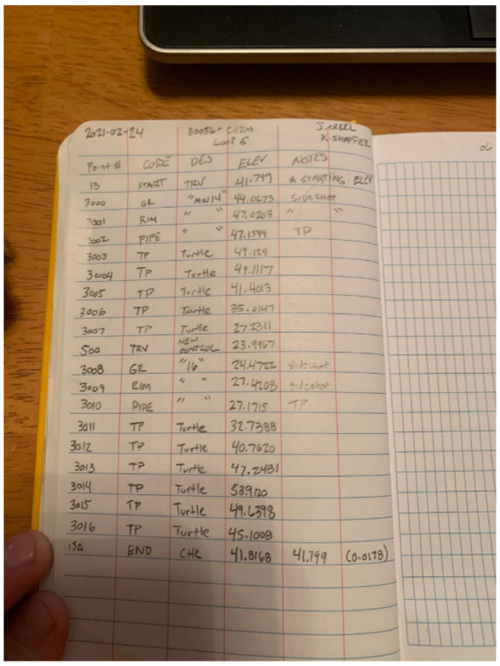


1021	GR	MW-08	91.8171	sideshot
1022	RIM	" "	94.8829	" "
1023	PIPE	MW-08	94.4927	TP
8A	END	TRV	96.1708	Exist= 96.149 (0.0218)

Loop #4 *Loop#5*



Point #	CODE	DES	ELEV	NOTES
13	START	TRV	41.799	& START ELEV
2000	TP	Turtle	48.7374	
2001	TP	#14 TRV	55.1817	(NEEDS TO BE CHANGED)
2002	TP	Turtle	57.1367	
2003	TP	Turtle	59.7584	
2004	TP	Turtle	66.4536	
2005	TP	Turtle	71.3647	
2006	SG01	Gauge	75.2511	Rebar set by crew
2007	TP	Turtle	74.8432	
2008	TP	Turtle	66.5573	
2009	TP	Turtle	59.7141	
2010	TP	Turtle	54.0473	
2011	TP	Turtle	45.5949	
2012	SG02	Gauge	40.6492	
2013	SG03	Gauge	38.6788	
2014	TP	Turtle	43.8153	
2015	GR	"15"		
2016	RIM	" "	47.8552	SIDESHOT " "
2017	PIPE	" "	47.6455	
13A	CLOSE	CHK	41.8181	41.799 (.019)



Point #	CODE	DES	ELEV	NOTES
13	START	TRV	41.799	& STARTING ELEV
3000	GR	"MAN14"	44.0673	SIDESHOT
3001	RIM	" "	47.0203	" "
3002	PIPE	" "	47.1599	TP
3003	TP	Turtle	49.129	
3004	TP	Turtle	49.1117	
3005	TP	Turtle	41.4013	
3006	TP	Turtle	35.0147	
3007	TP	Turtle	27.3211	
500	TRV	NEW BENCH	23.9967	
3008	GR	"16"	24.4722	SIDESHOT
3009	RIM	" "	27.4203	SIDESHOT
3010	PIPE	" "	27.1715	TP
3011	TP	Turtle	32.7338	
3012	TP	Turtle	40.7620	
3013	TP	Turtle	47.2481	
3014	TP	Turtle	53.9170	
3015	TP	Turtle	49.6398	
3016	TP	Turtle	45.1008	
13A	END	CHK	41.8168	41.799 (0.0178)

See attached field notes to this report

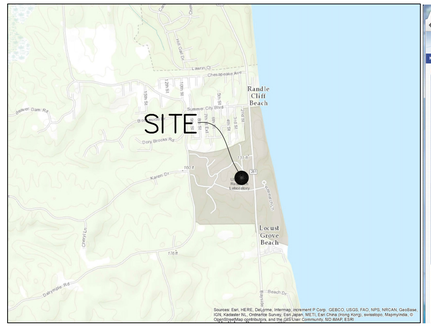
Surveyor's Certification

THIS AS BUILT SURVEY WAS PREPARED BY ME, TRISTAN STEWART FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION ON JANURARY 27-29, 2020 & FEBRUARY 23, 2021. I HEREBY CERTIFY THAT THE ACCURACY OF THIS SURVEY MEETS THE ACCURACY REQUIREMENTS OF THE CH2M STATEMENT OF WORK AND THAT THE PLAN SHOWN ON THE MAP PROVIDED WITH THIS REPORT IS ACCURATE, AND THAT I WAS IN RESPONSIBLE CHARGE OVER ITS PREPARATION IN ACCORDANCE WITH THE REQUIREMENTS SET FORTH IN THE STATEMENT OF WORK AND IN COMAR 09.13.06.03.

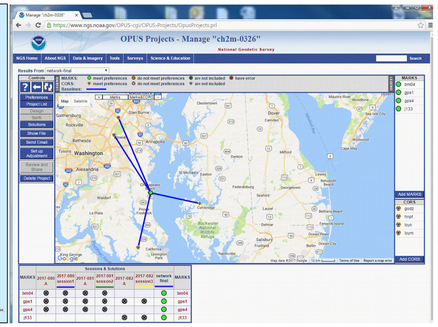
Tristan Stewart 03/25/21

BOWMAN CONSULTING GROUP *DATE*
BY: TRISTAN STEWART
PROFESSIONAL LAND SURVEYOR
MD REG. NO. 21306
RENEWAL DATE: 06/26/2018

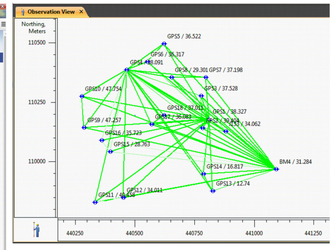




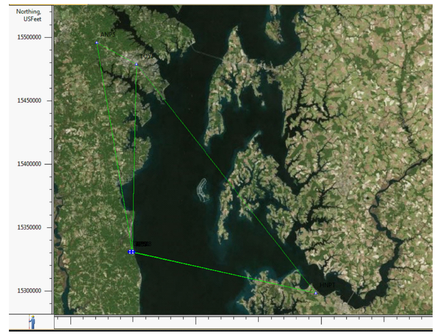
VICINITY MAP
–NOT TO SCALE–



OPUS GPS MANAGE ch2m–0326
–NOT TO SCALE–



LOCAL GPS NETWORK
–NOT TO SCALE–



GPS 1 TIED TO CORS. CORS (ANP5, LOYF AND HNPT HELD FOR HORIZONTAL (NAD83(2011))
–NOT TO SCALE–

NOTES:

1. NORTH MERIDIAN INFORMATION AS SHOWN HEREON IS MARYLAND STATE PLANE NAD 83/2011, AND HAS BEEN PROCESSED THROUGH THE USE OF MAGNET TOOLS

   CONTROL POINT 3 GPS3
   N: 361797.8200 E:1446113.6340 ELEVATION 123.1100 R/C SET
   (SEE PREVIOUS REPORT 05/2018)

   CONTROL POINT 6 GPS6
   N: 362273.2310 E:1445373.4320 ELEVATION 124.9720 R/C SET
   (SEE PREVIOUS REPORT 05/2018)

   CONTROL POINT 14 GPS 14
   N: 360721.4600 E:1446143.8870 ELEVATION 55.1740 R/C SET
   (SEE PREVIOUS REPORT 05/2018)

   CONTROL POINT GPS 500
   N: 360009.6975 E:1446717.9005 ELEVATION 23.9884 R/C SET
   (SEE PREVIOUS REPORT 05/2018)

   CONTROL POINT GPS 501
   N: 359878.4899 E:1446994.5624 ELEVATION 20.2137 R/C SET

2. VERTICAL DATUM SHOWN HEREON IS NAVD 88 AND IS BASED ON THE CONTROL POINTS DESCRIBED IN NOTE 1.

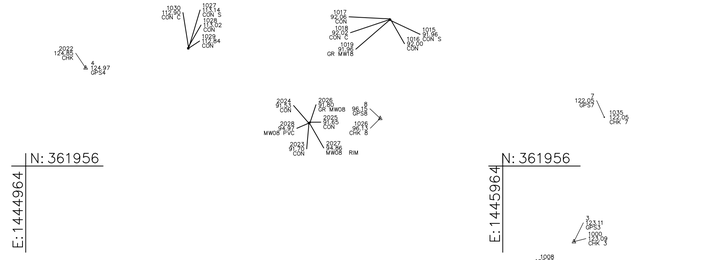
3. THIS SURVEY HAS BEEN PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT. THE PROPERTY SHOWN HEREON MAY BE SUBJECT TO EASEMENTS,GRANTS, RIGHTS–OF–WAY AND BUILDING RESTRICTION LINES NOT OTHERWISE SHOWN.

4. FIELD WORK WAS PERFORMED 01/27/20–01/29/20 & 02/23/21

MARYLAND STATE GRID
NAD 83/2011
N



CONTROL POINTS 500 & 501
–NOT TO SCALE–





SURVEYOR'S CERTIFICATE

THIS AS BUILT SURVEY WAS PREPARED BY ME, TRISTAN STEWART FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION ON JANURARY 27–29, 2020 & FEBRUARY 23, 2021. I HEREBY CERTIFY THAT THE ACCURACY OF THIS SURVEY MEETS THE ACCURACY REQUIREMENTS OF THE CH2M STATEMENT OF WORK AND THAT THE PLAN SHOWN ON THE MAP PROVIDED WITH THIS REPORT IS ACCURATE, AND THAT I WAS IN RESPONSIBLE CHARGE OVER ITS PREPARATION IN ACCORDANCE WITH THE REQUIREMENTS SET FORTH IN THE STATEMENT OF WORK AND IN COMAR 09.13.06.03.

Tristan Stewart *03/17/2021*

BOWMAN CONSULTING GROUP DATE
BY: TRISTAN STEWART
PROFESSIONAL LAND SURVEYOR
MD REG. NO. 21306
RENEWAL DATE: 06/26/2022

STATE OF MARYLAND · TRISTAN STEWART · 21306 · PROFESSIONAL LAND SURVEYOR

MONITORING WELL LOCATIONS

NAVY CLEAN 9000 CTO JU23

ON THE PROPERTY OF

CHESAPEAKE DETACHMENT CHESAPEAKE BEACH MARYLAND

CALVERT COUNTY, MARYLAND

SCALE: 1"=150' DATE: MARCH 2021

REVISION	

Bowman CONSULTING

Bowman Consulting Group, Ltd.
185 Admiral Cochran Drive, Suite 215
Annapolis, Maryland 21401

Phone: (410) 224-7590
Fax: (410) 224-7592
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

DWG:			BY: TMS	CHK: T.S.	QC:
BCG PROJECT NO: 8740–01–001	TASK: ?	COUNTY REF NO: ?		SHEET 1	OF 1

PREPARED FOR
CH2M
5701 CLEVELAND STREET SUITE 200
VIRGINIA BEACH, VIRGINIA 23462

OFFICE: 757–671–6258

100 0 100 200
GRAPHIC SCALE

Appendix D
Investigation-Derived Waste Profiles and Disposal Manifests

Advanced Environmental Laboratories, Inc.

Volatile Analysis Results

FORM 1

SW-846 8260C

SDG No.: J2014907

Client: Jacobs - CH2M Hill

Sample ID:	**J2014907001**		**Client ID:**	**CBD-AOA-IW01-102820**	
			File ID:	**201107A045.qgd**	
Date Collected:	**10/28/2020**				
Date Analyzed:	**11/8/2020**	**07:52**	**Matrix:**	**TCLP**	
Date Prepared:	**11/8/2020**	**01:16**	**Instrument ID:**	**J1A**	
Dilution:	**50**		**Analytical Run ID:**	**201107A-8260-DOD**	
Sample Wt/Vol:	**5.00**	**mL**	**% Moisture:**	**100**	
Final Vol:	**5000**	**uL**	**Lims Prep Batch:**	**2864**	
Prep Method:	**SW-846 5030B**		**Lims Analytical Batch:**	**2865**	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
1,1-Dichloroethene	75-35-4	**0.050**	U	0.025	0.050	0.10	mg/L
1,2-Dichloroethane	107-06-2	**0.025**	U	0.012	0.025	0.050	mg/L
1,4-Dichlorobenzene	106-46-7	**0.050**	U	0.025	0.050	0.10	mg/L
2-Butanone (MEK)	78-93-3	**0.025**	U	0.012	0.025	0.050	mg/L
Benzene	71-43-2	**0.025**	U	0.012	0.025	0.050	mg/L
Carbon tetrachloride	56-23-5	**0.025**	U	0.012	0.025	0.050	mg/L
Chlorobenzene	108-90-7	**0.050**	U	0.025	0.050	0.10	mg/L
Chloroform	67-66-3	**0.050**	U	0.025	0.050	0.10	mg/L
Tetrachloroethene (PCE)	127-18-4	**0.025**	U	0.012	0.025	0.050	mg/L
Trichloroethene	79-01-6	**0.025**	U	0.012	0.025	0.050	mg/L
Vinyl Chloride	75-01-4	**0.025**	U	0.012	0.025	0.050	mg/L

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

Semi Volatile Analysis Results

FORM 1

SW-846 8270D

SDG No.: J2014907

Client: Jacobs - CH2M Hill

Sample ID:	**J2014907001**		**Client ID:**	**CBD-AOA-IW01-102820**	
			File ID:	**201105H006.qgd**	
Date Collected:	**10/28/2020**				
Date Analyzed:	**11/5/2020**	**18:34**	**Matrix:**	**TCLP**	
Date Extracted:	**11/4/2020**	**09:00**	**Instrument ID:**	**J7H**	
Dilution:	**1**		**Analytical Run ID:**	**201105H-8270**	
Sample Wt/Vol:	**20.00**	**mL**	**% Moisture:**	**100**	
Extract Vol:	**1000**	**uL**	**Lims Prep Batch:**	**2525**	
Prep Method:	**SW-846 3510C**		**Lims Analytical Batch:**	**1631**	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
1,4-Dichlorobenzene	106-46-7	**0.25**	U	0.12	0.25	0.50	mg/L
2,4,5-Trichlorophenol	95-95-4	**0.12**	U	0.062	0.12	0.25	mg/L
2,4,6-Trichlorophenol	88-06-2	**0.12**	U	0.062	0.12	0.25	mg/L
2,4-Dinitrotoluene (2,4-DNT)	121-14-2	**0.25**	U	0.12	0.25	0.50	mg/L
2-Methylphenol (o-Cresol)	95-48-7	**0.12**	U	0.062	0.12	0.25	mg/L
3+4-Methylphenol(m&p-Cresol)	65794-96-9	**0.12**	U	0.062	0.12	0.25	mg/L
Hexachlorobenzene	118-74-1	**0.12**	U	0.062	0.12	0.25	mg/L
Hexachlorobutadiene	87-68-3	**0.12**	U	0.062	0.12	0.25	mg/L
Hexachloroethane	67-72-1	**0.12**	U	0.062	0.12	0.25	mg/L
Nitrobenzene	98-95-3	**0.12**	U	0.062	0.12	0.25	mg/L
Pentachlorophenol	87-86-5	**0.12**	U	0.048	0.12	0.25	mg/L
Pyridine	110-86-1	**0.12**	U	0.062	0.12	0.25	mg/L

* Analyte Reported in SIM Mode

Diphenylamine is reported from N-Nitrosodiphenylamine and Azobenzene is reported as 1,2-Diphenylhydrazine

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8081B

SDG No.: J2014907

Client: Jacobs - CH2M Hill

Sample ID:	**J2014907001**		**Client ID:**	**CBD-AOA-IW01-102820**	
Date Collected:	**10/28/2020**		**Matrix:**	**TCLP**	
Date Analyzed:	**11/10/2020**	**06:06:20**	**File ID:**	**Y09A045|Y09B045**	
Date Extracted:	**11/5/2020**	**12:00**	**Instrument ID:**	**J7Y**	
Dilution:	**1**		**Analytical Run ID:**	**201109Y-8081**	
Sample Wt/Vol:	**20.00**	**mL**	**% Moisture:**	**100**	
Extract Vol:	**1000**	**uL**	**Lims Prep Batch:**	**2537**	
Prep Method:	**SW-846 3510C**		**Lims Analytical Batch:**	**2129**	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Chlordane (technical)	57-74-9	0.012	U	0.0062	0.012	0.025	mg/L
Endrin	72-20-8	0.00050	U	0.00025	0.00050	0.0010	mg/L
gamma-BHC (Lindane)	58-89-9	0.00050	U	0.00025	0.00050	0.0010	mg/L
Heptachlor	76-44-8	0.00050	U	0.00025	0.00050	0.0010	mg/L
Heptachlor Epoxide	1024-57-3	0.00050	U	0.00025	0.00050	0.0010	mg/L
Methoxychlor	72-43-5	0.00050	U	0.00025	0.00050	0.0010	mg/L
Toxaphene	8001-35-2	0.012	U	0.0062	0.012	0.025	mg/L

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8151A

SDG No.: J2014907

Client: Jacobs - CH2M Hill

Sample ID:	**J2014907001**		**Client ID:**	**CBD-AOA-IW01-102820**	
Date Collected:	**10/28/2020**		**Matrix:**	**TCLP**	
Date Analyzed:	**11/9/2020**	**13:06:53**	**File ID:**	**Z09A008|Z09B008**	
Date Extracted:	**11/4/2020**	**12:00**	**Instrument ID:**	**J7Z**	
Dilution:	**5**		**Analytical Run ID:**	**201109Z-8151**	
Sample Wt/Vol:	**20.00**	**mL**	**% Moisture:**	**100**	
Extract Vol:	**1000**	**uL**	**Lims Prep Batch:**	**2531**	
Prep Method:	**SW-846 8151A**		**Lims Analytical Batch:**	**2055**	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
2,4-D	94-75-7	0.10	U	0.050	0.10	0.20	mg/L
Silvex (2,4,5-TP)	93-72-1	0.050	U	0.025	0.050	0.10	mg/L

Advanced Environmental Laboratories, Inc.

- FORM 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Jacobs - CH2M Hill **SDG No.:** J2014907

Sample ID: J2014907001 **Client ID:** CBD-AOA-IW01-102820

Matrix: TCLP **Date Received:** 10/29/2020 **Date Collected:** 10/28/2020

% Solids:

TCLP **Analytical Method:** SW-846 6010C **Preparation Method:** SW-846 3010A

Analyte	CAS No.	Result	Units	C	Q	MDL	LOD	LOQ	Dil	Prep Batch	Prep Date	Prep Time	Analytical Batch	Analytical Date	Analytical Time
Arsenic	7440-38-2	0.16	mg/L	U		0.080	0.16	0.32	1	2475	11/5/20	04:29	1647	11/5/20	10:15
Barium	7440-39-3	0.086	mg/L	J		0.030	0.060	0.12	1	2475	11/5/20	04:29	1647	11/5/20	10:15
Cadmium	7440-43-9	0.010	mg/L	U		0.0050	0.010	0.020	1	2475	11/5/20	04:29	1647	11/5/20	10:15
Chromium	7440-47-3	0.10	mg/L	U		0.050	0.10	0.20	1	2475	11/5/20	04:29	1647	11/5/20	10:15
Lead	7439-92-1	0.060	mg/L	U		0.030	0.060	0.12	1	2475	11/5/20	04:29	1647	11/5/20	10:15
Selenium	7782-49-2	0.80	mg/L	U		0.40	0.80	1.6	1	2475	11/5/20	04:29	1647	11/5/20	10:15
Silver	7440-22-4	0.16	mg/L	U		0.080	0.16	0.32	1	2475	11/5/20	04:29	1647	11/5/20	10:15

Comments:

Advanced Environmental Laboratories, Inc.

- FORM 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Jacobs - CH2M Hill **SDG No.:** J2014907

Sample ID: J2014907001 **Client ID:** CBD-AOA-IW01-102820

Matrix: TCLP **Date Received:** 10/29/2020 **Date Collected:** 10/28/2020

% Solids:

TCLP **Analytical Method:** SW-846 7470A **Preparation Method:** SW-846 7470A

Analyte	CAS No.	Result	Units	C	Q	MDL	LOD	LOQ	Dil	Prep Batch	Prep Date	Prep Time	Analytical Batch	Analytical Date	Analytical Time
Mercury	7439-97-6	0.0040	mg/L	U		0.0011	0.0040	0.010	1	2482	11/5/20	11:22	1313	11/5/20	14:16

Comments:

Certificate of Analysis

Company : Advanced Environmental Laboratories, Inc.
Address : 6681 Southpoint Pkwy
Jacksonville, Florida 32216

Report Date: December 4, 2020

Contact: Craig Myers
Project: **Jacobs DODQSM**

Client Sample ID:	CBD-AOA-IW01-102820	Project:	AELS01120
Sample ID:	526225001	Client ID:	AELS001
Matrix:	Water		
Collect Date:	28-OCT-20 17:30		
Receive Date:	03-NOV-20		
Collector:	Client		

Parameter	Qualifier	Result	DL	LOD	LOQ	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Flow Injection Analysis													
SW9012A Cyanide, Total "As Received"													
Cyanide, Total	U	3.34	1.67	3.34	5.00	ug/L	1.00	1	AXH3	11/04/20	0909	2058426	1
Titration and Ion Analysis													
SW846 9030B/9034 Sulfide, Liquid "As Received"													
Acid Soluble Sulfides	U	1.00	1.00	1.00	2.50	mg/L			VH1	11/04/20	1537	2058773	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 9010C Distillation	SW846 9010C Prep	AXH3	11/04/20	0823	2058425

The following Analytical Methods were performed :

Method	Description	Analyst Comments
1	SW846 9012B	
2	SW846 9030B/9034	

Advanced Environmental Laboratories, Inc.

- FORM 1 -
WETCHEM ANALYSIS DATA PACKAGE

Client: Jacobs - CH2M Hill **SDG No.:** J2014907

Sample ID: J2014907001 **Client ID:** CBD-AOA-IW01-102820

Matrix: WATER **Date Received:** 10/29/2020

% Solids:

Analytical Method: EPA 9040C

Analyte	CAS No.	Result	Units	C	Q	MDL	LOD	LOQ	Dil	Batch	Analytical Date	Analytical Time
pH	PH	7.8	SU		H	1.0	1.0	1.0	1	3786	10/30/20	09:40

Comments:

Advanced Environmental Laboratories, Inc.

- FORM 1 -
WETCHEM ANALYSIS DATA PACKAGE

Client: Jacobs - CH2M Hill **SDG No.:** J2014907

Sample ID: J2014907001 **Client ID:** CBD-AOA-IW01-102820

Matrix: WATER **Date Received:** 10/29/2020

% Solids:

Analytical Method: EPA 1020

Analyte	CAS No.	Result	Units	C	Q	MDL	LOD	LOQ	Dil	Batch	Analytical Date	Analytical Time
Ignitability (Flashpoint)	IGNITE	>200	°F			70	70	70	1	3791	10/30/20	12:00

Comments:

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID		CBD-AOA-IW01-102820							
Battelle ID		G2212-FS							
Sample Type		SA							
Collection Date		10/28/2020							
Extraction Date		11/04/2020							
Analytical Instrument		Sciex 6500+ (AE) LC/MS/MS							
% Moisture		NA							
Matrix		AQ							
Sample Size		0.280							
Size Unit-Basis		L							
Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	787	D	G2212-FS-D(5)	25.000	11/19/2020	11.8	33.5	112
PFHpA	375-85-9	492		G2212-FS(0)	1.000	11/19/2020	0.235	0.893	4.46
PFOA	335-67-1	933	D	G2212-FS-D(5)	25.000	11/19/2020	11.4	33.5	112
PFNA	375-95-1	3110	D	G2212-FS-D(7)	125.000	11/19/2020	34.5	112	558
PFDA	335-76-2	119		G2212-FS(0)	1.000	11/19/2020	0.127	0.446	4.46
PFUnA	2058-94-8	213		G2212-FS(0)	1.000	11/19/2020	0.196	0.446	4.46
PFDoA	307-55-1	3.99	J	G2212-FS(0)	1.000	11/19/2020	0.171	0.446	4.46
PFTrDA	72629-94-8	15.2		G2212-FS(0)	1.000	11/19/2020	0.138	0.446	4.46
PFTeDA	376-06-7	1.79	U	G2212-FS(0)	1.000	11/19/2020	0.654	1.79	4.46
NMeFOSAA	2355-31-9	0.893	U	G2212-FS(0)	1.000	11/19/2020	0.313	0.893	4.46
NEtFOSAA	2991-50-6	0.893	U	G2212-FS(0)	1.000	11/19/2020	0.446	0.893	4.46
PFBS	375-73-5	86.6		G2212-FS(0)	1.000	11/19/2020	0.129	0.446	4.46
PFHxS	355-46-4	2270	D	G2212-FS-D(7)	125.000	11/19/2020	12.5	44.6	558
PFOS	1763-23-1	15600	D	G2212-FS-D(9)	312.500	11/19/2020	122	279	1400
HFPO-DA	13252-13-6	0.446	U	G2212-FS(0)	1.000	11/19/2020	0.221	0.446	4.46
Adona	919005-14-4	0.893	U	G2212-FS(0)	1.000	11/19/2020	0.237	0.893	4.46
9Cl-PF3ONS	756426-58-1	0.446	U	G2212-FS(0)	1.000	11/19/2020	0.239	0.446	4.46
11Cl-PF3OUdS	763051-92-9	0.893	U	G2212-FS(0)	1.000	11/19/2020	0.206	0.893	4.46

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-IW01-102820
Battelle ID	G2212-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	**Recovery**		**Extract ID**	**Analysis Date**
13C5-PFHxA	76	D	G2212-FS-D(5)	11/19/2020
13C4-PFHpA	76	D	G2212-FS-D(5)	11/19/2020
13C8-PFOA	80	D	G2212-FS-D(5)	11/19/2020
13C9-PFNA	95	D	G2212-FS-D(9)	11/19/2020
13C6-PFDA	69		G2212-FS(0)	11/19/2020
13C7-PFUnA	65		G2212-FS(0)	11/19/2020
13C2-PFDoA	78		G2212-FS(0)	11/19/2020
13C2-PFTeDA	116		G2212-FS(0)	11/19/2020
d3-MeFOSAA	106	D	G2212-FS-D(9)	11/19/2020
d5-EtFOSAA	109	D	G2212-FS-D(9)	11/19/2020
13C3-PFBS	94	D	G2212-FS-D(9)	11/19/2020
13C3-PFHxS	105	D	G2212-FS-D(9)	11/19/2020
13C8-PFOS	97	D	G2212-FS-D(9)	11/19/2020
13C3-HFPO-DA	63	D	G2212-FS-D(5)	11/19/2020

Advanced Environmental Laboratories, Inc.

Volatile Analysis Results

FORM 1

SW-846 8260C

SDG No.: J2014907

Client: Jacobs - CH2M Hill

Sample ID:	**J2014907002**		**Client ID:**	**CBD-AOA-IS01-102820**	
			File ID:	**201107A046.qgd**	
Date Collected:	**10/28/2020**				
Date Analyzed:	**11/8/2020**	**08:18**	**Matrix:**	**TCLP**	
Date Prepared:	**11/8/2020**	**01:16**	**Instrument ID:**	**J1A**	
Dilution:	**10**		**Analytical Run ID:**	**201107A-8260-DOD**	
Sample Wt/Vol:	**5.00**	**mL**	**% Moisture:**	**100**	
Final Vol:	**5000**	**uL**	**Lims Prep Batch:**	**2864**	
Prep Method:	**SW-846 5030B**		**Lims Analytical Batch:**	**2865**	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
1,1-Dichloroethene	75-35-4	**0.010**	U	0.0050	0.010	0.020	mg/L
1,2-Dichloroethane	107-06-2	**0.0050**	U	0.0025	0.0050	0.010	mg/L
1,4-Dichlorobenzene	106-46-7	**0.010**	U	0.0050	0.010	0.020	mg/L
2-Butanone (MEK)	78-93-3	**0.0050**	U	0.0025	0.0050	0.010	mg/L
Benzene	71-43-2	**0.0050**	U	0.0025	0.0050	0.010	mg/L
Carbon tetrachloride	56-23-5	**0.0050**	U	0.0025	0.0050	0.010	mg/L
Chlorobenzene	108-90-7	**0.010**	U	0.0050	0.010	0.020	mg/L
Chloroform	67-66-3	**0.010**	U	0.0050	0.010	0.020	mg/L
Tetrachloroethene (PCE)	127-18-4	**0.0050**	U,J	0.0025	0.0050	0.010	mg/L
Trichloroethene	79-01-6	**0.0050**	U,J	0.0025	0.0050	0.010	mg/L
Vinyl Chloride	75-01-4	**0.0050**	U	0.0025	0.0050	0.010	mg/L

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

Semi Volatile Analysis Results

FORM 1

SW-846 8270D

SDG No.: J2014907

Client: Jacobs - CH2M Hill

Sample ID:	**J2014907002**		**Client ID:**	**CBD-AOA-IS01-102820**	
			File ID:	**201106H007.qgd**	
Date Collected:	**10/28/2020**				
Date Analyzed:	**11/6/2020**	**16:53**	**Matrix:**	**TCLP**	
Date Extracted:	**11/4/2020**	**09:00**	**Instrument ID:**	**J7H**	
Dilution:	**1**		**Analytical Run ID:**	**201106H-8270**	
Sample Wt/Vol:	**20.00**	**mL**	**% Moisture:**	**100**	
Extract Vol:	**1000**	**uL**	**Lims Prep Batch:**	**2525**	
Prep Method:	**SW-846 3510C**		**Lims Analytical Batch:**	**1631**	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
1,4-Dichlorobenzene	106-46-7	**0.25**	U	0.12	0.25	0.50	mg/L
2,4,5-Trichlorophenol	95-95-4	**0.12**	U	0.062	0.12	0.25	mg/L
2,4,6-Trichlorophenol	88-06-2	**0.12**	U	0.062	0.12	0.25	mg/L
2,4-Dinitrotoluene (2,4-DNT)	121-14-2	**0.25**	U	0.12	0.25	0.50	mg/L
2-Methylphenol (o-Cresol)	95-48-7	**0.12**	U,J	0.062	0.12	0.25	mg/L
3+4-Methylphenol(m&p-Cresol)	65794-96-9	**0.12**	U	0.062	0.12	0.25	mg/L
Hexachlorobenzene	118-74-1	**0.12**	U	0.062	0.12	0.25	mg/L
Hexachlorobutadiene	87-68-3	**0.12**	U,J	0.062	0.12	0.25	mg/L
Hexachloroethane	67-72-1	**0.12**	U	0.062	0.12	0.25	mg/L
Nitrobenzene	98-95-3	**0.12**	U,J	0.062	0.12	0.25	mg/L
Pentachlorophenol	87-86-5	**0.12**	U	0.048	0.12	0.25	mg/L
Pyridine	110-86-1	**0.12**	U	0.062	0.12	0.25	mg/L

* Analyte Reported in SIM Mode

Diphenylamine is reported from N-Nitrosodiphenylamine and Azobenzene is reported as 1,2-Diphenylhydrazine

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8081B

SDG No.: J2014907

Client: Jacobs - CH2M Hill

Sample ID:	**J2014907002**		**Client ID:**	**CBD-AOA-IS01-102820**	
Date Collected:	**10/28/2020**		**Matrix:**	**TCLP**	
Date Analyzed:	**11/10/2020**	**06:28:39**	**File ID:**	**Y09A046|Y09B046**	
Date Extracted:	**11/5/2020**	**12:00**	**Instrument ID:**	**J7Y**	
Dilution:	**1**		**Analytical Run ID:**	**201109Y-8081**	
Sample Wt/Vol:	**20.00**	**mL**	**% Moisture:**	**100**	
Extract Vol:	**1000**	**uL**	**Lims Prep Batch:**	**2537**	
Prep Method:	**SW-846 3510C**		**Lims Analytical Batch:**	**2129**	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Chlordane (technical)	57-74-9	0.012	U	0.0062	0.012	0.025	mg/L
Endrin	72-20-8	0.00050	U	0.00025	0.00050	0.0010	mg/L
gamma-BHC (Lindane)	58-89-9	0.00050	U	0.00025	0.00050	0.0010	mg/L
Heptachlor	76-44-8	0.00050	U	0.00025	0.00050	0.0010	mg/L
Heptachlor Epoxide	1024-57-3	0.00050	U	0.00025	0.00050	0.0010	mg/L
Methoxychlor	72-43-5	0.00050	U	0.00025	0.00050	0.0010	mg/L
Toxaphene	8001-35-2	0.012	U	0.0062	0.012	0.025	mg/L

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8151A

SDG No.: J2014907

Client: Jacobs - CH2M Hill

Sample ID:	**J2014907002**		**Client ID:**	**CBD-AOA-IS01-102820**	
Date Collected:	**10/28/2020**		**Matrix:**	**TCLP**	
Date Analyzed:	**11/9/2020**	**13:41:05**	**File ID:**	**Z09A009|Z09B009**	
Date Extracted:	**11/4/2020**	**12:00**	**Instrument ID:**	**J7Z**	
Dilution:	**5**		**Analytical Run ID:**	**201109Z-8151**	
Sample Wt/Vol:	**20.00**	**mL**	**% Moisture:**	**100**	
Extract Vol:	**1000**	**uL**	**Lims Prep Batch:**	**2531**	
Prep Method:	**SW-846 8151A**		**Lims Analytical Batch:**	**2055**	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
2,4-D	94-75-7	0.10	U	0.050	0.10	0.20	mg/L
Silvex (2,4,5-TP)	93-72-1	0.050	U	0.025	0.050	0.10	mg/L

Advanced Environmental Laboratories, Inc.

- FORM 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Jacobs - CH2M Hill **SDG No.:** J2014907

Sample ID: J2014907002 **Client ID:** CBD-AOA-IS01-102820

Matrix: TCLP **Date Received:** 10/29/2020 **Date Collected:** 10/28/2020

% Solids:

TCLP **Analytical Method:** SW-846 6010C **Preparation Method:** SW-846 3010A

Analyte	CAS No.	Result	Units	C	Q	MDL	LOD	LOQ	Dil	Prep Batch	Prep Date	Prep Time	Analytical Batch	Analytical Date	Analytical Time
Arsenic	7440-38-2	0.16	mg/L	U		0.080	0.16	0.32	1	2475	11/5/20	04:29	1647	11/5/20	10:32
Barium	7440-39-3	0.38	mg/L			0.030	0.060	0.12	1	2475	11/5/20	04:29	1647	11/5/20	10:32
Cadmium	7440-43-9	0.012	mg/L	J		0.0050	0.010	0.020	1	2475	11/5/20	04:29	1647	11/5/20	10:32
Chromium	7440-47-3	0.10	mg/L	U		0.050	0.10	0.20	1	2475	11/5/20	04:29	1647	11/5/20	10:32
Lead	7439-92-1	0.060	mg/L	U		0.030	0.060	0.12	1	2475	11/5/20	04:29	1647	11/5/20	10:32
Selenium	7782-49-2	0.80	mg/L	U		0.40	0.80	1.6	1	2475	11/5/20	04:29	1647	11/5/20	10:32
Silver	7440-22-4	0.16	mg/L	U		0.080	0.16	0.32	1	2475	11/5/20	04:29	1647	11/5/20	10:32

Comments:

Advanced Environmental Laboratories, Inc.

- FORM 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Jacobs - CH2M Hill **SDG No.:** J2014907

Sample ID: J2014907002 **Client ID:** CBD-AOA-IS01-102820

Matrix: TCLP **Date Received:** 10/29/2020 **Date Collected:** 10/28/2020

% Solids:

TCLP **Analytical Method:** SW-846 7470A **Preparation Method:** SW-846 7470A

Analyte	CAS No.	Result	Units	C	Q	MDL	LOD	LOQ	Dil	Prep Batch	Prep Date	Prep Time	Analytical Batch	Analytical Date	Analytical Time
Mercury	7439-97-6	0.00020	mg/L	U		0.000055	0.00020	0.00050	1	2482	11/5/20	11:22	1313	11/5/20	14:19

Comments:

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Advanced Environmental Laboratories, Inc.
Address : 6681 Southpoint Pkwy
Jacksonville, Florida 32216

Report Date: December 4, 2020

Contact: Craig Myers
Project: **Jacobs DODQSM**

Client Sample ID:	CBD-AOA-IS01-102820	Project:	AELS01120
Sample ID:	526225003	Client ID:	AELS001
Matrix:	Soil		
Collect Date:	28-OCT-20 17:35		
Receive Date:	04-NOV-20		
Collector:	Client		
Moisture:	38.5%		

Parameter	Qualifier	Result	DL	LOD	LOQ	Units	PF	DF	Analyst	Date	Time	Batch	Mtd.
Flow Injection Analysis													
SW9012A Cyanide, Total "Dry Weight Corrected"													
Cyanide, Total	U	215	108	215	322	ug/kg	39.7	1	AXH3	11/10/20	0622	2059335	1
Titration and Ion Analysis													
SW846 9030B/9034 Sulfide, Solid "Dry Weight Corrected"													
Acid Soluble Sulfides	U	14500	14500	14500	40400	ug/kg			VH1	11/25/20	1044	2058774	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 9010B Prep	SW846 9010B Prep	AXH3	11/09/20	1021	2059334

The following Analytical Methods were performed :

Method	Description	Analyst Comments
1	SW846 9012A	
2	SW846 9030B/9034	

Advanced Environmental Laboratories, Inc.

- FORM 1 -
WETCHEM ANALYSIS DATA PACKAGE

Client: Jacobs - CH2M Hill **SDG No.:** J2014907

Sample ID: J2014907002 **Client ID:** CBD-AOA-IS01-102820

Matrix: SOIL **Date Received:** 10/29/2020

% Solids: 0.00

Analytical Method: EPA 9045

Analyte	CAS No.	Result	Units	C	Q	MDL	LOD	LOQ	Dil	Batch	Analytical Date	Analytical Time
pH	PH	7.6	SU		H	0.040	0.040	0.040	1	3787	10/30/20	10:00

Comments:

Advanced Environmental Laboratories, Inc.

- FORM 1 -
WETCHEM ANALYSIS DATA PACKAGE

Client: Jacobs - CH2M Hill **SDG No.:** J2014907

Sample ID: J2014907002 **Client ID:** CBD-AOA-IS01-102820

Matrix: SOIL **Date Received:** 10/29/2020

% Solids: 0.00

Analytical Method: EPA 1030

Analyte	CAS No.	Result	Units	C	Q	MDL	LOD	LOQ	Dil	Batch	Analytical Date	Analytical Time
Ignitability (Flashpoint)	IGNITE	Non-Ignitable	°F			70	70	70	1	3792	10/30/20	11:30

Comments:

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-IS01-102820
Battelle ID	G2213-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/06/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	25.41
Matrix	SO
Sample Size	1.57
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.55	U	G2213-FS(3)	10.000	11/24/2020	0.901	2.55	6.37
PFHpA	375-85-9	1.91	U	G2213-FS(3)	10.000	11/24/2020	0.645	1.91	6.37
PFOA	335-67-1	2.55	U	G2213-FS(3)	10.000	11/24/2020	0.773	2.55	6.37
PFNA	375-95-1	1.27	U	G2213-FS(3)	10.000	11/24/2020	0.625	1.27	6.37
PFDA	335-76-2	1.27	U	G2213-FS(3)	10.000	11/24/2020	0.590	1.27	6.37
PFUnA	2058-94-8	1.27	U	G2213-FS(3)	10.000	11/24/2020	0.582	1.27	6.37
PFDoA	307-55-1	2.55	U	G2213-FS(3)	10.000	11/24/2020	0.780	2.55	6.37
PFTrDA	72629-94-8	1.27	U	G2213-FS(3)	10.000	11/24/2020	0.357	1.27	6.37
PFTeDA	376-06-7	3.18	U	G2213-FS(3)	10.000	11/24/2020	1.38	3.18	6.37
NMeFOSAA	2355-31-9	3.18	U	G2213-FS(3)	10.000	11/24/2020	1.30	3.18	6.37
NEtFOSAA	2991-50-6	2.55	U	G2213-FS(3)	10.000	11/24/2020	0.953	2.55	6.37
PFBS	375-73-5	1.27	U	G2213-FS(3)	10.000	11/24/2020	0.446	1.27	6.37
PFHxS	355-46-4	2.55	U	G2213-FS(3)	10.000	11/24/2020	1.03	2.55	6.37
PFOS	1763-23-1	2.55	U	G2213-FS(3)	10.000	11/24/2020	0.882	2.55	6.37
HFPO-DA	13252-13-6	2.55	U	G2213-FS(3)	10.000	11/24/2020	0.817	2.55	6.37
Adona	919005-14-4	2.55	U	G2213-FS(3)	10.000	11/24/2020	1.06	2.55	6.37
9Cl-PF3ONS	756426-58-1	1.27	U	G2213-FS(3)	10.000	11/24/2020	0.614	1.27	6.37
11Cl-PF3OUdS	763051-92-9	1.91	U	G2213-FS(3)	10.000	11/24/2020	0.668	1.91	6.37

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-IS01-102820
Battelle ID	G2213-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/06/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

Surrogate Recoveries (%)	**Recovery**	**Extract ID**	**Analysis Date**
13C5-PFHxA	82	G2213-FS(3)	11/24/2020
13C4-PFHpA	83	G2213-FS(3)	11/24/2020
13C8-PFOA	79	G2213-FS(3)	11/24/2020
13C9-PFNA	90	G2213-FS(3)	11/24/2020
13C6-PFDA	92	G2213-FS(3)	11/24/2020
13C7-PFUnA	83	G2213-FS(3)	11/24/2020
13C2-PFDoA	77	G2213-FS(3)	11/24/2020
13C2-PFTeDA	77	G2213-FS(3)	11/24/2020
d3-MeFOSAA	83	G2213-FS(3)	11/24/2020
d5-EtFOSAA	93	G2213-FS(3)	11/24/2020
13C3-PFBS	88	G2213-FS(3)	11/24/2020
13C3-PFHxS	82	G2213-FS(3)	11/24/2020
13C8-PFOS	78	G2213-FS(3)	11/24/2020
13C3-HFPO-DA	76	G2213-FS(3)	11/24/2020

Clearfield MMG
resourceful waste management

Waste Profile Form

Applicant / Agent Information

Company Name:	CH2M HILL, Inc. / Jacobs
Address:	2411 Dulles Corner Park, STE 600
City / State / Zip:	Herndon, VA 20171
Contact:	Laura Lampshire
Phone:	301.570.1042
e-mail:	laura.lampshire@jacobs.com

Generator Information

Company Name:	NRL-Chesapeake Bay Detachment
Address:	5813 Bayside Road
City / State / Zip:	Chesapeake Beach, MD
Contact:	Scott Lonesome
Phone:	202-359-9422
e-mail:	scott.lonesome@nrl.navy.mil

Project Description

Site Name: Fire Testing Area, Site 10, NRL Chesapeake Bay Detachment

Site Address: NRL Chesapeake Bay Detachment, Chesapeake Beach, MD

Source of Contamination: ☐ UST ☐ AST ☐ Spill ☑ Historical / Other: _____

Waste Generating Activity: Installation and Development of Monitoring Wells

Waste Characterization

Applicant must complete the following information and attach all supporting laboratory analyses and / or SDS utilized to characterize the material as non-hazardous and acceptable for receipt by Clearfield MMG.

Common Waste Name: Soil Cuttings

Type of Waste: ☑ Soil ☐ Sludge ☐ Liquid ☐ Absorbents ☐ Other: _____

Type of Contamination: ☐ Unused Petroleum ☐ Used Petroleum ☐ No Petroleum ☑ Other

(list all contaminants & include type of petroleum, if any): See Analysis

Flash Point Range: NI **pH Range:** 7.6 **Reactive:** ☐ YES ☑ NO

Quantity: 9 **Units:** 55 Gallon Drums **Lab Analysis / SDS Attached:** ☑ YES ☐ NO

Generator Certification

I hereby certify, based upon my diligent inquiry into the activities and processes generating the waste described on this form, that these materials are not classified as listed or characteristic hazardous waste as regulated by the Commonwealth of Virginia or the state of origin of this waste; that the materials do not contain 50.0 parts per million or more of polychlorinated biphenyls (PCB's); that the analytical results, completed *Waste Profile Form* and attached documentation are a representative, true, and accurate description of these materials; that no deliberate or willful omissions have been made in the preparation of this form; and that all known or suspect hazards have been disclosed herein. I further acknowledge that I am aware it is the duty of all persons to dispose of their solid waste in a legal manner (Va.Code ' 10.1-1418.1.A).

LONESOME.SCOTT.LAMAR.1042506342 Digitally signed by LONESOME.SCOTT.LAMAR.1042506342 Date: 2021.01.07 11:59:01 -05'00'

Generator or Agent Signature / Date

Generator or Agent Printed Name

If I am an agent signing on behalf of the generator, I have confirmed with the generator that the information contained in this profile is accurate and complete.

For Facility Use Only

Approved By:	Approval Code:
Approval Date:	Comments:

Clearfield MMG
resourceful waste management

Waste Profile Form

Applicant / Agent Information

Company Name:	CH2M HILL, Inc. / Jacobs
Address:	2411 Dulles Corner Park, STE 600
City / State / Zip:	Herndon, VA 20171
Contact:	Laura Lampshire
Phone:	301.570.1042
e-mail:	laura.lampshire@jacobs.com

Generator Information

Company Name:	NRL-Chesapeake Bay Detachment
Address:	5813 Bayside Road
City / State / Zip:	Chesapeake Beach, MD
Contact:	Scott Lonesome
Phone:	202-359-9422
e-mail:	scott.lonesome@nrl.navy.mil

Project Description

Site Name: Fire Testing Area, Site 10, NRL Chesapeake Bay Detachment

Site Address: NRL Chesapeake Bay Detachment, Chesapeake Beach, MD

Source of Contamination: ☐ UST ☐ AST ☐ Spill ☑ Historical / Other: _____

Waste Generating Activity: Installation and Development of Monitoring Wells

Waste Characterization

Applicant must complete the following information and attach all supporting laboratory analyses and / or SDS utilized to characterize the material as non-hazardous and acceptable for receipt by Clearfield MMG.

Common Waste Name: Groundwater

Type of Waste: ☐ Soil ☐ Sludge ☑ Liquid ☐ Absorbents ☐ Other: _____

Type of Contamination: ☐ Unused Petroleum ☐ Used Petroleum ☐ No Petroleum ☑ Other

(list all contaminants & include type of petroleum, if any): See Analysis

Flash Point Range: >200 F **pH Range:** 7.8 **Reactive:** ☐ YES ☑ NO

Quantity: 7 **Units:** 55 Gallon Drums **Lab Analysis / SDS Attached:** ☑ YES ☐ NO

Generator Certification

I hereby certify, based upon my diligent inquiry into the activities and processes generating the waste described on this form, that these materials are not classified as listed or characteristic hazardous waste as regulated by the Commonwealth of Virginia or the state of origin of this waste; that the materials do not contain 50.0 parts per million or more of polychlorinated biphenyls (PCB's); that the analytical results, completed *Waste Profile Form* and attached documentation are a representative, true, and accurate description of these materials; that no deliberate or willful omissions have been made in the preparation of this form; and that all known or suspect hazards have been disclosed herein. I further acknowledge that I am aware it is the duty of all persons to dispose of their solid waste in a legal manner (Va.Code ' 10.1-1418.1.A).

LONESOME.SCOTT.LAMAR.1042506342 Digitally signed by LONESOME.SCOTT.LAMAR.1042506342 Date: 2021.01.07 12:00:41 -05'00'

Generator or Agent Signature / Date

Generator or Agent Printed Name

If I am an agent signing on behalf of the generator, I have confirmed with the generator that the information contained in this profile is accurate and complete.

For Facility Use Only

Approved By:	Approval Code:
Approval Date:	Comments:

Clearfield MMG
resourceful waste management

POST OFFICE BOX 1444 • CHESAPEAKE, VA 23327
PHONE: (757) 549-8448 • WWW.CLEARFIELDMMG.COM

NON-HAZARDOUS
SHIPPING MANIFEST

MANIFEST NO. _____

GENERATOR

NAME	NRL - Chesapeake Bay Detachment	TELEPHONE	202-359-9422
ADDRESS	5813 Bayside Road	CITY/STATE	Chesapeake Beach, MD
SHIPMENT ORIGIN	NRL-CBD, Site 10 Fire Testing Area	CITY/STATE	Chesapeake Beach, MD
AUTHORIZED AGENT	c/o CH2M HILL, Inc. / Jacobs	FIRM	
OTHER	PO # 148019237		

WASTE CHARACTERIZATION

WASTE NAME AND DESCRIPTION — **PHYSICAL STATE**

1. IDW Groundwater — SOLID _____ LIQUID / SLUDGE X

BULK LOAD WEIGHT / TONS _____ **CONTAINERS** TYPE 55 Gallon Drum QUANTITY 7

2. IDW Soil Cuttings — SOLID X LIQUID / SLUDGE _____

BULK LOAD WEIGHT / TONS _____ **CONTAINERS** TYPE 55 Gallon Drum QUANTITY 9

ADDITIONAL INFORMATION

Groundwater Contains PFAS > 70 ppt and must be solidifed and landfilled

GENERATOR'S CERTIFICATION

I hereby certify, to the best of my knowledge, that the materials characterized above are not classified as listed or characteristic hazardous waste as regulated by the Commonwealth of Virginia, the state of origin, or Federal Regulations. All containers have been properly marked / labeled and are in proper condition for transport according to all DOT and government regulations.

Scott Lonergan		01/21/2021
Generator / Agent's Printed Name	Signature	Date

TRANSPORTER

TRANSPORTER NAME Clearfield MMG, Inc. TELEPHONE 757-549-8448 TRUCK NO. 22

I certify that the materials described above were received by me for shipment and delivered to the designated facility.

	1-21-21
Transporter's Signature	Date

FACILITY

I certify that the materials described above were delivered to the facility and received by me.

DESIGNATED FACILITY: Chesapeake Facility, 3900 Shannon St.

Hunter McCrea		1/21/21
Printed Name	Signature	Date

FACILITY

Appendix E
Data Quality Assessment

TECHNICAL MEMORANDUM

Data Quality Assessment: PFAS SI at Site 10 - Fire Testing Area Naval Research Laboratory – Chesapeake Bay Detachment Chesapeake Beach, Maryland

DATE: July 29, 2021

Introduction

Aqueous film-forming foam (AFFF) was historically used during fire and emergency response, testing, and training activities at Site 10 - Fire Testing Area (FTA) at the Naval Research Laboratory – Chesapeake Bay Detachment (NRL-CBD) in Chesapeake Beach, Maryland. This historical use has prompted the Department of the Navy to conduct a per- and polyfluoroalkyl substances (PFAS) Site Inspection (SI) at the installation. The purpose of this Data Quality Assessment is to summarize the results of the data validation process for the soil, groundwater, surface water, and sediment samples collected from September through October, 2020, during the PFAS SI at Site 10.

Soil and water samples were submitted to Battelle Laboratories in Norwell, MA for PFAS analysis via Liquid Chromatography with tandem mass spectrometry (LC-MS/MS) compliant with Department of Defense Quality Systems Manual (DoD QSM) v. 5.3 Table B-15. A subset of samples were also submitted to Advanced Environmental Laboratories, Inc. (AEL) in Jacksonville, FL for analysis of Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) and Diesel Range Organics (DRO). The sample results were validated by Environmental Data Services, Inc. (EDS) to evaluate compliance against the analytical method and Quality Assurance Project Plan (QAPP) requirements. Data validation narratives, included in **Attachment 2** for the following sample delivery groups (SDGs), were reviewed and summarized for the purposes of this data quality assessment:

20-1215	20-1224	20-1225	20-1233
20-1245	20-1246	20-1255	20-1256
20-1283	20-1297	20-1298	20-1305
20-1310	20-1321	20-1329	20-1375
J2014423 (for TPH)			

The following SDGs are also part of this project:

20-1232	Aqueous field blanks only
20-1284	Aqueous field blanks only
20-1419	Re-extracts of eight surface water samples
20-1441	Re-extracts of two groundwater samples: HVG-GW10 and HVG-GW09
20-1455	Re-extracts of two groundwater samples: AOA-MW15 and AOA-MW16
20-1481	Re-extraction of one groundwater sample: AOA-MW18
20-1511	Re-extracts of three groundwater samples: AOA-MW17, S03-MW02, and AOA-MW09

20-1519	Re-extracts of one aqueous field blank and five groundwater samples collected 10/27-10/28/2020

The process of conducting this data quality assessment included a review of validated results to assess any potential impacts to their accuracy, precision, and completeness. Validation was performed based on:

- Quality assurance (QA)/quality control (QC) criteria in UFP-SAP (CH2M, 2020)
- DoD General Data Validation Guidelines (DoD, 2019)
- DoD Data Validation Guidelines Module 3 for PFAS (DoD, 2020)
- Analysis Methods (Battelle SOP 5-369-08 and SW-846 8015C)
- The reviewer's professional judgement

The QA/QC summary forms and data reports were reviewed, and the resulting findings are documented within each subsection that follows.

During the data validation by EDS, if QA/QC parameters exceeded their acceptance limits, associated sample results were qualified to indicate a potential anomaly with the data. Furthermore, a "reason code" was applied to indicate the reason for qualification. Qualifier definitions and reason codes are presented below.

Qualifier Definitions

The following primary qualifiers were used to qualify the data:

[None]: Detection. Further qualification was not warranted.

J: Estimated.

U: Nondetect or not detected at significantly greater than that in an associated blank.

UJ: Nondetect; estimated reporting limit.

Reason Codes

The following codes were used to indicate the reason for qualification:

EBL: Equipment Blank contamination

FD: Field Duplicate precision

MBL: Method Blank contamination

MSH: Matrix Spike recovery; high exceedance

MSL: Matrix Spike recovery; low exceedance

OT: "Other" – ion ratio exceeds percent difference (%D) criteria

SSL: Spiked Surrogate recovery; low exceedance

Quality Control Measures

The following list represents the QA/QC measures that were reviewed during the data quality evaluation procedure:

- Holding Times – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- Blank Samples – Method blank, equipment rinseate blank, and ambient field blank samples were provided for this project. Blank samples enable the reviewer to determine if an analyte may be attributed to sampling or laboratory procedures, rather than environmental contamination from site activities.

- Surrogate Recoveries – Surrogate compounds are added to each sample and the recoveries are used to monitor laboratory performance and possible matrix interference.
- Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) – These samples are a "controlled matrix", laboratory reagent water, in which target compounds have been added prior to extraction/analysis. The recoveries serve as a monitor of the overall performance of each step during the analysis, including sample preparation.
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples – Spike recovery is used to evaluate potential matrix interferences, as well as accuracy. Precision information is also determined by calculating the reproducibility between the recoveries of each spiked parameter.
- Field Duplicates – These samples are collected to determine precision between a parent sample and its duplicates. Precision, measured as percent difference, can only be calculated when target compounds are detected in both samples of the pair. Percent difference is only meaningful when results are sufficiently-high.
- Internal Standards – These are compounds added to the sample extracts prior to analysis. Their retention times and response are evaluated for method compliance. The internal standards are used in quantification of the target parameters and to monitor the instrument sensitivity and response for stability during analysis.
- Initial Calibration – The initial calibration ensures the instrument is capable of producing acceptable qualitative and quantitative data for the compounds of interest. Multiple standard solutions are analyzed to determine the response and linearity of the instrument over a varying concentration range.
- Continuing Calibration – The continuing calibration checks satisfactory performance of the instrument and its predicted response to the target compounds by analysis of a standard solution(s) at known concentrations.
- Sample Evaluation – Other miscellaneous QA/QC measures not listed above.

Quality Control Review

The QA/QC parameters for all samples were within acceptable control limits with the exceptions listed below. A brief overview of the data evaluation follows:

Holding Time

Acceptance criteria were met.

Recoveries – Surrogate, MS/MSD, and LCS/LCSD

Surrogates, MS/MSD, and LCS/LCSD recoveries met acceptance criteria with the exception of those listed below:

- MS/MSD:
  - Perfluorotridecanoic Acid (PFTrDA) was characterized by 242 percent recovery in the MS and 267 percent recovery in the MSD of CBD-AOA-SW10-1020, both of which exceeded the upper control limit of 144 percent. Associated results were already J-qualified as “estimated” by the laboratory.
  - Perfluoro-2-methyl-3-oxahexanoic acid (HFPO-DA) was characterized by 64 percent recovery in the MSD of CBD-AOA-MW08-1020, which exceeded the lower control limit of 70 percent. The MS was characterized by acceptable recovery. Associated results were UJ-qualified as “nondetect, estimated reporting limit”.
  - Perfluorohexanesulfonic acid (PFHxS) was characterized by 21 percent recovery in the MS and 0 percent recovery in the MSD of CBD-AOA-MW16-1020, both of which exceeded the lower control limit of 68 percent. Associated results were J-qualified as “estimated”.
  - Perfluorooctane Sulfonate (PFOS) was characterized by 21 percent recovery in the MS and 0 percent recovery in the MSD of CBD-AOA-MW16-1020, both of which exceeded the lower control limit of 65 percent. Associated results were J-qualified as “estimated”.

  - Perfluoroundecanoic Acid (PFUnA) was characterized by 22 percent recovery in the MS and 0 percent recovery in the MSD of CBD-AOA-SW10-1020, both of which exceeded the lower control limit of 69 percent. Associated results were J-qualified as “estimated”.

- Surrogates:
  - Various surrogates exceeded their lower control limit in various samples. Samples were re-extracted if necessary due to method requirements. This may be indicative of matrix effects. No surrogate recoveries were so severely-low that rejection of data was warranted. Associated results were J-qualified as “estimated” or UJ-qualified as “nondetect, estimated reporting limit”.
  - For results J-qualified as “estimated” and UJ-qualified as “nondetect, estimated reporting limit”, the data user should take care if concentrations are similar to screening levels. Affected data are summarized in **Attachment 1**.

Field Duplicate Precision

- Field duplicate pair CBD-AOA-SB25-1517 / CBD-AOA-SB25P-0810 was characterized by 97.4 percent relative percent difference (RPD) for Perfluorononanoic acid (PFNA) and hence did not meet the precision criterion of 35 percent RPD for soils.
- Field duplicate pair CBD-AOA-SW11-1020 / CBD-AOA-SW11P-1020 was characterized by 33.4 percent RPD for Perfluoroundecanoic Acid (PFUnA) and hence did not meet the precision criterion of 25 percent RPD for waters.

Associated results were J-qualified as estimated, as summarized in **Attachment 1**, notated with the MSH, MSL, or SSL reason code as applicable.

Field Blanks

Target analytes were detected in the following equipment rinseate blanks:

- CBD-AOA-EB02-100920-SO – Applies to soil samples collected 10/5-10/9/2020.
- CBD-AOA-EB01-101920-GW – Applies to groundwater samples collected 10/19/2020.
- CBD-AOA-EB01-102020-GW – Applies to groundwater samples collected 10/20/2020.
- CBD-AOA-EB01-102120-GW – Applies to groundwater samples collected 10/21/2020.
- CBD-AOA-EB01-102820-GW – Applies to groundwater samples collected 10/28/2020.

The following detections were observed (all results shown are at a 1X dilution factor):

Sample Name	Analyte	Result	Units	Flag	SDG
CBD-AOA-EB02-100920-SO	Perfluorooctane Sulfonate (PFOS)	13	NG_L	J	20-1284
CBD-AOA-EB01-101920-GW	Perfluorooctane Sulfonate (PFOS)	0.44	NG_L	J	20-1321
CBD-AOA-EB01-102020-GW	Perfluoroundecanoic Acid (PFUnA)	0.26	NG_L	J	20-1329
CBD-AOA-EB01-102120-GW	Perfluoroundecanoic Acid (PFUnA)	0.28	NG_L	J	20-1329
CBD-AOA-EB01-102820-GW	Perfluorotridecanoic Acid (PFTrDA)	0.29	NG_L	J	20-1375
CBD-AOA-EB01-102820-GW	Perfluorooctane Sulfonate (PFOS)	1.2	NG_L	J	20-1375

- Associated detections were U-qualified as “not detected at significantly greater than that in an associated blank” if this was the case, according to DV guidance. Please refer to **Attachment 1** for the affected results, notated with the “EBL” reason code.

- For results U-qualified due to blank contamination, the data user should understand that these were detected at the laboratory and subsequently U-qualified by the data validator. The data user should take care if results U-qualified due to blank contamination are greater than screening levels.

Laboratory Blanks

Target analytes were detected in the following laboratory method blanks:

- LE58 IB – Associated with SDG 20-1321.
- DB009PB-FS – Associated with SDG 20-1329.
- DB124PB-FS – Associated with SDG 20-1375.

The following detections were observed:

Sample Name	Analyte	Result (ng/L)	SDG
LE58 IB	N-Methyl Perfluorooctanesulfonamidoacetic Acid (MeFOSAA)	0.387	20-1321
DB009PB-FS	Perfluorobutanesulfonic acid (PFBS)	0.166	20-1329
DB009PB-FS	Perfluorohexanesulfonic acid (PFHxS)	0.155	20-1329
DB009PB-FS	Perfluorooctane Sulfonate (PFOS)	0.661	20-1329
DB124PB-FS	Perfluorohexanoic Acid (PFHxA)	1.02	20-1375

Note:

ng/L = nanogram(s) per liter

- Associated detections were U-qualified as “not detected at significantly greater than that in an associated blank” if this was the case, according to DV guidance. Please refer to **Attachment 1** for the affected results, notated with the “MBL” reason code.
- For results U-qualified due to blank contamination, the data user should understand that these were detected at the laboratory and subsequently U-qualified by the data validator. The data user should take care if results U-qualified due to blank contamination are greater than screening levels.

Calibration

Acceptance criteria were met.

Serial Dilution

Acceptance criteria were met.

Sample Evaluation

For two results, Perfluoroundecanoic Acid (PFUnA) in CBD-AOA-SS01-000H and MeFOSAA in CBD-AOA-SS19-000H, the ion ratio did not meet criteria. Ion ratios can be used to determine if the sample matrix resulted in a bias in the results. Ion ratio failures could be caused by matrix interference and/or the presence of isomers in the sample at different ratios than the calibration standards. Associated data were J-qualified as “estimated”. Please refer to **Attachment 1** for the affected results, notated with the “OT” reason code.

Reporting Limits Evaluation

Laboratory detection limits, limits of detection, and limit of quantitation were evaluated and compared to the project quantitation limit goals and screening levels. They were found to be acceptable.

PARCC

Precision is assessed via the agreement between duplicate results and was evaluated by comparing recoveries between MS and MSD and between parents and field duplicates. Precision was always within acceptable limits, with the exception of the four results J-qualified due to field duplicate precision, described above. Although the J-qualification of results indicates that they are "estimated", the exceedance was not so severe as to warrant rejection. Therefore, there were no significant negative impacts on precision.

Accuracy is a measure of the agreement between an experimental determination and the true value of the parameter being measured. Each sample was spiked with surrogate compounds. Additionally, an MS/MSD and LCS were spiked with a known concentration of each target compound before preparation. Internal standards also provide a measure of accuracy. Recovery of internal standards, surrogates, and MS/MSDs provides a measure of the matrix effects on the analytical accuracy. The LCS demonstrates accuracy of the method and the laboratory's ability to meet the method criteria. Accuracy is also assessed by calibration responses. Potential biases and trends were evaluated by first determining whether a QA/QC exceedance may indicate a potential bias or trend. If so, then the exceedance was examined to determine whether the bias or trend was significant enough to warrant rejection of data. All spike recoveries were within acceptable limits with the exception of those described above. Spike recovery exceedances were likely the result of matrix interference. No spike recovery exceedances were so severe as to warrant rejection. Although the J- and UJ-qualification of results indicates that they are "estimated" and "nondetect, estimated reporting limit", respectively, there were no significant negative impacts on accuracy as evidenced by the absence of R-qualification (rejection).

Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition (e.g., nature and extent of contamination). Representativeness is a subjective parameter and is used to evaluate the efficacy of the sample planning design. In terms of data quality, representativeness was assured, because the sampling team followed approved standard operating procedures (SOPs) for sample collection and handling, and the accredited laboratories followed approved SOPs for sample handling, preparation, and analysis. All field samples were collected and analyzed as proposed in the SAP.

Completeness is defined as the percentage of measurements that are judged to be valid; validity being defined by the data quality objectives. Therefore, completeness is calculated as the number of analytically sound results that are available for use compared to the total number of measurements made. Data validation guidance designates all results, except those R-qualified as "rejected", as available for use. The R-qualifier is the only qualifier that negatively affects a data point's availability. This data set is 100 percent complete and the completeness goal of 95 percent was easily met.

Comparability is another qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix, and analytical methods. In this case, because approved SOPs were used for sample collection and handling, common sample matrices (for example, soil, groundwater, and surface water/sediment) were evaluated, and typical United States Environmental Protection Agency methods were utilized, the data user may express confidence in that fact that this data set is comparable to others of acceptable data quality. Comparability is controlled by the other PARCC parameters, because data sets can be compared with confidence only when precision and accuracy are known. Precision and accuracy were demonstrated to be acceptable, and the data user may be confident that this data set is comparable to others of high data quality.

The data validator re-calculated 10 percent of laboratory results as described in their statement of work. No anomalies were found. No error in professional judgment was identified as part of this data quality evaluation.

Conclusion

It should be noted that, aside from the discussion above, all other QA/QC were within specification, and did not result in qualification of data. Overall, the data were found to be of acceptable quality and quantity, and there

were no rejected data. No data gaps were identified. A review of the analytical data submitted for the September-October, 2020 NRL-CBD Site 10 FTA PFAS and TPH sampling event has been completed. The data quality evaluation demonstrated that the analytical systems were generally in control and all the results are available for use in the project decision-making process.

References

CH2M HILL, Inc. (CH2M). 2020. *Sampling and Analysis Plan, Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory-Chesapeake Bay Detachment, Chesapeake Beach, Maryland*. August.

Department of Defense (DoD). 2019. *General Data Validation Guidelines*. November.

DoD. 2020. *Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15*. May.

Attachment 1
Qualified Data

Attachment 1. Qualified Data

Sample ID	Analysis Method	Parameter	CAS	Lab Result	Lab Flag	Final Result	DV Flag	Units	Reason Code	SDG
CBD-AOA-MW01-1020	PFAS_QSM5.3	N-Methyl Perfluorooctanesulfonamidoacetic Acid (MeFOSAA)	2355-31-9	0.76	J	0.96	U	NG_L	MBL	20-1321
CBD-AOA-MW01P-1020 [FD]	PFAS_QSM5.3	N-Methyl Perfluorooctanesulfonamidoacetic Acid (MeFOSAA)	2355-31-9	0.84	J	0.94	U	NG_L	MBL	20-1321
CBD-AOA-MW03-1020	PFAS_QSM5.3	N-Methyl Perfluorooctanesulfonamidoacetic Acid (MeFOSAA)	2355-31-9	1.05	J	1.05	U	NG_L	MBL	20-1321
CBD-AOA-MW05-1020	PFAS_QSM5.3	Perfluorobutanesulfonic acid (PFBS)	375-73-5	0.93	J	0.93	U	NG_L	MBL	20-1329
CBD-AOA-MW05-1020	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	0.71	J	0.94	U	NG_L	MBL	20-1329
CBD-AOA-MW06-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	1.46	J	1.46	U	NG_L	MBL	20-1375
CBD-AOA-MW06-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.92	U	1.92	UJ	NG_L	SSL	20-1375
CBD-AOA-MW07-1020	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	3.94	J	3.94	U	NG_L	MBL	20-1329
CBD-AOA-MW07-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.28	J	0.45	U	NG_L	EBL	20-1329
CBD-AOA-MW08-1020	PFAS_QSM5.3	Perfluoro-2-methyl-3-oxahexanoic acid (HFPO-DA)	13252-13-6	0.48	U	0.48	UJ	NG_L	MSL	20-1321
CBD-AOA-MW09-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.85	U	1.85	UJ	NG_L	SSL	20-1329
CBD-AOA-MW09-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.28	J	0.46	U	NG_L	EBL	20-1329
CBD-AOA-MW11-1020	PFAS_QSM5.3	Perfluoro-2-methyl-3-oxahexanoic acid (HFPO-DA)	13252-13-6	0.46	U	0.46	UJ	NG_L	SSL	20-1375
CBD-AOA-MW11-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	0.92	U	0.92	UJ	NG_L	SSL	20-1375
CBD-AOA-MW11-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	1.39	U	1.39	UJ	NG_L	SSL	20-1375
CBD-AOA-MW11P-1020 [FD]	PFAS_QSM5.3	Perfluoro-2-methyl-3-oxahexanoic acid (HFPO-DA)	13252-13-6	0.49	U	0.49	UJ	NG_L	SSL	20-1375
CBD-AOA-MW11P-1020 [FD]	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	0.98	U	0.98	UJ	NG_L	SSL	20-1375
CBD-AOA-MW11P-1020 [FD]	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	1.47	U	1.47	UJ	NG_L	SSL	20-1375
CBD-AOA-MW12-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	0.9	U	0.9	UJ	NG_L	SSL	20-1375
CBD-AOA-MW12-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	1.36	U	1.36	UJ	NG_L	SSL	20-1375
CBD-AOA-MW14-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	4.36	J	4.36	UJ	NG_L	SSL	20-1375
CBD-AOA-MW14-1020	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	4.25	J	4.25	U	NG_L	EBL	20-1375
CBD-AOA-MW15-1020	PFAS_QSM5.3	N-Ethyl Perfluorooctanesulfonamidoacetic Acid (EtFOSAA)	2991-50-6	0.96	U	0.96	UJ	NG_L	SSL	20-1310
CBD-AOA-MW15-1020	PFAS_QSM5.3	Perfluorododecanoic Acid (PFDoA)	307-55-1	0.48	U	0.48	UJ	NG_L	SSL	20-1310
CBD-AOA-MW15-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.92	U	1.92	UJ	NG_L	SSL	20-1310
CBD-AOA-MW16-1020	PFAS_QSM5.3	Perfluorododecanoic Acid (PFDoA)	307-55-1	0.48	U	0.48	UJ	NG_L	SSL	20-1310
CBD-AOA-MW16-1020	PFAS_QSM5.3	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	118		118	J	NG_L	MSL	20-1310
CBD-AOA-MW16-1020	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	92		92	J	NG_L	MSL	20-1310
CBD-AOA-MW16-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.92	U	1.92	UJ	NG_L	SSL	20-1310
CBD-AOA-MW17-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.85	U	1.85	UJ	NG_L	SSL	20-1329
CBD-AOA-MW17-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.4	J	0.46	U	NG_L	EBL	20-1329
CBD-AOA-MW18-1020	PFAS_QSM5.3	N-Methyl Perfluorooctanesulfonamidoacetic Acid (MeFOSAA)	2355-31-9	0.44	J	0.98	U	NG_L	MBL	20-1321
CBD-AOA-MW18-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.96	U	1.96	UJ	NG_L	SSL	20-1321
CBD-AOA-SB02-0810	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	10.4		10.4	U	NG_G	EBL	20-1215
CBD-AOA-SB03-0810	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	96.7		96.7	U	NG_G	EBL	20-1215
CBD-AOA-SB05-1113	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	11		11	U	NG_G	EBL	20-1256
CBD-AOA-SB05P-1113 [FD]	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	12.9		12.9	U	NG_G	EBL	20-1256
CBD-AOA-SB06-0709	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	41		41	U	NG_G	EBL	20-1215
CBD-AOA-SB07-0809	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	16.3		16.3	U	NG_G	EBL	20-1245
CBD-AOA-SB08-0810	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	24.9		24.9	U	NG_G	EBL	20-1215
CBD-AOA-SB11-1315	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	115		115	U	NG_G	EBL	20-1246
CBD-AOA-SB14-1012	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	6.58		6.58	U	NG_G	EBL	20-1256
CBD-AOA-SB15-0810	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	5.29	J	5.29	U	NG_G	EBL	20-1256
CBD-AOA-SB15-1113	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	15.2		15.2	U	NG_G	EBL	20-1256
CBD-AOA-SB15P-1113 [FD]	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	14.7		14.7	U	NG_G	EBL	20-1256
CBD-AOA-SB16-0608	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	6.69		6.69	U	NG_G	EBL	20-1255
CBD-AOA-SB18-0204	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	84.6		84.6	U	NG_G	EBL	20-1246

Attachment 1. Qualified Data

Sample ID	Analysis Method	Parameter	CAS	Lab Result	Lab Flag	Final Result	DV Flag	Units	Reason Code	SDG
CBD-AOA-SB18-0809	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	6.1	J	6.1	U	NG_G	EBL	20-1246
CBD-AOA-SB19-0608	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	123		123	U	NG_G	EBL	20-1246
CBD-AOA-SB20-0810	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	4.63	J	4.63	U	NG_G	EBL	20-1246
CBD-AOA-SB21-1516	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	15		15	U	NG_G	EBL	20-1233
CBD-AOA-SB22-0911	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	1.38	J	2.38	U	NG_G	EBL	20-1233
CBD-AOA-SB23-1516	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	1.78	J	2.60	U	NG_G	EBL	20-1283
CBD-AOA-SB24-0103	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	39.5		39.5	U	NG_G	EBL	20-1233
CBD-AOA-SB25-1517	PFAS_QSM5.3	Perfluorononanoic acid (PFNA)	375-95-1	47.6		47.6	J	NG_G	FD	20-1225
CBD-AOA-SB25P-0810 [FD]	PFAS_QSM5.3	Perfluorononanoic acid (PFNA)	375-95-1	138	D	138	J	NG_G	FD	20-1225
CBD-AOA-SB27-1012	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	1.49	J	2.45	U	NG_G	EBL	20-1255
CBD-AOA-SB27P-1012 [FD]	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	1.7	J	2.16	U	NG_G	EBL	20-1255
CBD-AOA-SB28-0809	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	2.83	J	2.83	U	NG_G	EBL	20-1283
CBD-AOA-SB28-1516	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	15.2		15.2	U	NG_G	EBL	20-1283
CBD-AOA-SB29-0608	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	3.15	J	3.15	U	NG_G	EBL	20-1233
CBD-AOA-SB29-0810	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	3.61	J	3.61	U	NG_G	EBL	20-1233
CBD-AOA-SS01-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	19.6		19.6	U	NG_G	EBL	20-1225
CBD-AOA-SS01-000H	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	158	DQ	158	J	NG_G	OT	20-1225
CBD-AOA-SS01P-000H [FD]	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	20.4		20.4	U	NG_G	EBL	20-1225
CBD-AOA-SS02-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	58.7		58.7	U	NG_G	EBL	20-1215
CBD-AOA-SS03-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	84.6		84.6	U	NG_G	EBL	20-1215
CBD-AOA-SS05-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	11		11	U	NG_G	EBL	20-1256
CBD-AOA-SS06-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	19.7		19.7	U	NG_G	EBL	20-1215
CBD-AOA-SS07-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	34.3		34.3	U	NG_G	EBL	20-1245
CBD-AOA-SS11-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	128		128	U	NG_G	EBL	20-1246
CBD-AOA-SS11P-000H [FD]	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	114		114	U	NG_G	EBL	20-1246
CBD-AOA-SS12-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	36.2		36.2	U	NG_G	EBL	20-1246
CBD-AOA-SS13-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	6.18		6.18	U	NG_G	EBL	20-1255
CBD-AOA-SS14-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	3.87	J	3.87	U	NG_G	EBL	20-1256
CBD-AOA-SS15-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	6.51		6.51	U	NG_G	EBL	20-1256
CBD-AOA-SS16-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	16.1		16.1	U	NG_G	EBL	20-1255
CBD-AOA-SS18-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	82.1		82.1	U	NG_G	EBL	20-1246
CBD-AOA-SS19-000H	PFAS_QSM5.3	N-Methyl Perfluorooctanesulfonamidoacetic Acid (MeFOSAA)	2355-31-9	8.05	Q	8.05	J	NG_G	OT	20-1246
CBD-AOA-SS21-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	7.12		7.12	U	NG_G	EBL	20-1233
CBD-AOA-SS21P-000H [FD]	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	6.41		6.41	U	NG_G	EBL	20-1233
CBD-AOA-SS22-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	7.91		7.91	U	NG_G	EBL	20-1233
CBD-AOA-SS23-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	16.1		16.1	U	NG_G	EBL	20-1283
CBD-AOA-SS24-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	7.1		7.1	U	NG_G	EBL	20-1233
CBD-AOA-SS25-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	91		91	U	NG_G	EBL	20-1225
CBD-AOA-SS27-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	64.2		64.2	U	NG_G	EBL	20-1255
CBD-AOA-SS28-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	1.09	J	2.07	U	NG_G	EBL	20-1283
CBD-AOA-SS29-000H	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	6.4		6.4	U	NG_G	EBL	20-1233
CBD-AOA-SW01-1020	PFAS_QSM5.3	Perfluoro-2-methyl-3-oxahexanoic acid (HFPO-DA)	13252-13-6	0.46	U	0.46	UJ	NG_L	SSL	20-1298
CBD-AOA-SW01-1020	PFAS_QSM5.3	Perfluorobutanesulfonic acid (PFBS)	375-73-5	1.74	J	1.74	J	NG_L	SSL	20-1298
CBD-AOA-SW01-1020	PFAS_QSM5.3	Perfluorododecanoic Acid (PFDoA)	307-55-1	0.46	U	0.46	UJ	NG_L	SSL	20-1298
CBD-AOA-SW01-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	1.44	J	1.44	J	NG_L	SSL	20-1298
CBD-AOA-SW01-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	2.84	J	2.84	J	NG_L	SSL	20-1298
CBD-AOA-SW01-1020	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	12.8		12.8	J	NG_L	SSL	20-1298

Attachment 1. Qualified Data

Sample ID	Analysis Method	Parameter	CAS	Lab Result	Lab Flag	Final Result	DV Flag	Units	Reason Code	SDG
CBD-AOA-SW01-1020	PFAS_QSM5.3	Perfluorooctanoic acid (PFOA)	335-67-1	2.93	J	2.93	J	NG_L	SSL	20-1298
CBD-AOA-SW01-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.85	U	1.85	UJ	NG_L	SSL	20-1298
CBD-AOA-SW01-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.46	J	0.46	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS	763051-92-9	0.94	U	0.94	UJ	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	0.94	U	0.94	UJ	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	0.47	U	0.47	UJ	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	N-Ethyl Perfluorooctanesulfonamidoacetic Acid (EtFOSAA)	2991-50-6	0.94	U	0.94	UJ	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	N-Methyl Perfluorooctanesulfonamidoacetic Acid (MeFOSAA)	2355-31-9	0.94	U	0.94	UJ	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluoro-2-methyl-3-oxahexanoic acid (HFPO-DA)	13252-13-6	0.47	U	0.47	UJ	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorobutanesulfonic acid (PFBS)	375-73-5	2.41	J	2.41	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorodecanoic Acid (PFDA)	335-76-2	0.36	J	0.36	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorododecanoic Acid (PFDoA)	307-55-1	0.47	U	0.47	UJ	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	4.36	J	4.36	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	56.8		56.8	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	9.51		9.51	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorononanoic acid (PFNA)	375-95-1	5.16		5.16	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	58.4		58.4	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorooctanoic acid (PFOA)	335-67-1	10.1		10.1	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.89	U	1.89	UJ	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.32	J	0.32	J	NG_L	SSL	20-1298
CBD-AOA-SW02-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	2.17	J	2.17	J	NG_L	SSL	20-1298
CBD-AOA-SW02P-1020 [FD]	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	4.64	J	4.64	J	NG_L	SSL	20-1298
CBD-AOA-SW02P-1020 [FD]	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	10.6		10.6	J	NG_L	SSL	20-1298
CBD-AOA-SW02P-1020 [FD]	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.89	U	1.89	UJ	NG_L	SSL	20-1298
CBD-AOA-SW03-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	17.9		17.9	J	NG_L	SSL	20-1298
CBD-AOA-SW03-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	34.3		34.3	J	NG_L	SSL	20-1298
CBD-AOA-SW03-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	2	U	2	UJ	NG_L	SSL	20-1298
CBD-AOA-SW04-1020	PFAS_QSM5.3	Perfluorododecanoic Acid (PFDoA)	307-55-1	0.5	U	0.5	UJ	NG_L	SSL	20-1298
CBD-AOA-SW04-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	10.1		10.1	J	NG_L	SSL	20-1298
CBD-AOA-SW04-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	24		24	J	NG_L	SSL	20-1298
CBD-AOA-SW04-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	2.02	U	2.02	UJ	NG_L	SSL	20-1298
CBD-AOA-SW05-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	57.1		57.1	J	NG_L	SSL	20-1298
CBD-AOA-SW05-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	128		128	J	NG_L	SSL	20-1298
CBD-AOA-SW05-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.92	U	1.92	UJ	NG_L	SSL	20-1298
CBD-AOA-SW06-1020	PFAS_QSM5.3	Perfluorododecanoic Acid (PFDoA)	307-55-1	1.51	J	1.51	J	NG_L	SSL	20-1298
CBD-AOA-SW06-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.92	U	1.92	UJ	NG_L	SSL	20-1298
CBD-AOA-SW07-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	59.5		59.5	J	NG_L	SSL	20-1298
CBD-AOA-SW07-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	124		124	J	NG_L	SSL	20-1298
CBD-AOA-SW09-1020	PFAS_QSM5.3	Perfluorododecanoic Acid (PFDoA)	307-55-1	3.14	J	3.14	J	NG_L	SSL	20-1298
CBD-AOA-SW09-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	2	U	2	UJ	NG_L	SSL	20-1298
CBD-AOA-SW10-1020	PFAS_QSM5.3	Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	4	J	4	J	NG_L	MSH	20-1298
CBD-AOA-SW10-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	99	D	99	J	NG_L	MSL	20-1298
CBD-AOA-SW11-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.89	U	1.89	UJ	NG_L	SSL	20-1298
CBD-AOA-SW11-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	81.4		81.4	J	NG_L	FD	20-1298
CBD-AOA-SW11P-1020 [FD]	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	1.85	U	1.85	UJ	NG_L	SSL	20-1298
CBD-AOA-SW11P-1020 [FD]	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	114		114	J	NG_L	FD	20-1298
CBD-BKG-MW01-1020	PFAS_QSM5.3	Perfluorobutanesulfonic acid (PFBS)	375-73-5	1.19	J	1.19	U	NG_L	MBL	20-1329

Attachment 1. Qualified Data

Sample ID	Analysis Method	Parameter	CAS	Lab Result	Lab Flag	Final Result	DV Flag	Units	Reason Code	SDG
CBD-BKG-MW01-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.24	J	0.46	U	NG_L	EBL	20-1329
CBD-BKG-MW02-1020	PFAS_QSM5.3	Perfluorobutanesulfonic acid (PFBS)	375-73-5	0.99	J	0.99	U	NG_L	MBL	20-1329
CBD-BKG-MW02-1020	PFAS_QSM5.3	Perfluorooctane Sulfonate (PFOS)	1763-23-1	2.25	J	2.25	U	NG_L	MBL	20-1329
CBD-BKG-MW02-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.23	J	0.46	U	NG_L	EBL	20-1329
CBD-HVGGW09-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	1.42	U	1.42	UJ	NG_L	SSL	20-1305
CBD-HVGGW10-1020	PFAS_QSM5.3	Perfluorobutanesulfonic acid (PFBS)	375-73-5	2.82	J	2.82	J	NG_L	SSL	20-1305
CBD-HVGGW10-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	1	U	1	UJ	NG_L	SSL	20-1305
CBD-HVGGW10-1020	PFAS_QSM5.3	Perfluorohexanoic Acid (PFHxA)	307-24-4	1.5	U	1.5	UJ	NG_L	SSL	20-1305
CBD-HVGGW10-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	2	U	2	UJ	NG_L	SSL	20-1305
CBD-S03-MW02-1020	PFAS_QSM5.3	Perfluorotetradecanoic Acid (PFTeDA)	376-06-7	2	U	2	UJ	NG_L	SSL	20-1329
CBD-S03-MW02-1020	PFAS_QSM5.3	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.48	J	0.50	U	NG_L	EBL	20-1329
CBD-S03-MW02-1020	8015C_D	TPH-Diesel Range	TPH-DRO	220	J	220	J	UG_L	SSL	J2014423
CBD-S04-MW01-1020	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	51.1		51.1	J	NG_L	SSL	20-1305
CBD-S04-MW01P-1020 [FD]	PFAS_QSM5.3	Perfluoroheptanoic acid (PFHpA)	375-85-9	53.7		53.7	J	NG_L	SSL	20-1305

Attachment 2
Data Validation Reports

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1215
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 8, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SS02-000H	G0904-FS	Soil
2	CBD-AOA-SB02-0810	G0905-FS	Soil
3	CBD-AOA-SS03-000H	G0906-FS	Soil
4	CBD-AOA-SB03-0810	G0907-FS	Soil
5	CBD-AOA-SS06-000H	G0908-FS	Soil
6	CBD-AOA-SB06-0709	G0909-FS	Soil
7	CBD-AOA-SS08-000H	G0910-FS	Soil
8	CBD-AOA-SB08-0810	G0911-FS	Soil

A Stage 2B/4 data validation was performed on the analytical data for eight soil samples collected on September 30, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for soil samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-100220-SO	PFOS	9.86	U	1-6, 8
CBD-AOA-FB01-100220	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS02-000H
Battelle ID	G0904-FS
Sample Type	SA
Collection Date	09/30/2020
Extraction Date	10/01/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	34.50
Matrix	SO
Sample Size	1.30
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.19 J	G0904-FS(3)	10.000	10/6/2020	1.09	3.08	7.69	
PFHpA	375-85-9	1.50 J	G0904-FS(3)	10.000	10/6/2020	0.780	2.31	7.69	
PFOA	335-67-1	2.22 J	G0904-FS(3)	10.000	10/6/2020	0.930	3.08	7.69	
PFNA	375-95-1	5.66 J	G0904-FS(3)	10.000	10/6/2020	0.760	1.54	7.69	
PFDA	335-76-2	2.90 J	G0904-FS(3)	10.000	10/6/2020	0.710	1.54	7.69	
PFUnA	2058-94-8	93.9	G0904-FS(3)	10.000	10/6/2020	0.700	1.54	7.69	
PFDoA	307-55-1	6.52 J	G0904-FS(3)	10.000	10/6/2020	0.940	3.08	7.69	
PFTrDA	72629-94-8	85.4	G0904-FS(3)	10.000	10/6/2020	0.430	1.54	7.69	
PFTeDA	376-06-7	3.85 U	G0904-FS(3)	10.000	10/6/2020	1.66	3.85	7.69	
NMeFOSAA	2355-31-9	3.85 U	G0904-FS(3)	10.000	10/6/2020	1.57	3.85	7.69	
NEtFOSAA	2991-50-6	3.08 U	G0904-FS(3)	10.000	10/6/2020	1.15	3.08	7.69	
PFBS	375-73-5	1.54 U	G0904-FS(3)	10.000	10/6/2020	0.540	1.54	7.69	
PFHxS	355-46-4	6.82 J	G0904-FS(3)	10.000	10/6/2020	1.24	3.08	7.69	
PFOS	1763-23-1	58.7 u	G0904-FS(3)	10.000	10/6/2020	1.06	3.08	7.69	EBL
HFPO-DA	13252-13-6	3.08 U	G0904-FS(3)	10.000	10/6/2020	0.990	3.08	7.69	
Adona	919005-14-4	3.08 U	G0904-FS(3)	10.000	10/6/2020	1.28	3.08	7.69	
9Cl-PF3ONS	756426-58-1	1.54 U	G0904-FS(3)	10.000	10/6/2020	0.740	1.54	7.69	
11Cl-PF3OUdS	763051-92-9	2.31 U	G0904-FS(3)	10.000	10/6/2020	0.810	2.31	7.69	

NW 1/8/21

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB02-0810
Battelle ID	G0905-FS
Sample Type	SA
Collection Date	09/30/2020
Extraction Date	10/01/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	31.10
Matrix	SO
Sample Size	1.38
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.90 U	G0905-FS(3)	10.000	10/6/2020	1.02	2.90	7.25	
PFHpA	375-85-9	2.17 U	G0905-FS(3)	10.000	10/6/2020	0.730	2.17	7.25	
PFOA	335-67-1	2.90 U	G0905-FS(3)	10.000	10/6/2020	0.880	2.90	7.25	
PFNA	375-95-1	1.45 U	G0905-FS(3)	10.000	10/6/2020	0.710	1.45	7.25	
PFDA	335-76-2	1.45 U	G0905-FS(3)	10.000	10/6/2020	0.670	1.45	7.25	
PFUnA	2058-94-8	5.10 J	G0905-FS(3)	10.000	10/6/2020	0.660	1.45	7.25	
PFDoA	307-55-1	2.90 U	G0905-FS(3)	10.000	10/6/2020	0.890	2.90	7.25	
PFTrDA	72629-94-8	1.55 J	G0905-FS(3)	10.000	10/6/2020	0.410	1.45	7.25	
PFTeDA	376-06-7	3.62 U	G0905-FS(3)	10.000	10/6/2020	1.57	3.62	7.25	
NMeFOSAA	2355-31-9	3.62 U	G0905-FS(3)	10.000	10/6/2020	1.48	3.62	7.25	
NEtFOSAA	2991-50-6	2.90 U	G0905-FS(3)	10.000	10/6/2020	1.08	2.90	7.25	
PFBS	375-73-5	1.45 U	G0905-FS(3)	10.000	10/6/2020	0.510	1.45	7.25	
PFHxS	355-46-4	1.32 J	G0905-FS(3)	10.000	10/6/2020	1.17	2.90	7.25	
PFOS	1763-23-1	10.4 U	G0905-FS(3)	10.000	10/6/2020	1.00	2.90	7.25	EBL
HFPO-DA	13252-13-6	2.90 U	G0905-FS(3)	10.000	10/6/2020	0.930	2.90	7.25	
Adona	919005-14-4	2.90 U	G0905-FS(3)	10.000	10/6/2020	1.20	2.90	7.25	
9Cl-PF3ONS	756426-58-1	1.45 U	G0905-FS(3)	10.000	10/6/2020	0.700	1.45	7.25	
11Cl-PF3OUdS	763051-92-9	2.17 U	G0905-FS(3)	10.000	10/6/2020	0.760	2.17	7.25	

NW 11/8/21

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS03-000H
Battelle ID	G0906-FS
Sample Type	SA
Collection Date	09/30/2020
Extraction Date	10/01/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	20.58
Matrix	SO
Sample Size	1.57
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	3.73 J	G0906-FS(3)	10.000	10/6/2020	0.900	2.55	6.37	
PFHpA	375-85-9	3.17 J	G0906-FS(3)	10.000	10/6/2020	0.640	1.91	6.37	
PFOA	335-67-1	4.02 J	G0906-FS(3)	10.000	10/6/2020	0.770	2.55	6.37	
PFNA	375-95-1	6.52	G0906-FS(3)	10.000	10/6/2020	0.630	1.27	6.37	
PFDA	335-76-2	4.83 J	G0906-FS(3)	10.000	10/6/2020	0.590	1.27	6.37	
PFUnA	2058-94-8	70.3	G0906-FS(3)	10.000	10/6/2020	0.580	1.27	6.37	
PFDoA	307-55-1	9.77	G0906-FS(3)	10.000	10/6/2020	0.780	2.55	6.37	
PFTrDA	72629-94-8	164	G0906-FS-D(5)	50.000	10/7/2020	1.78	6.37	31.9	
PFTeDA	376-06-7	2.39 J	G0906-FS(3)	10.000	10/6/2020	1.38	3.18	6.37	
NMeFOSAA	2355-31-9	3.18 U	G0906-FS(3)	10.000	10/6/2020	1.30	3.18	6.37	
NEtFOSAA	2991-50-6	1.72 J	G0906-FS(3)	10.000	10/6/2020	0.950	2.55	6.37	
PFBS	375-73-5	1.27 U	G0906-FS(3)	10.000	10/6/2020	0.450	1.27	6.37	
PFHxS	355-46-4	23.1	G0906-FS(3)	10.000	10/6/2020	1.03	2.55	6.37	
PFOS	1763-23-1	84.6 U	G0906-FS(3)	10.000	10/6/2020	0.880	2.55	6.37	EBL
HFPO-DA	13252-13-6	2.55 U	G0906-FS(3)	10.000	10/6/2020	0.820	2.55	6.37	
Adona	919005-14-4	2.55 U	G0906-FS(3)	10.000	10/6/2020	1.06	2.55	6.37	
9Cl-PF3ONS	756426-58-1	1.27 U	G0906-FS(3)	10.000	10/6/2020	0.610	1.27	6.37	
11Cl-PF3OUdS	763051-92-9	1.91 U	G0906-FS(3)	10.000	10/6/2020	0.670	1.91	6.37	

nw 1/8/21

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

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Client ID	CBD-AOA-SB03-0810
Battelle ID	G0907-FS
Sample Type	SA
Collection Date	09/30/2020
Extraction Date	10/01/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	37.50
Matrix	SO
Sample Size	1.26
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	5.84 J	G0907-FS(3)	10.000	10/6/2020	1.12	3.17	7.94	
PFHpA	375-85-9	1.41 J	G0907-FS(3)	10.000	10/6/2020	0.800	2.38	7.94	
PFOA	335-67-1	5.68 J	G0907-FS(3)	10.000	10/6/2020	0.960	3.17	7.94	
PFNA	375-95-1	13.8	G0907-FS(3)	10.000	10/6/2020	0.780	1.59	7.94	
PFDA	335-76-2	1.59 U	G0907-FS(3)	10.000	10/6/2020	0.730	1.59	7.94	
PFUnA	2058-94-8	3.65 J	G0907-FS(3)	10.000	10/6/2020	0.730	1.59	7.94	
PFDoA	307-55-1	3.17 U	G0907-FS(3)	10.000	10/6/2020	0.970	3.17	7.94	
PFTrDA	72629-94-8	1.59 U	G0907-FS(3)	10.000	10/6/2020	0.440	1.59	7.94	
PFTeDA	376-06-7	3.97 U	G0907-FS(3)	10.000	10/6/2020	1.71	3.97	7.94	
NMeFOSAA	2355-31-9	3.97 U	G0907-FS(3)	10.000	10/6/2020	1.62	3.97	7.94	
NEtFOSAA	2991-50-6	3.17 U	G0907-FS(3)	10.000	10/6/2020	1.19	3.17	7.94	
PFBS	375-73-5	1.59 U	G0907-FS(3)	10.000	10/6/2020	0.560	1.59	7.94	
PFHxS	355-46-4	12.6	G0907-FS(3)	10.000	10/6/2020	1.28	3.17	7.94	
PFOS	1763-23-1	96.7 u	G0907-FS(3)	10.000	10/6/2020	1.10	3.17	7.94	EBL
HFPO-DA	13252-13-6	3.17 U	G0907-FS(3)	10.000	10/6/2020	1.02	3.17	7.94	
Adona	919005-14-4	3.17 U	G0907-FS(3)	10.000	10/6/2020	1.32	3.17	7.94	
9Cl-PF3ONS	756426-58-1	1.59 U	G0907-FS(3)	10.000	10/6/2020	0.770	1.59	7.94	
11Cl-PF3OUdS	763051-92-9	2.38 U	G0907-FS(3)	10.000	10/6/2020	0.830	2.38	7.94	

AW 1/8/21

Analyzed by: Griffith, Lauren
Printed: 10/8/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS06-000H
Battelle ID	G0908-FS
Sample Type	SA
Collection Date	09/30/2020
Extraction Date	10/01/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	17.55
Matrix	SO
Sample Size	1.55
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.77 J	G0908-FS(3)	10.000	10/6/2020	0.910	2.58	6.45	
PFHpA	375-85-9	2.30 J	G0908-FS(3)	10.000	10/6/2020	0.650	1.94	6.45	
PFOA	335-67-1	1.76 J	G0908-FS(3)	10.000	10/6/2020	0.780	2.58	6.45	
PFNA	375-95-1	2.41 J	G0908-FS(3)	10.000	10/6/2020	0.630	1.29	6.45	
PFDA	335-76-2	3.89 J	G0908-FS(3)	10.000	10/6/2020	0.600	1.29	6.45	
PFUnA	2058-94-8	92.6	G0908-FS(3)	10.000	10/6/2020	0.590	1.29	6.45	
PFDoA	307-55-1	7.08	G0908-FS(3)	10.000	10/6/2020	0.790	2.58	6.45	
PFTrDA	72629-94-8	124	G0908-FS(3)	10.000	10/6/2020	0.360	1.29	6.45	
PFTeDA	376-06-7	1.59 J	G0908-FS(3)	10.000	10/6/2020	1.39	3.23	6.45	
NMeFOSAA	2355-31-9	3.23 U	G0908-FS(3)	10.000	10/6/2020	1.32	3.23	6.45	
NEtFOSAA	2991-50-6	2.58 U	G0908-FS(3)	10.000	10/6/2020	0.970	2.58	6.45	
PFBS	375-73-5	1.29 U	G0908-FS(3)	10.000	10/6/2020	0.450	1.29	6.45	
PFHxS	355-46-4	5.36 J	G0908-FS(3)	10.000	10/6/2020	1.04	2.58	6.45	
PFOS	1763-23-1	19.7 u	G0908-FS(3)	10.000	10/6/2020	0.890	2.58	6.45	EBL
HFPO-DA	13252-13-6	2.58 U	G0908-FS(3)	10.000	10/6/2020	0.830	2.58	6.45	
Adona	919005-14-4	2.58 U	G0908-FS(3)	10.000	10/6/2020	1.07	2.58	6.45	
9Cl-PF3ONS	756426-58-1	1.29 U	G0908-FS(3)	10.000	10/6/2020	0.620	1.29	6.45	
11Cl-PF3OUdS	763051-92-9	1.94 U	G0908-FS(3)	10.000	10/6/2020	0.680	1.94	6.45	

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Analyzed by: Griffith, Lauren
Printed: 10/8/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB06-0709
Battelle ID	G0909-FS
Sample Type	SA
Collection Date	09/30/2020
Extraction Date	10/01/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	33.93
Matrix	SO
Sample Size	1.41
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.74 J	G0909-FS(3)	10.000	10/6/2020	1.00	2.84	7.09	
PFHpA	375-85-9	1.38 J	G0909-FS(3)	10.000	10/6/2020	0.720	2.13	7.09	
PFOA	335-67-1	2.11 J	G0909-FS(3)	10.000	10/6/2020	0.860	2.84	7.09	
PFNA	375-95-1	9.66	G0909-FS(3)	10.000	10/6/2020	0.700	1.42	7.09	
PFDA	335-76-2	1.42 U	G0909-FS(3)	10.000	10/6/2020	0.660	1.42	7.09	
PFUnA	2058-94-8	1.42 U	G0909-FS(3)	10.000	10/6/2020	0.650	1.42	7.09	
PFDoA	307-55-1	2.84 U	G0909-FS(3)	10.000	10/6/2020	0.870	2.84	7.09	
PFTrDA	72629-94-8	1.42 U	G0909-FS(3)	10.000	10/6/2020	0.400	1.42	7.09	
PFTeDA	376-06-7	3.55 U	G0909-FS(3)	10.000	10/6/2020	1.53	3.55	7.09	
NMeFOSAA	2355-31-9	3.55 U	G0909-FS(3)	10.000	10/6/2020	1.45	3.55	7.09	
NEtFOSAA	2991-50-6	2.84 U	G0909-FS(3)	10.000	10/6/2020	1.06	2.84	7.09	
PFBS	375-73-5	0.598 J	G0909-FS(3)	10.000	10/6/2020	0.500	1.42	7.09	
PFHxS	355-46-4	6.78 J	G0909-FS(3)	10.000	10/6/2020	1.15	2.84	7.09	
PFOS	1763-23-1	41.0 u	G0909-FS(3)	10.000	10/6/2020	0.980	2.84	7.09	EBL
HFPO-DA	13252-13-6	2.84 U	G0909-FS(3)	10.000	10/6/2020	0.910	2.84	7.09	
Adona	919005-14-4	2.84 U	G0909-FS(3)	10.000	10/6/2020	1.18	2.84	7.09	
9Cl-PF3ONS	756426-58-1	1.42 U	G0909-FS(3)	10.000	10/6/2020	0.680	1.42	7.09	
11Cl-PF3OUdS	763051-92-9	2.13 U	G0909-FS(3)	10.000	10/6/2020	0.740	2.13	7.09	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS08-000H
Battelle ID	G0910-FS
Sample Type	SA
Collection Date	09/30/2020
Extraction Date	10/01/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	25.57
Matrix	SO
Sample Size	1.41
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	4.85 J	G0910-FS(3)	10.000	10/6/2020	1.00	2.84	7.09
PFHpA	375-85-9	2.12 J	G0910-FS(3)	10.000	10/6/2020	0.720	2.13	7.09
PFOA	335-67-1	4.05 J	G0910-FS(3)	10.000	10/6/2020	0.860	2.84	7.09
PFNA	375-95-1	5.71 J	G0910-FS(3)	10.000	10/6/2020	0.700	1.42	7.09
PFDA	335-76-2	5.52 J	G0910-FS(3)	10.000	10/6/2020	0.660	1.42	7.09
PFUnA	2058-94-8	115	G0910-FS(3)	10.000	10/6/2020	0.650	1.42	7.09
PFDoA	307-55-1	8.86	G0910-FS(3)	10.000	10/6/2020	0.870	2.84	7.09
PFTrDA	72629-94-8	110	G0910-FS(3)	10.000	10/6/2020	0.400	1.42	7.09
PFTeDA	376-06-7	1.68 J	G0910-FS(3)	10.000	10/6/2020	1.53	3.55	7.09
NMeFOSAA	2355-31-9	3.55 U	G0910-FS(3)	10.000	10/6/2020	1.45	3.55	7.09
NEtFOSAA	2991-50-6	2.84 U	G0910-FS(3)	10.000	10/6/2020	1.06	2.84	7.09
PFBS	375-73-5	0.581 J	G0910-FS(3)	10.000	10/6/2020	0.500	1.42	7.09
PFHxS	355-46-4	33.3	G0910-FS(3)	10.000	10/6/2020	1.15	2.84	7.09
PFOS	1763-23-1	195	G0910-FS-D(5)	50.000	10/7/2020	4.91	14.2	35.5
HFPO-DA	13252-13-6	2.84 U	G0910-FS(3)	10.000	10/6/2020	0.910	2.84	7.09
Adona	919005-14-4	2.84 U	G0910-FS(3)	10.000	10/6/2020	1.18	2.84	7.09
9Cl-PF3ONS	756426-58-1	1.42 U	G0910-FS(3)	10.000	10/6/2020	0.680	1.42	7.09
11Cl-PF3OUdS	763051-92-9	2.13 U	G0910-FS(3)	10.000	10/6/2020	0.740	2.13	7.09

NW 1/8/21

Analyzed by: Griffith, Lauren
Printed: 10/8/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB08-0810
Battelle ID	G0911-FS
Sample Type	SA
Collection Date	09/30/2020
Extraction Date	10/01/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	36.68
Matrix	SO
Sample Size	1.32
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.85 J	G0911-FS(3)	10.000	10/6/2020	1.07	3.03	7.58	
PFHpA	375-85-9	1.26 J	G0911-FS(3)	10.000	10/6/2020	0.770	2.27	7.58	
PFOA	335-67-1	1.66 J	G0911-FS(3)	10.000	10/6/2020	0.920	3.03	7.58	
PFNA	375-95-1	4.37 J	G0911-FS(3)	10.000	10/6/2020	0.740	1.52	7.58	
PFDA	335-76-2	1.52 U	G0911-FS(3)	10.000	10/6/2020	0.700	1.52	7.58	
PFUnA	2058-94-8	1.17 J	G0911-FS(3)	10.000	10/6/2020	0.690	1.52	7.58	
PFDoA	307-55-1	3.03 U	G0911-FS(3)	10.000	10/6/2020	0.930	3.03	7.58	
PFTrDA	72629-94-8	1.52 U	G0911-FS(3)	10.000	10/6/2020	0.420	1.52	7.58	
PFTeDA	376-06-7	3.79 U	G0911-FS(3)	10.000	10/6/2020	1.64	3.79	7.58	
NMeFOSAA	2355-31-9	3.79 U	G0911-FS(3)	10.000	10/6/2020	1.55	3.79	7.58	
NEtFOSAA	2991-50-6	3.03 U	G0911-FS(3)	10.000	10/6/2020	1.13	3.03	7.58	
PFBS	375-73-5	1.52 U	G0911-FS(3)	10.000	10/6/2020	0.530	1.52	7.58	
PFHxS	355-46-4	5.36 J	G0911-FS(3)	10.000	10/6/2020	1.22	3.03	7.58	
PFOS	1763-23-1	24.9 u	G0911-FS(3)	10.000	10/6/2020	1.05	3.03	7.58	EBL
HFPO-DA	13252-13-6	3.03 U	G0911-FS(3)	10.000	10/6/2020	0.970	3.03	7.58	
Adona	919005-14-4	3.03 U	G0911-FS(3)	10.000	10/6/2020	1.26	3.03	7.58	
9Cl-PF3ONS	756426-58-1	1.52 U	G0911-FS(3)	10.000	10/6/2020	0.730	1.52	7.58	
11Cl-PF3OUdS	763051-92-9	2.27 U	G0911-FS(3)	10.000	10/6/2020	0.790	2.27	7.58	

NW 11/8/21

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1224
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 8, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SS04-000H	G0976-FS	Soil
2	CBD-AOA-SB04-1618	G0977-FS	Soil
3	CBD-AOA-SS09-000H	G0981-FS	Soil
4	CBD-AOA-SB09-0103	G0982-FS	Soil
5	CBD-AOA-SB09-0608	G0983-FS	Soil

A Stage 2B/4 data validation was performed on the analytical data for five soil samples collected on October 1, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times

- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes. There were no qualifications.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for soil samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-100220-SO	PFOS	9.86	None	All Samples >10X
CBD-AOA-FB01-100920	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS04-000H
Battelle ID	G0976-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/05/2020
Analytical Instrument	Sciex 6500+ LC/MS/MS
% Moisture	16.73
Matrix	SO
Sample Size	1.81
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.63 J	G0976-FS(3)	10.000	10/7/2020	0.780	2.21	5.52
PFHpA	375-85-9	3.27 J	G0976-FS(3)	10.000	10/7/2020	0.560	1.66	5.52
PFOA	335-67-1	4.76 J	G0976-FS(3)	10.000	10/7/2020	0.670	2.21	5.52
PFNA	375-95-1	6.14	G0976-FS(3)	10.000	10/7/2020	0.540	1.10	5.52
PFDA	335-76-2	9.90	G0976-FS(3)	10.000	10/7/2020	0.510	1.10	5.52
PFUnA	2058-94-8	176	G0976-FS-D(5)	50.000	10/8/2020	2.52	5.52	27.6
PFDoA	307-55-1	7.91	G0976-FS(3)	10.000	10/7/2020	0.680	2.21	5.52
PFTrDA	72629-94-8	129	G0976-FS(3)	10.000	10/7/2020	0.310	1.10	5.52
PFTeDA	376-06-7	1.99 J	G0976-FS(3)	10.000	10/7/2020	1.19	2.76	5.52
NMeFOSAA	2355-31-9	2.76 U	G0976-FS(3)	10.000	10/7/2020	1.13	2.76	5.52
NEtFOSAA	2991-50-6	2.21 U	G0976-FS(3)	10.000	10/7/2020	0.830	2.21	5.52
PFBS	375-73-5	1.10 U	G0976-FS(3)	10.000	10/7/2020	0.390	1.10	5.52
PFHxS	355-46-4	13.5	G0976-FS(3)	10.000	10/7/2020	0.890	2.21	5.52
PFOS	1763-23-1	168	G0976-FS-D(5)	50.000	10/8/2020	3.82	11.1	27.6
HFPO-DA	13252-13-6	2.21 U	G0976-FS(3)	10.000	10/7/2020	0.710	2.21	5.52
Adona	919005-14-4	2.21 U	G0976-FS(3)	10.000	10/7/2020	0.920	2.21	5.52
9Cl-PF3ONS	756426-58-1	1.10 U	G0976-FS(3)	10.000	10/7/2020	0.530	1.10	5.52
11Cl-PF3OUdS	763051-92-9	1.66 U	G0976-FS(3)	10.000	10/7/2020	0.580	1.66	5.52

NW 18/21

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB04-1618
Battelle ID	G0977-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/05/2020
Analytical Instrument	Sciex 6500+ LC/MS/MS
% Moisture	35.25
Matrix	SO
Sample Size	1.18
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	5.93 J	G0977-FS(3)	10.000	10/7/2020	1.20	3.39	8.47
PFHpA	375-85-9	1.67 J	G0977-FS(3)	10.000	10/7/2020	0.860	2.54	8.47
PFOA	335-67-1	3.52 J	G0977-FS(3)	10.000	10/7/2020	1.03	3.39	8.47
PFNA	375-95-1	8.12 J	G0977-FS(3)	10.000	10/7/2020	0.830	1.69	8.47
PFDA	335-76-2	1.69 U	G0977-FS(3)	10.000	10/7/2020	0.780	1.69	8.47
PFUnA	2058-94-8	5.74 J	G0977-FS(3)	10.000	10/7/2020	0.770	1.69	8.47
PFDoA	307-55-1	3.39 U	G0977-FS(3)	10.000	10/7/2020	1.04	3.39	8.47
PFTrDA	72629-94-8	1.69 U	G0977-FS(3)	10.000	10/7/2020	0.470	1.69	8.47
PFTeDA	376-06-7	4.24 U	G0977-FS(3)	10.000	10/7/2020	1.83	4.24	8.47
NMeFOSAA	2355-31-9	4.24 U	G0977-FS(3)	10.000	10/7/2020	1.73	4.24	8.47
NEtFOSAA	2991-50-6	3.39 U	G0977-FS(3)	10.000	10/7/2020	1.27	3.39	8.47
PFBS	375-73-5	1.69 U	G0977-FS(3)	10.000	10/7/2020	0.590	1.69	8.47
PFHxS	355-46-4	10.7	G0977-FS(3)	10.000	10/7/2020	1.37	3.39	8.47
PFOS	1763-23-1	106	G0977-FS(3)	10.000	10/7/2020	1.17	3.39	8.47
HFPO-DA	13252-13-6	3.39 U	G0977-FS(3)	10.000	10/7/2020	1.09	3.39	8.47
Adona	919005-14-4	3.39 U	G0977-FS(3)	10.000	10/7/2020	1.41	3.39	8.47
9Cl-PF3ONS	756426-58-1	1.69 U	G0977-FS(3)	10.000	10/7/2020	0.820	1.69	8.47
11Cl-PF3OUdS	763051-92-9	2.54 U	G0977-FS(3)	10.000	10/7/2020	0.890	2.54	8.47

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3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS09-000H
Battelle ID	G0981-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/05/2020
Analytical Instrument	Sciex 6500+ LC/MS/MS
% Moisture	21.61
Matrix	SO
Sample Size	1.50
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	3.24 J	G0981-FS(3)	10.000	10/7/2020	0.940	2.67	6.67
PFHpA	375-85-9	2.46 J	G0981-FS(3)	10.000	10/7/2020	0.670	2.00	6.67
PFOA	335-67-1	2.67 J	G0981-FS(3)	10.000	10/7/2020	0.810	2.67	6.67
PFNA	375-95-1	4.06 J	G0981-FS(3)	10.000	10/7/2020	0.650	1.33	6.67
PFDA	335-76-2	3.51 J	G0981-FS(3)	10.000	10/7/2020	0.620	1.33	6.67
PFUnA	2058-94-8	148 P	G0981-FS-D(5)	50.000	10/8/2020	3.05	6.67	33.3
PFDoA	307-55-1	9.75	G0981-FS(3)	10.000	10/7/2020	0.820	2.67	6.67
PFTrDA	72629-94-8	145 P	G0981-FS-D(5)	50.000	10/8/2020	1.87	6.67	33.3
PFTeDA	376-06-7	2.93 J	G0981-FS(3)	10.000	10/7/2020	1.44	3.33	6.67
NMeFOSAA	2355-31-9	3.33 U	G0981-FS(3)	10.000	10/7/2020	1.36	3.33	6.67
NEtFOSAA	2991-50-6	2.67 U	G0981-FS(3)	10.000	10/7/2020	1.00	2.67	6.67
PFBS	375-73-5	1.33 U	G0981-FS(3)	10.000	10/7/2020	0.470	1.33	6.67
PFHxS	355-46-4	15.1	G0981-FS(3)	10.000	10/7/2020	1.08	2.67	6.67
PFOS	1763-23-1	178	G0981-FS(3)	10.000	10/7/2020	0.920	2.67	6.67
HFPO-DA	13252-13-6	2.67 U	G0981-FS(3)	10.000	10/7/2020	0.850	2.67	6.67
Adona	919005-14-4	2.67 U	G0981-FS(3)	10.000	10/7/2020	1.11	2.67	6.67
9Cl-PF3ONS	756426-58-1	1.33 U	G0981-FS(3)	10.000	10/7/2020	0.640	1.33	6.67
11Cl-PF3OUdS	763051-92-9	2.00 U	G0981-FS(3)	10.000	10/7/2020	0.700	2.00	6.67

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BATTELLE
It can be done

4

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB09-0103
Battelle ID	G0982-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/05/2020
Analytical Instrument	Sciex 6500+ LC/MS/MS
% Moisture	12.50
Matrix	SO
Sample Size	1.74
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	54.0	G0982-FS(5)	10.000	10/8/2020	0.810	2.30	5.75
PFHpA	375-85-9	13.4	G0982-FS(5)	10.000	10/8/2020	0.580	1.72	5.75
PFOA	335-67-1	68.0	G0982-FS(5)	10.000	10/8/2020	0.700	2.30	5.75
PFNA	375-95-1	364	G0982-FS(5)	10.000	10/8/2020	0.560	1.15	5.75
PFDA	335-76-2	23.8	G0982-FS(5)	10.000	10/8/2020	0.530	1.15	5.75
PFUnA	2058-94-8	517 D	G0982-FS-D(7)	50.000	10/8/2020	2.63	5.75	28.7
PFDoA	307-55-1	12.5	G0982-FS(5)	10.000	10/8/2020	0.700	2.30	5.75
PFTrDA	72629-94-8	299 D	G0982-FS-D(7)	50.000	10/8/2020	1.61	5.75	28.7
PFTeDA	376-06-7	5.49 J	G0982-FS(5)	10.000	10/8/2020	1.24	2.87	5.75
NMeFOSAA	2355-31-9	4.26 J	G0982-FS(5)	10.000	10/8/2020	1.17	2.87	5.75
NEtFOSAA	2991-50-6	1.24 J	G0982-FS(5)	10.000	10/8/2020	0.860	2.30	5.75
PFBS	375-73-5	5.37 J	G0982-FS(5)	10.000	10/8/2020	0.400	1.15	5.75
PFHxS	355-46-4	227 D	G0982-FS-D(7)	50.000	10/8/2020	4.64	11.5	28.7
PFOS	1763-23-1	7150 D	G0982-FS-D(9)	625.000	10/8/2020	49.7	144	359
HFPO-DA	13252-13-6	2.30 U	G0982-FS(5)	10.000	10/8/2020	0.740	2.30	5.75
Adona	919005-14-4	2.30 U	G0982-FS(5)	10.000	10/8/2020	0.950	2.30	5.75
9Cl-PF3ONS	756426-58-1	1.15 U	G0982-FS(5)	10.000	10/8/2020	0.550	1.15	5.75
11Cl-PF3OUdS	763051-92-9	1.72 U	G0982-FS(5)	10.000	10/8/2020	0.600	1.72	5.75

BATTELLE
It can be done

5

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB09-0608
Battelle ID	G0983-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/05/2020
Analytical Instrument	Sciex 6500+ LC/MS/MS
% Moisture	30.52
Matrix	SO
Sample Size	1.26
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	71.6	G0983-FS(3)	10.000	10/7/2020	1.12	3.17	7.94
PFHpA	375-85-9	5.79 J	G0983-FS(3)	10.000	10/7/2020	0.800	2.38	7.94
PFOA	335-67-1	17.8	G0983-FS(3)	10.000	10/7/2020	0.960	3.17	7.94
PFNA	375-95-1	67.8	G0983-FS(3)	10.000	10/7/2020	0.780	1.59	7.94
PFDA	335-76-2	6.92 J	G0983-FS(3)	10.000	10/7/2020	0.730	1.59	7.94
PFUnA	2058-94-8	175	G0983-FS(3)	10.000	10/7/2020	0.730	1.59	7.94
PFDoA	307-55-1	2.96 J	G0983-FS(3)	10.000	10/7/2020	0.970	3.17	7.94
PFTrDA	72629-94-8	65.9	G0983-FS(3)	10.000	10/7/2020	0.440	1.59	7.94
PFTeDA	376-06-7	3.97 U	G0983-FS(3)	10.000	10/7/2020	1.71	3.97	7.94
NMeFOSAA	2355-31-9	3.97 U	G0983-FS(3)	10.000	10/7/2020	1.62	3.97	7.94
NEtFOSAA	2991-50-6	3.17 U	G0983-FS(3)	10.000	10/7/2020	1.19	3.17	7.94
PFBS	375-73-5	0.866 J	G0983-FS(3)	10.000	10/7/2020	0.560	1.59	7.94
PFHxS	355-46-4	52.4	G0983-FS(3)	10.000	10/7/2020	1.28	3.17	7.94
PFOS	1763-23-1	7950	G0983-FS-D(7)	625.000	10/8/2020	68.7	198	496
HFPO-DA	13252-13-6	3.17 U	G0983-FS(3)	10.000	10/7/2020	1.02	3.17	7.94
Adona	919005-14-4	3.17 U	G0983-FS(3)	10.000	10/7/2020	1.32	3.17	7.94
9Cl-PF3ONS	756426-58-1	1.59 U	G0983-FS(3)	10.000	10/7/2020	0.770	1.59	7.94
11Cl-PF3OUdS	763051-92-9	2.38 U	G0983-FS(3)	10.000	10/7/2020	0.830	2.38	7.94

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ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1225
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 8, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SS01-000H	G0978-FS	Soil
2	CBD-AOA-SS01P-000H	G0979-FS	Soil
3	CBD-AOA-SB01-0709	G0980-FS	Soil
4	CBD-AOA-SS25-000H	G0984-FS	Soil
4MS	CBD-AOA-SS25-000HMS	G0985-FSMS	Soil
4MSD	CBD-AOA-SS25-000HMSD	G0986-FSMSD	Soil
5	CBD-AOA-SB25-0810	G0987-FS	Soil
6	CBD-AOA-SB25-1517	G0988-FS	Soil
7	CBD-AOA-SB25P-0810	G0989-FS	Soil
8	CBD-AOA-SS10-000II	G0990-FS	Soil
9	CBD-AOA-SB10-0608	G0991-FS	Soil
10	CBD-AOA-SB10P-0608	G0992-FS	Soil

A Stage 2B/4 data validation was performed on the analytical data for ten soil samples collected on October 1, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for soil samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-100220-SO	PFOS	9.86	U	1, 2, 4
CBD-AOA-FB01-100220	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples exhibited acceptable percent recoveries (%R) and RPD values.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.
- The ion ratio exceeded percent difference criteria and was flagged (Q) by the laboratory and further qualified estimated (J) by the reviewer for one compound in EDS Sample 1.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was unacceptable for PFNA in one field duplicate pair. These results were qualified as estimated (J).

Compound	CBD-AOA-SS01-000H ng/g	CBD-AOA-SS01P-000H ng/g	RPD	Qualifier
PFHxA	1.44	1.48	3%	None
PFOA	0.928	0.823	12%	
PFNA	1.50	1.70	13%	
PFDA	2.10	2.09	0%	
PFUnA	158	136	15%	
PFDoA	5.55	5.28	5%	
PFTrDA	99.4	97.0	2%	
PFHxS	3.33	3.42	3%	

Compound	CBD-AOA-SB25-1517 ng/g	CBD-AOA-SB25P-0810 ng/g	RPD	Qualifier
PFHxA	3.61	2.27U	NC	None
PFHpA	0.852	1.70U	NC	
PFOA	3.34	0.895	115%	None - <5X LOQ
PFNA	47.6	138	97%	J
PFDA	1.11	1.14U	NC	None
PFUnA	15.8	1.14U	NC	
PFTrDA	1.84	1.14U	NC	
PFHxS	7.69	2.27U	NC	
PFOS	204	150	31%	

Compound	CBD-AOA-SB10-0608 ng/g	CBD-AOA-SB10P-0608 ng/g	RPD	Qualifier
PFHxA	51.8	55.7	7%	None
PFHpA	10.4	10.5	1%	
PFOA	34.7	33.7	3%	
PFNA	110	101	9%	
PFDA	5.84	5.42	7%	
PFUnA	16.1	14.7	9%	
PFTrDA	0.571	0.483	17%	
PFBS	6.08	5.97	2%	
PFHxS	174	163	7%	

Compound	CBD-AOA-SB10-0608 ng/g	CBD-AOA-SB10P-0608 ng/g	RPD	Qualifier
PFOS	1200	915	27%	None

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS01-000H
Battelle ID	G0978-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	16.83
Matrix	SO
Sample Size	1.56
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.44 J	G0978-FS(3)	10.000	10/24/2020	0.910	2.56	6.41	
PFHpA	375-85-9	1.92 U	G0978-FS(3)	10.000	10/24/2020	0.650	1.92	6.41	
PFOA	335-67-1	0.928 J	G0978-FS(3)	10.000	10/24/2020	0.780	2.56	6.41	
PFNA	375-95-1	1.50 J	G0978-FS(3)	10.000	10/24/2020	0.630	1.28	6.41	
PFDA	335-76-2	2.10 J	G0978-FS(3)	10.000	10/24/2020	0.590	1.28	6.41	
PFUnA	2058-94-8	158 ~~BE~~ J	G0978-FS-D(5)	50.000	10/26/2020	2.93	6.41	32.1	OT
PFDoA	307-55-1	5.55 J	G0978-FS(3)	10.000	10/24/2020	0.780	2.56	6.41	
PFTrDA	72629-94-8	99.4	G0978-FS(3)	10.000	10/24/2020	0.360	1.28	6.41	
PFTeDA	376-06-7	3.21 U	G0978-FS(3)	10.000	10/24/2020	1.38	3.21	6.41	
NMeFOSAA	2355-31-9	3.21 U	G0978-FS(3)	10.000	10/24/2020	1.31	3.21	6.41	
NEtFOSAA	2991-50-6	2.56 U	G0978-FS(3)	10.000	10/24/2020	0.960	2.56	6.41	
PFBS	375-73-5	1.28 U	G0978-FS(3)	10.000	10/24/2020	0.450	1.28	6.41	
PFHxS	355-46-4	3.33 J	G0978-FS(3)	10.000	10/24/2020	1.04	2.56	6.41	
PFOS	1763-23-1	19.6 U	G0978-FS(3)	10.000	10/24/2020	0.890	2.56	6.41	EBL
HFPO-DA	13252-13-6	2.56 U	G0978-FS(3)	10.000	10/24/2020	0.820	2.56	6.41	
Adona	919005-14-4	2.56 U	G0978-FS(3)	10.000	10/24/2020	1.06	2.56	6.41	
9Cl-PF3ONS	756426-58-1	1.28 U	G0978-FS(3)	10.000	10/24/2020	0.620	1.28	6.41	
11Cl-PF3OUdS	763051-92-9	1.92 U	G0978-FS(3)	10.000	10/24/2020	0.670	1.92	6.41	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS01P-000H
Battelle ID	G0979-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	18.33
Matrix	SO
Sample Size	1.67
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.48 J	G0979-FS(3)	10.000	10/24/2020	0.850	2.40	5.99	
PFHpA	375-85-9	1.80 U	G0979-FS(3)	10.000	10/24/2020	0.610	1.80	5.99	
PFOA	335-67-1	0.823 J	G0979-FS(3)	10.000	10/24/2020	0.730	2.40	5.99	
PFNA	375-95-1	1.70 J	G0979-FS(3)	10.000	10/24/2020	0.590	1.20	5.99	
PFDA	335-76-2	2.09 J	G0979-FS(3)	10.000	10/24/2020	0.550	1.20	5.99	
PFUnA	2058-94-8	136	G0979-FS-D(5)	50.000	10/26/2020	2.74	5.99	29.9	
PFDoA	307-55-1	5.28 J	G0979-FS(3)	10.000	10/24/2020	0.730	2.40	5.99	
PFTrDA	72629-94-8	97.0	G0979-FS(3)	10.000	10/24/2020	0.340	1.20	5.99	
PFTeDA	376-06-7	2.99 U	G0979-FS(3)	10.000	10/24/2020	1.29	2.99	5.99	
NMeFOSAA	2355-31-9	2.99 U	G0979-FS(3)	10.000	10/24/2020	1.22	2.99	5.99	
NEtFOSAA	2991-50-6	2.40 U	G0979-FS(3)	10.000	10/24/2020	0.900	2.40	5.99	
PFBS	375-73-5	1.20 U	G0979-FS(3)	10.000	10/24/2020	0.420	1.20	5.99	
PFHxS	355-46-4	3.42 J	G0979-FS(3)	10.000	10/24/2020	0.970	2.40	5.99	
PFOS	1763-23-1	20.4 u	G0979-FS(3)	10.000	10/24/2020	0.830	2.40	5.99	EBL
HFPO-DA	13252-13-6	2.40 U	G0979-FS(3)	10.000	10/24/2020	0.770	2.40	5.99	
Adona	919005-14-4	2.40 U	G0979-FS(3)	10.000	10/24/2020	0.990	2.40	5.99	
9Cl-PF3ONS	756426-58-1	1.20 U	G0979-FS(3)	10.000	10/24/2020	0.580	1.20	5.99	
11Cl-PF3OUdS	763051-92-9	1.80 U	G0979-FS(3)	10.000	10/24/2020	0.630	1.80	5.99	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB01-0709
Battelle ID	G0980-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	19.10
Matrix	SO
Sample Size	1.58
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.53 U	G0980-FS(3)	10.000	10/24/2020	0.890	2.53	6.33
PFHpA	375-85-9	1.90 U	G0980-FS(3)	10.000	10/24/2020	0.640	1.90	6.33
PFOA	335-67-1	2.53 U	G0980-FS(3)	10.000	10/24/2020	0.770	2.53	6.33
PFNA	375-95-1	9.04	G0980-FS(3)	10.000	10/24/2020	0.620	1.27	6.33
PFDA	335-76-2	1.27 U	G0980-FS(3)	10.000	10/24/2020	0.590	1.27	6.33
PFUnA	2058-94-8	1.94 J	G0980-FS(3)	10.000	10/24/2020	0.580	1.27	6.33
PFDoA	307-55-1	2.53 U	G0980-FS(3)	10.000	10/24/2020	0.770	2.53	6.33
PFTrDA	72629-94-8	1.27 U	G0980-FS(3)	10.000	10/24/2020	0.350	1.27	6.33
PFTeDA	376-06-7	3.16 U	G0980-FS(3)	10.000	10/24/2020	1.37	3.16	6.33
NMeFOSAA	2355-31-9	3.16 U	G0980-FS(3)	10.000	10/24/2020	1.29	3.16	6.33
NEtFOSAA	2991-50-6	2.53 U	G0980-FS(3)	10.000	10/24/2020	0.950	2.53	6.33
PFBS	375-73-5	1.27 U	G0980-FS(3)	10.000	10/24/2020	0.440	1.27	6.33
PFHxS	355-46-4	1.95 J	G0980-FS(3)	10.000	10/24/2020	1.02	2.53	6.33
PFOS	1763-23-1	214	G0980-FS-D(5)	50.000	10/26/2020	4.38	12.7	31.7
HFPO-DA	13252-13-6	2.53 U	G0980-FS(3)	10.000	10/24/2020	0.810	2.53	6.33
Adona	919005-14-4	2.53 U	G0980-FS(3)	10.000	10/24/2020	1.05	2.53	6.33
9Cl-PF3ONS	756426-58-1	1.27 U	G0980-FS(3)	10.000	10/24/2020	0.610	1.27	6.33
11Cl-PF3OUdS	763051-92-9	1.90 U	G0980-FS(3)	10.000	10/24/2020	0.660	1.90	6.33

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS25-000H
Battelle ID	G0984-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	21.20
Matrix	SO
Sample Size	1.56
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	3.18 J	G0984-FS(3)	10.000	10/24/2020	0.910	2.56	6.41	
PFHpA	375-85-9	3.05 J	G0984-FS(3)	10.000	10/24/2020	0.650	1.92	6.41	
PFOA	335-67-1	2.29 J	G0984-FS(3)	10.000	10/24/2020	0.780	2.56	6.41	
PFNA	375-95-1	4.24 J	G0984-FS(3)	10.000	10/24/2020	0.630	1.28	6.41	
PFDA	335-76-2	3.82 J	G0984-FS(3)	10.000	10/24/2020	0.590	1.28	6.41	
PFUnA	2058-94-8	77.4	G0984-FS(3)	10.000	10/24/2020	0.590	1.28	6.41	
PFDoA	307-55-1	3.42 J	G0984-FS(3)	10.000	10/24/2020	0.780	2.56	6.41	
PFTrDA	72629-94-8	55.3	G0984-FS(3)	10.000	10/24/2020	0.360	1.28	6.41	
PFTeDA	376-06-7	3.21 U	G0984-FS(3)	10.000	10/24/2020	1.38	3.21	6.41	
NMeFOSAA	2355-31-9	3.21 U	G0984-FS(3)	10.000	10/24/2020	1.31	3.21	6.41	
NEtFOSAA	2991-50-6	2.56 U	G0984-FS(3)	10.000	10/24/2020	0.960	2.56	6.41	
PFBS	375-73-5	1.28 U	G0984-FS(3)	10.000	10/24/2020	0.450	1.28	6.41	
PFHxS	355-46-4	16.6	G0984-FS(3)	10.000	10/24/2020	1.04	2.56	6.41	
PFOS	1763-23-1	91.0 u	G0984-FS(3)	10.000	10/24/2020	0.890	2.56	6.41	EBL
HFPO-DA	13252-13-6	2.56 U	G0984-FS(3)	10.000	10/24/2020	0.820	2.56	6.41	
Adona	919005-14-4	2.56 U	G0984-FS(3)	10.000	10/24/2020	1.06	2.56	6.41	
9Cl-PF3ONS	756426-58-1	1.28 U	G0984-FS(3)	10.000	10/24/2020	0.620	1.28	6.41	
11Cl-PF3OUdS	763051-92-9	1.92 U	G0984-FS(3)	10.000	10/24/2020	0.670	1.92	6.41	

MW 11/8/21

Analyzed by: Schultz, Stephanie
Printed: 10/29/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB25-0810
Battelle ID	G0987-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	17.05
Matrix	SO
Sample Size	1.73
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.31 U	G0987-FS(3)	10.000	10/24/2020	0.820	2.31	5.78
PFHpA	375-85-9	1.73 U	G0987-FS(3)	10.000	10/24/2020	0.580	1.73	5.78
PFOA	335-67-1	0.764 J	G0987-FS(3)	10.000	10/24/2020	0.700	2.31	5.78
PFNA	375-95-1	143	G0987-FS(3)	10.000	10/24/2020	0.570	1.16	5.78
PFDA	335-76-2	1.16 U	G0987-FS(3)	10.000	10/24/2020	0.540	1.16	5.78
PFUnA	2058-94-8	1.16 U	G0987-FS(3)	10.000	10/24/2020	0.530	1.16	5.78
PFDoA	307-55-1	2.31 U	G0987-FS(3)	10.000	10/24/2020	0.710	2.31	5.78
PFTrDA	72629-94-8	1.16 U	G0987-FS(3)	10.000	10/24/2020	0.320	1.16	5.78
PFTeDA	376-06-7	2.89 U	G0987-FS(3)	10.000	10/24/2020	1.25	2.89	5.78
NMeFOSAA	2355-31-9	2.89 U	G0987-FS(3)	10.000	10/24/2020	1.18	2.89	5.78
NEtFOSAA	2991-50-6	2.31 U	G0987-FS(3)	10.000	10/24/2020	0.860	2.31	5.78
PFBS	375-73-5	1.16 U	G0987-FS(3)	10.000	10/24/2020	0.400	1.16	5.78
PFHxS	355-46-4	2.31 U	G0987-FS(3)	10.000	10/24/2020	0.930	2.31	5.78
PFOS	1763-23-1	145	G0987-FS-D(5)	50.000	10/26/2020	4.00	11.6	28.9
HFPO-DA	13252-13-6	2.31 U	G0987-FS(3)	10.000	10/24/2020	0.740	2.31	5.78
Adona	919005-14-4	2.31 U	G0987-FS(3)	10.000	10/24/2020	0.960	2.31	5.78
9Cl-PF3ONS	756426-58-1	1.16 U	G0987-FS(3)	10.000	10/24/2020	0.560	1.16	5.78
11Cl-PF3OUdS	763051-92-9	1.73 U	G0987-FS(3)	10.000	10/24/2020	0.610	1.73	5.78

NW 11/8/21

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB25-1517
Battelle ID	G0988-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	28.53
Matrix	SO
Sample Size	1.43
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	3.61 J	G0988-FS(3)	10.000	10/24/2020	0.990	2.80	6.99
PFHpA	375-85-9	0.852 J	G0988-FS(3)	10.000	10/24/2020	0.710	2.10	6.99
PFOA	335-67-1	3.34 J	G0988-FS(3)	10.000	10/24/2020	0.850	2.80	6.99
PFNA	375-95-1	47.6 J	G0988-FS(3)	10.000	10/24/2020	0.690	1.40	6.99
PFDA	335-76-2	1.11 J	G0988-FS(3)	10.000	10/24/2020	0.650	1.40	6.99
PFUnA	2058-94-8	15.8	G0988-FS(3)	10.000	10/24/2020	0.640	1.40	6.99
PFDoA	307-55-1	2.80 U	G0988-FS(3)	10.000	10/24/2020	0.860	2.80	6.99
PFTrDA	72629-94-8	1.84 J	G0988-FS(3)	10.000	10/24/2020	0.390	1.40	6.99
PFTeDA	376-06-7	3.50 U	G0988-FS(3)	10.000	10/24/2020	1.51	3.50	6.99
NMeFOSAA	2355-31-9	3.50 U	G0988-FS(3)	10.000	10/24/2020	1.43	3.50	6.99
NEtFOSAA	2991-50-6	2.80 U	G0988-FS(3)	10.000	10/24/2020	1.05	2.80	6.99
PFBS	375-73-5	1.40 U	G0988-FS(3)	10.000	10/24/2020	0.490	1.40	6.99
PFHxS	355-46-4	7.69	G0988-FS(3)	10.000	10/24/2020	1.13	2.80	6.99
PFOS	1763-23-1	204	G0988-FS-D(5)	50.000	10/26/2020	4.84	14.0	35.0
HFPO-DA	13252-13-6	2.80 U	G0988-FS(3)	10.000	10/24/2020	0.900	2.80	6.99
Adona	919005-14-4	2.80 U	G0988-FS(3)	10.000	10/24/2020	1.16	2.80	6.99
9Cl-PF3ONS	756426-58-1	1.40 U	G0988-FS(3)	10.000	10/24/2020	0.670	1.40	6.99
11Cl-PF3OUdS	763051-92-9	2.10 U	G0988-FS(3)	10.000	10/24/2020	0.730	2.10	6.99

11/8/21
Analyzed by: Schultz, Stephanie
Printed: 10/29/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB25P-0810
Battelle ID	G0989-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	16.94
Matrix	SO
Sample Size	1.76
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.27 U	G0989-FS(3)	10.000	10/24/2020	0.800	2.27	5.68	
PFHpA	375-85-9	1.70 U	G0989-FS(3)	10.000	10/24/2020	0.580	1.70	5.68	
PFOA	335-67-1	0.895 J	G0989-FS(3)	10.000	10/24/2020	0.690	2.27	5.68	
PFNA	375-95-1	138 J	G0989-FS-D(5)	50.000	10/26/2020	2.79	5.68	28.4	FD
PFDA	335-76-2	1.14 U	G0989-FS(3)	10.000	10/24/2020	0.530	1.14	5.68	
PFUnA	2058-94-8	1.14 U	G0989-FS(3)	10.000	10/24/2020	0.520	1.14	5.68	
PFDoA	307-55-1	2.27 U	G0989-FS(3)	10.000	10/24/2020	0.700	2.27	5.68	
PFTrDA	72629-94-8	1.14 U	G0989-FS(3)	10.000	10/24/2020	0.320	1.14	5.68	
PFTeDA	376-06-7	2.84 U	G0989-FS(3)	10.000	10/24/2020	1.23	2.84	5.68	
NMeFOSAA	2355-31-9	2.84 U	G0989-FS(3)	10.000	10/24/2020	1.16	2.84	5.68	
NEtFOSAA	2991-50-6	2.27 U	G0989-FS(3)	10.000	10/24/2020	0.850	2.27	5.68	
PFBS	375-73-5	1.14 U	G0989-FS(3)	10.000	10/24/2020	0.400	1.14	5.68	
PFHxS	355-46-4	2.27 U	G0989-FS(3)	10.000	10/24/2020	0.920	2.27	5.68	
PFOS	1763-23-1	150 J	G0989-FS-D(5)	50.000	10/26/2020	3.93	11.4	28.4	
HFPO-DA	13252-13-6	2.27 U	G0989-FS(3)	10.000	10/24/2020	0.730	2.27	5.68	
Adona	919005-14-4	2.27 U	G0989-FS(3)	10.000	10/24/2020	0.940	2.27	5.68	
9Cl-PF3ONS	756426-58-1	1.14 U	G0989-FS(3)	10.000	10/24/2020	0.550	1.14	5.68	
11Cl-PF3OUdS	763051-92-9	1.70 U	G0989-FS(3)	10.000	10/24/2020	0.600	1.70	5.68	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS10-000H
Battelle ID	G0990-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	21.55
Matrix	SO
Sample Size	1.62
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	3.03 J	G0990-FS(3)	10.000	10/24/2020	0.870	2.47	6.17
PFHpA	375-85-9	2.25 J	G0990-FS(3)	10.000	10/24/2020	0.620	1.85	6.17
PFOA	335-67-1	1.82 J	G0990-FS(3)	10.000	10/24/2020	0.750	2.47	6.17
PFNA	375-95-1	61.8	G0990-FS(3)	10.000	10/24/2020	0.610	1.23	6.17
PFDA	335-76-2	2.01 J	G0990-FS(3)	10.000	10/24/2020	0.570	1.23	6.17
PFUnA	2058-94-8	82.9	G0990-FS(3)	10.000	10/24/2020	0.560	1.23	6.17
PFDoA	307-55-1	2.98 J	G0990-FS(3)	10.000	10/24/2020	0.760	2.47	6.17
PFTrDA	72629-94-8	62.2	G0990-FS(3)	10.000	10/24/2020	0.350	1.23	6.17
PFTeDA	376-06-7	3.09 U	G0990-FS(3)	10.000	10/24/2020	1.33	3.09	6.17
NMeFOSAA	2355-31-9	3.09 U	G0990-FS(3)	10.000	10/24/2020	1.26	3.09	6.17
NEtFOSAA	2991-50-6	2.47 U	G0990-FS(3)	10.000	10/24/2020	0.920	2.47	6.17
PFBS	375-73-5	1.23 U	G0990-FS(3)	10.000	10/24/2020	0.430	1.23	6.17
PFHxS	355-46-4	6.98	G0990-FS(3)	10.000	10/24/2020	1.00	2.47	6.17
PFOS	1763-23-1	138	G0990-FS-D(5)	50.000	10/26/2020	4.27	12.4	30.9
HFPO-DA	13252-13-6	2.47 U	G0990-FS(3)	10.000	10/24/2020	0.790	2.47	6.17
Adona	919005-14-4	2.47 U	G0990-FS(3)	10.000	10/24/2020	1.02	2.47	6.17
9Cl-PF3ONS	756426-58-1	1.23 U	G0990-FS(3)	10.000	10/24/2020	0.600	1.23	6.17
11Cl-PF3OUdS	763051-92-9	1.85 U	G0990-FS(3)	10.000	10/24/2020	0.650	1.85	6.17

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB10-0608
Battelle ID	G0991-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	28.99
Matrix	SO
Sample Size	1.44
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	51.8	G0991-FS(3)	10.000	10/24/2020	0.980	2.78	6.94
PFHpA	375-85-9	10.4	G0991-FS(3)	10.000	10/24/2020	0.700	2.08	6.94
PFOA	335-67-1	34.7	G0991-FS(3)	10.000	10/24/2020	0.840	2.78	6.94
PFNA	375-95-1	110	G0991-FS(3)	10.000	10/24/2020	0.680	1.39	6.94
PFDA	335-76-2	5.84 J	G0991-FS(3)	10.000	10/24/2020	0.640	1.39	6.94
PFUnA	2058-94-8	16.1	G0991-FS(3)	10.000	10/24/2020	0.630	1.39	6.94
PFDoA	307-55-1	2.78 U	G0991-FS(3)	10.000	10/24/2020	0.850	2.78	6.94
PFTrDA	72629-94-8	0.571 J	G0991-FS(3)	10.000	10/24/2020	0.390	1.39	6.94
PFTeDA	376-06-7	3.47 U	G0991-FS(3)	10.000	10/24/2020	1.50	3.47	6.94
NMeFOSAA	2355-31-9	3.47 U	G0991-FS(3)	10.000	10/24/2020	1.42	3.47	6.94
NEtFOSAA	2991-50-6	2.78 U	G0991-FS(3)	10.000	10/24/2020	1.04	2.78	6.94
PFBS	375-73-5	6.08 J	G0991-FS(3)	10.000	10/24/2020	0.490	1.39	6.94
PFHxS	355-46-4	174	G0991-FS(3)	10.000	10/24/2020	1.12	2.78	6.94
PFOS	1763-23-1	1200	G0991-FS-D(5)	125.000	10/26/2020	12.0	34.7	86.8
HFPO-DA	13252-13-6	2.78 U	G0991-FS(3)	10.000	10/24/2020	0.890	2.78	6.94
Adona	919005-14-4	2.78 U	G0991-FS(3)	10.000	10/24/2020	1.15	2.78	6.94
9Cl-PF3ONS	756426-58-1	1.39 U	G0991-FS(3)	10.000	10/24/2020	0.670	1.39	6.94
11Cl-PF3OUdS	763051-92-9	2.08 U	G0991-FS(3)	10.000	10/24/2020	0.730	2.08	6.94

nw 1/8/21

Analyzed by: Schultz, Stephanie
Printed: 10/29/2020

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10

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB10P-0608
Battelle ID	G0992-FS
Sample Type	SA
Collection Date	10/01/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	37.78
Matrix	SO
Sample Size	1.30
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	55.7	G0992-FS(3)	10.000	10/24/2020	1.09	3.08	7.69
PFHpA	375-85-9	10.5	G0992-FS(3)	10.000	10/24/2020	0.780	2.31	7.69
PFOA	335-67-1	33.7	G0992-FS(3)	10.000	10/24/2020	0.930	3.08	7.69
PFNA	375-95-1	101	G0992-FS(3)	10.000	10/24/2020	0.760	1.54	7.69
PFDA	335-76-2	5.42 J	G0992-FS(3)	10.000	10/24/2020	0.710	1.54	7.69
PFUnA	2058-94-8	14.7	G0992-FS(3)	10.000	10/24/2020	0.700	1.54	7.69
PFDoA	307-55-1	3.08 U	G0992-FS(3)	10.000	10/24/2020	0.940	3.08	7.69
PFTrDA	72629-94-8	0.483 J	G0992-FS(3)	10.000	10/24/2020	0.430	1.54	7.69
PFTeDA	376-06-7	3.85 U	G0992-FS(3)	10.000	10/24/2020	1.66	3.85	7.69
NMeFOSAA	2355-31-9	3.85 U	G0992-FS(3)	10.000	10/24/2020	1.57	3.85	7.69
NEtFOSAA	2991-50-6	3.08 U	G0992-FS(3)	10.000	10/24/2020	1.15	3.08	7.69
PFBS	375-73-5	5.97 J	G0992-FS(3)	10.000	10/24/2020	0.540	1.54	7.69
PFHxS	355-46-4	163	G0992-FS(3)	10.000	10/24/2020	1.24	3.08	7.69
PFOS	1763-23-1	915	G0992-FS-D(5)	125.000	10/26/2020	13.3	38.5	96.2
HFPO-DA	13252-13-6	3.08 U	G0992-FS(3)	10.000	10/24/2020	0.990	3.08	7.69
Adona	919005-14-4	3.08 U	G0992-FS(3)	10.000	10/24/2020	1.28	3.08	7.69
9Cl-PF3ONS	756426-58-1	1.54 U	G0992-FS(3)	10.000	10/24/2020	0.740	1.54	7.69
11Cl-PF3OUdS	763051-92-9	2.31 U	G0992-FS(3)	10.000	10/24/2020	0.810	2.31	7.69

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Analyzed by: Schultz, Stephanie
Printed: 10/29/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1232
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 8, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-EB01-100220-SO	G1071-FS	Water
2	CBD-AOA-FB01-100220	G1072-FS	Water

A Stage 2B/4 data validation was performed on the analytical data for one aqueous equipment blank sample and one aqueous trip blank sample collected on October 2, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries

- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes. There were no qualifications.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for water samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-100220-SO	PFOS	9.86	None	Applies to other packages
CBD-AOA-FB01-100220	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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1

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB01-100220-SO
Battelle ID	G1071-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/07/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.290
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.29 U	G1071-FS(0)	1.000	10/28/2020	0.454	1.29	4.31
PFHpA	375-85-9	0.862 U	G1071-FS(0)	1.000	10/28/2020	0.227	0.862	4.31
PFOA	335-67-1	1.29 U	G1071-FS(0)	1.000	10/28/2020	0.441	1.29	4.31
PFNA	375-95-1	0.862 U	G1071-FS(0)	1.000	10/28/2020	0.266	0.862	4.31
PFDA	335-76-2	0.431 U	G1071-FS(0)	1.000	10/28/2020	0.122	0.431	4.31
PFUnA	2058-94-8	0.431 U	G1071-FS(0)	1.000	10/28/2020	0.189	0.431	4.31
PFDoA	307-55-1	0.431 U	G1071-FS(0)	1.000	10/28/2020	0.166	0.431	4.31
PFTrDA	72629-94-8	0.431 U	G1071-FS(0)	1.000	10/28/2020	0.133	0.431	4.31
PFTeDA	376-06-7	1.72 U	G1071-FS(0)	1.000	10/28/2020	0.632	1.72	4.31
NMeFOSAA	2355-31-9	0.862 U	G1071-FS(0)	1.000	10/28/2020	0.302	0.862	4.31
NEtFOSAA	2991-50-6	0.862 U	G1071-FS(0)	1.000	10/28/2020	0.431	0.862	4.31
PFBS	375-73-5	0.431 U	G1071-FS(0)	1.000	10/28/2020	0.124	0.431	4.31
PFHxS	355-46-4	0.345 U	G1071-FS(0)	1.000	10/28/2020	0.0966	0.345	4.31
PFOS	1763-23-1	9.86	G1071-FS(0)	1.000	10/28/2020	0.377	0.862	4.31
HFPO-DA	13252-13-6	0.431 U	G1071-FS(0)	1.000	10/28/2020	0.214	0.431	4.31
Adona	919005-14-4	0.862 U	G1071-FS(0)	1.000	10/28/2020	0.228	0.862	4.31
9Cl-PF3ONS	756426-58-1	0.431 U	G1071-FS(0)	1.000	10/28/2020	0.231	0.431	4.31
11Cl-PF3OUdS	763051-92-9	0.862 U	G1071-FS(0)	1.000	10/28/2020	0.199	0.862	4.31

NW 11/8/21

Analyzed by: Schultz, Stephanie
Printed: 11/2/2020

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-FB01-100220
Battelle ID	G1072-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/07/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.290
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.29 U	G1072-FS(0)	1.000	10/29/2020	0.454	1.29	4.31
PFHpA	375-85-9	0.862 U	G1072-FS(0)	1.000	10/29/2020	0.227	0.862	4.31
PFOA	335-67-1	1.29 U	G1072-FS(0)	1.000	10/29/2020	0.441	1.29	4.31
PFNA	375-95-1	0.862 U	G1072-FS(0)	1.000	10/29/2020	0.286	0.862	4.31
PFDA	335-76-2	0.431 U	G1072-FS(0)	1.000	10/29/2020	0.122	0.431	4.31
PFUnA	2058-94-8	0.431 U	G1072-FS(0)	1.000	10/29/2020	0.189	0.431	4.31
PFDoA	307-55-1	0.431 U	G1072-FS(0)	1.000	10/29/2020	0.166	0.431	4.31
PFTrDA	72629-94-8	0.431 U	G1072-FS(0)	1.000	10/29/2020	0.133	0.431	4.31
PFTeDA	376-06-7	1.72 U	G1072-FS(0)	1.000	10/29/2020	0.632	1.72	4.31
NMeFOSAA	2355-31-9	0.862 U	G1072-FS(0)	1.000	10/29/2020	0.302	0.862	4.31
NEtFOSAA	2991-50-6	0.862 U	G1072-FS(0)	1.000	10/29/2020	0.431	0.862	4.31
PFBS	375-73-5	0.431 U	G1072-FS(0)	1.000	10/29/2020	0.124	0.431	4.31
PFHxS	355-46-4	0.345 U	G1072-FS(0)	1.000	10/29/2020	0.0966	0.345	4.31
PFOS	1763-23-1	0.862 U	G1072-FS(0)	1.000	10/29/2020	0.377	0.862	4.31
HFPO-DA	13252-13-6	0.431 U	G1072-FS(0)	1.000	10/29/2020	0.214	0.431	4.31
Adona	919005-14-4	0.862 U	G1072-FS(0)	1.000	10/29/2020	0.228	0.862	4.31
9Cl-PF3ONS	756426-58-1	0.431 U	G1072-FS(0)	1.000	10/29/2020	0.231	0.431	4.31
11Cl-PF3OUdS	763051-92-9	0.862 U	G1072-FS(0)	1.000	10/29/2020	0.199	0.862	4.31

MW 1/8/21

Analyzed by: Schultz, Stephanie
Printed: 11/2/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1233
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 8, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SS22-000H	G1066-FS	Soil
2	CBD-AOA-SB22-0911	G1067-FS	Soil
3	CBD-AOA-SS21-000H	G1068-FS	Soil
4	CBD-AOA-SS21P-000H	G1069-FS	Soil
5	CBD-AOA-SB21-1516	G1070-FS	Soil
6	CBD-AOA-SS29-000H	G1073-FS	Soil
7	CBD-AOA-SB29-0608	G1074-FS	Soil
8	CBD-AOA-SB29-0810	G1075-FS	Soil
9	CBD-AOA-SS24-000H	G1076-FS	Soil
10	CBD-AOA-SB24-0103	G1077-FS	Soil

A Stage 2B/4 data validation was performed on the analytical data for ten soil samples collected on October 2, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for soil samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-100220-SO	PFOS	9.86	U	All Samples
CBD-AOA-FB01-100220	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	CBD-AOA-SS21-000H ng/g	CBD-AOA-SS21P-000H ng/g	RPD	Qualifier
PFUnA	5.11	5.57	9%	None
PFTrDA	4.46	3.75	17%	
PFHxS	1.10	1.16	5%	

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS22-000H
Battelle ID	G1066-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	17.29
Matrix	SO
Sample Size	1.76
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.27 U	G1066-FS(3)	10.000	10/28/2020	0.800	2.27	5.68
PFHpA	375-85-9	1.70 U	G1066-FS(3)	10.000	10/28/2020	0.580	1.70	5.68
PFOA	335-67-1	2.27 U	G1066-FS(3)	10.000	10/28/2020	0.690	2.27	5.68
PFNA	375-95-1	1.14 U	G1066-FS(3)	10.000	10/28/2020	0.560	1.14	5.68
PFDA	335-76-2	1.14 U	G1066-FS(3)	10.000	10/28/2020	0.530	1.14	5.68
PFUnA	2058-94-8	6.41	G1066-FS(3)	10.000	10/28/2020	0.520	1.14	5.68
PFDoA	307-55-1	2.27 U	G1066-FS(3)	10.000	10/28/2020	0.700	2.27	5.68
PFTrDA	72629-94-8	3.33 J	G1066-FS(3)	10.000	10/28/2020	0.320	1.14	5.68
PFTeDA	376-06-7	2.84 U	G1066-FS(3)	10.000	10/28/2020	1.23	2.84	5.68
NMeFOSAA	2355-31-9	2.84 U	G1066-FS(3)	10.000	10/28/2020	1.16	2.84	5.68
NEtFOSAA	2991-50-6	2.27 U	G1066-FS(3)	10.000	10/28/2020	0.850	2.27	5.68
PFBS	375-73-5	1.14 U	G1066-FS(3)	10.000	10/28/2020	0.400	1.14	5.68
PFHxS	355-46-4	2.27 U	G1066-FS(3)	10.000	10/28/2020	0.920	2.27	5.68
PFOS	1763-23-1	7.91 4	G1066-FS(3)	10.000	10/28/2020	0.790	2.27	5.68
HFPO-DA	13252-13-6	2.27 U	G1066-FS(3)	10.000	10/28/2020	0.730	2.27	5.68
Adona	919005-14-4	2.27 U	G1066-FS(3)	10.000	10/28/2020	0.940	2.27	5.68
9Cl-PF3ONS	756426-58-1	1.14 U	G1066-FS(3)	10.000	10/28/2020	0.550	1.14	5.68
11Cl-PF3OUdS	763051-92-9	1.70 U	G1066-FS(3)	10.000	10/28/2020	0.600	1.70	5.68

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Analyzed by: Schultz, Stephanie
Printed: 11/2/2020

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB22-0911
Battelle ID	G1067-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	14.84
Matrix	SO
Sample Size	1.68
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.38 U	G1067-FS(3)	10.000	10/27/2020	0.840	2.38	5.95	
PFHpA	375-85-9	1.79 U	G1067-FS(3)	10.000	10/27/2020	0.600	1.79	5.95	
PFOA	335-67-1	2.38 U	G1067-FS(3)	10.000	10/27/2020	0.720	2.38	5.95	
PFNA	375-95-1	1.19 U	G1067-FS(3)	10.000	10/27/2020	0.580	1.19	5.95	
PFDA	335-76-2	1.19 U	G1067-FS(3)	10.000	10/27/2020	0.550	1.19	5.95	
PFUnA	2058-94-8	1.19 U	G1067-FS(3)	10.000	10/27/2020	0.540	1.19	5.95	
PFDoA	307-55-1	2.38 U	G1067-FS(3)	10.000	10/27/2020	0.730	2.38	5.95	
PFTrDA	72629-94-8	1.19 U	G1067-FS(3)	10.000	10/27/2020	0.330	1.19	5.95	
PFTeDA	376-06-7	2.98 U	G1067-FS(3)	10.000	10/27/2020	1.29	2.98	5.95	
NMeFOSAA	2355-31-9	2.98 U	G1067-FS(3)	10.000	10/27/2020	1.21	2.98	5.95	
NEtFOSAA	2991-50-6	2.38 U	G1067-FS(3)	10.000	10/27/2020	0.890	2.38	5.95	
PFBS	375-73-5	1.19 U	G1067-FS(3)	10.000	10/27/2020	0.420	1.19	5.95	
PFHxS	355-46-4	2.38 U	G1067-FS(3)	10.000	10/27/2020	0.960	2.38	5.95	
PFOS	1763-23-1	2.38 ~~1.38~~ U	G1067-FS(3)	10.000	10/27/2020	0.820	2.38	5.95	EBL
HFPO-DA	13252-13-6	2.38 U	G1067-FS(3)	10.000	10/27/2020	0.760	2.38	5.95	
Adona	919005-14-4	2.38 U	G1067-FS(3)	10.000	10/27/2020	0.990	2.38	5.95	
9Cl-PF3ONS	756426-58-1	1.19 U	G1067-FS(3)	10.000	10/27/2020	0.570	1.19	5.95	
11Cl-PF3OUdS	763051-92-9	1.79 U	G1067-FS(3)	10.000	10/27/2020	0.620	1.79	5.95	

NW 11/8/21

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3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS21-000H
Battelle ID	G1068-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	17.60
Matrix	SO
Sample Size	1.71
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.34 U	G1068-FS(3)	10.000	10/27/2020	0.830	2.34	5.85	
PFHpA	375-85-9	1.75 U	G1068-FS(3)	10.000	10/27/2020	0.590	1.75	5.85	
PFOA	335-67-1	2.34 U	G1068-FS(3)	10.000	10/27/2020	0.710	2.34	5.85	
PFNA	375-95-1	1.17 U	G1068-FS(3)	10.000	10/27/2020	0.570	1.17	5.85	
PFDA	335-76-2	1.17 U	G1068-FS(3)	10.000	10/27/2020	0.540	1.17	5.85	
PFUnA	2058-94-8	5.11 J	G1068-FS(3)	10.000	10/27/2020	0.530	1.17	5.85	
PFDoA	307-55-1	2.34 U	G1068-FS(3)	10.000	10/27/2020	0.720	2.34	5.85	
PFTrDA	72629-94-8	4.46 J	G1068-FS(3)	10.000	10/27/2020	0.330	1.17	5.85	
PFTeDA	376-06-7	2.92 U	G1068-FS(3)	10.000	10/27/2020	1.26	2.92	5.85	
NMeFOSAA	2355-31-9	2.92 U	G1068-FS(3)	10.000	10/27/2020	1.19	2.92	5.85	
NEtFOSAA	2991-50-6	2.34 U	G1068-FS(3)	10.000	10/27/2020	0.870	2.34	5.85	
PFBS	375-73-5	1.17 U	G1068-FS(3)	10.000	10/27/2020	0.410	1.17	5.85	
PFHxS	355-46-4	1.10 J	G1068-FS(3)	10.000	10/27/2020	0.950	2.34	5.85	
PFOS	1763-23-1	7.12 u	G1068-FS(3)	10.000	10/27/2020	0.810	2.34	5.85	EBL
HFPO-DA	13252-13-6	2.34 U	G1068-FS(3)	10.000	10/27/2020	0.750	2.34	5.85	
Adona	919005-14-4	2.34 U	G1068-FS(3)	10.000	10/27/2020	0.970	2.34	5.85	
9Cl-PF3ONS	756426-58-1	1.17 U	G1068-FS(3)	10.000	10/27/2020	0.560	1.17	5.85	
11Cl-PF3OUdS	763051-92-9	1.75 U	G1068-FS(3)	10.000	10/27/2020	0.610	1.75	5.85	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS21P-000H
Battelle ID	G1069-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	23.69
Matrix	SO
Sample Size	1.57
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.55 U	G1069-FS(3)	10.000	10/27/2020	0.900	2.55	6.37
PFHpA	375-85-9	1.91 U	G1069-FS(3)	10.000	10/27/2020	0.640	1.91	6.37
PFOA	335-67-1	2.55 U	G1069-FS(3)	10.000	10/27/2020	0.770	2.55	6.37
PFNA	375-95-1	1.27 U	G1069-FS(3)	10.000	10/27/2020	0.630	1.27	6.37
PFDA	335-76-2	1.27 U	G1069-FS(3)	10.000	10/27/2020	0.590	1.27	6.37
PFUnA	2058-94-8	5.57 J	G1069-FS(3)	10.000	10/27/2020	0.580	1.27	6.37
PFDoA	307-55-1	2.55 U	G1069-FS(3)	10.000	10/27/2020	0.780	2.55	6.37
PFTrDA	72629-94-8	3.75 J	G1069-FS(3)	10.000	10/27/2020	0.360	1.27	6.37
PFTeDA	376-06-7	3.18 U	G1069-FS(3)	10.000	10/27/2020	1.38	3.18	6.37
NMeFOSAA	2355-31-9	3.18 U	G1069-FS(3)	10.000	10/27/2020	1.30	3.18	6.37
NEtFOSAA	2991-50-6	2.55 U	G1069-FS(3)	10.000	10/27/2020	0.950	2.55	6.37
PFBS	375-73-5	1.27 U	G1069-FS(3)	10.000	10/27/2020	0.450	1.27	6.37
PFHxS	355-46-4	1.16 J	G1069-FS(3)	10.000	10/27/2020	1.03	2.55	6.37
PFOS	1763-23-1	6.41 u	G1069-FS(3)	10.000	10/27/2020	0.880	2.55	6.37
HFPO-DA	13252-13-6	2.55 U	G1069-FS(3)	10.000	10/27/2020	0.820	2.55	6.37
Adona	919005-14-4	2.55 U	G1069-FS(3)	10.000	10/27/2020	1.06	2.55	6.37
9Cl-PF3ONS	756426-58-1	1.27 U	G1069-FS(3)	10.000	10/27/2020	0.610	1.27	6.37
11Cl-PF3OUdS	763051-92-9	1.91 U	G1069-FS(3)	10.000	10/27/2020	0.670	1.91	6.37

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Printed: 11/2/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB21-1516
Battelle ID	G1070-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	21.54
Matrix	SO
Sample Size	1.51
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.65 U	G1070-FS(3)	10.000	10/27/2020	0.940	2.65	6.62	
PFHpA	375-85-9	1.99 U	G1070-FS(3)	10.000	10/27/2020	0.670	1.99	6.62	
PFOA	335-67-1	2.65 U	G1070-FS(3)	10.000	10/27/2020	0.800	2.65	6.62	
PFNA	375-95-1	1.32 U	G1070-FS(3)	10.000	10/27/2020	0.650	1.32	6.62	
PFDA	335-76-2	1.32 U	G1070-FS(3)	10.000	10/27/2020	0.610	1.32	6.62	
PFUnA	2058-94-8	1.08 J	G1070-FS(3)	10.000	10/27/2020	0.610	1.32	6.62	
PFDoA	307-55-1	2.65 U	G1070-FS(3)	10.000	10/27/2020	0.810	2.65	6.62	
PFTrDA	72629-94-8	1.32 U	G1070-FS(3)	10.000	10/27/2020	0.370	1.32	6.62	
PFTeDA	376-06-7	3.31 U	G1070-FS(3)	10.000	10/27/2020	1.43	3.31	6.62	
NMeFOSAA	2355-31-9	3.31 U	G1070-FS(3)	10.000	10/27/2020	1.35	3.31	6.62	
NEtFOSAA	2991-50-6	2.65 U	G1070-FS(3)	10.000	10/27/2020	0.990	2.65	6.62	
PFBS	375-73-5	1.32 U	G1070-FS(3)	10.000	10/27/2020	0.460	1.32	6.62	
PFHxS	355-46-4	2.65 U	G1070-FS(3)	10.000	10/27/2020	1.07	2.65	6.62	
PFOS	1763-23-1	15.0 u	G1070-FS(3)	10.000	10/27/2020	0.920	2.65	6.62	EBL
HFPO-DA	13252-13-6	2.65 U	G1070-FS(3)	10.000	10/27/2020	0.850	2.65	6.62	
Adona	919005-14-4	2.65 U	G1070-FS(3)	10.000	10/27/2020	1.10	2.65	6.62	
9Cl-PF3ONS	756426-58-1	1.32 U	G1070-FS(3)	10.000	10/27/2020	0.640	1.32	6.62	
11Cl-PF3OUdS	763051-92-9	1.99 U	G1070-FS(3)	10.000	10/27/2020	0.690	1.99	6.62	

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Analyzed by: Schultz, Stephanie
Printed: 11/2/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS29-000H
Battelle ID	G1073-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	13.26
Matrix	SO
Sample Size	1.68
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.38 U	G1073-FS(3)	10.000	10/28/2020	0.840	2.38	5.95	
PFHpA	375-85-9	1.79 U	G1073-FS(3)	10.000	10/28/2020	0.600	1.79	5.95	
PFOA	335-67-1	2.38 U	G1073-FS(3)	10.000	10/28/2020	0.720	2.38	5.95	
PFNA	375-95-1	1.19 U	G1073-FS(3)	10.000	10/28/2020	0.580	1.19	5.95	
PFDA	335-76-2	0.880 J	G1073-FS(3)	10.000	10/28/2020	0.550	1.19	5.95	
PFUnA	2058-94-8	3.11 J	G1073-FS(3)	10.000	10/28/2020	0.540	1.19	5.95	
PFDoA	307-55-1	0.836 J	G1073-FS(3)	10.000	10/28/2020	0.730	2.38	5.95	
PFTrDA	72629-94-8	1.41 J	G1073-FS(3)	10.000	10/28/2020	0.330	1.19	5.95	
PFTeDA	376-06-7	2.98 U	G1073-FS(3)	10.000	10/28/2020	1.29	2.98	5.95	
NMeFOSAA	2355-31-9	2.98 U	G1073-FS(3)	10.000	10/28/2020	1.21	2.98	5.95	
NEtFOSAA	2991-50-6	2.38 U	G1073-FS(3)	10.000	10/28/2020	0.890	2.38	5.95	
PFBS	375-73-5	1.19 U	G1073-FS(3)	10.000	10/28/2020	0.420	1.19	5.95	
PFHxS	355-46-4	2.38 U	G1073-FS(3)	10.000	10/28/2020	0.960	2.38	5.95	
PFOS	1763-23-1	6.40 u	G1073-FS(3)	10.000	10/28/2020	0.820	2.38	5.95	EBL
HFPO-DA	13252-13-6	2.38 U	G1073-FS(3)	10.000	10/28/2020	0.760	2.38	5.95	
Adona	919005-14-4	2.38 U	G1073-FS(3)	10.000	10/28/2020	0.990	2.38	5.95	
9Cl-PF3ONS	756426-58-1	1.19 U	G1073-FS(3)	10.000	10/28/2020	0.570	1.19	5.95	
11Cl-PF3OUdS	763051-92-9	1.79 U	G1073-FS(3)	10.000	10/28/2020	0.620	1.79	5.95	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB29-0608
Battelle ID	G1074-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	14.95
Matrix	SO
Sample Size	1.85
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.16 U	G1074-FS(3)	10.000	10/27/2020	0.760	2.16	5.41	
PFHpA	375-85-9	1.62 U	G1074-FS(3)	10.000	10/27/2020	0.550	1.62	5.41	
PFOA	335-67-1	2.16 U	G1074-FS(3)	10.000	10/27/2020	0.660	2.16	5.41	
PFNA	375-95-1	1.08 U	G1074-FS(3)	10.000	10/27/2020	0.530	1.08	5.41	
PFDA	335-76-2	1.08 U	G1074-FS(3)	10.000	10/27/2020	0.500	1.08	5.41	
PFUnA	2058-94-8	1.08 U	G1074-FS(3)	10.000	10/27/2020	0.490	1.08	5.41	
PFDoA	307-55-1	2.16 U	G1074-FS(3)	10.000	10/27/2020	0.660	2.16	5.41	
PFTrDA	72629-94-8	1.08 U	G1074-FS(3)	10.000	10/27/2020	0.300	1.08	5.41	
PFTeDA	376-06-7	2.70 U	G1074-FS(3)	10.000	10/27/2020	1.17	2.70	5.41	
NMeFOSAA	2355-31-9	2.70 U	G1074-FS(3)	10.000	10/27/2020	1.10	2.70	5.41	
NEtFOSAA	2991-50-6	2.16 U	G1074-FS(3)	10.000	10/27/2020	0.810	2.16	5.41	
PFBS	375-73-5	1.08 U	G1074-FS(3)	10.000	10/27/2020	0.380	1.08	5.41	
PFHxS	355-46-4	2.16 U	G1074-FS(3)	10.000	10/27/2020	0.870	2.16	5.41	
PFOS	1763-23-1	3.15 J U	G1074-FS(3)	10.000	10/27/2020	0.750	2.16	5.41	EBL
HFPO-DA	13252-13-6	2.16 U	G1074-FS(3)	10.000	10/27/2020	0.690	2.16	5.41	
Adona	919005-14-4	2.16 U	G1074-FS(3)	10.000	10/27/2020	0.900	2.16	5.41	
9Cl-PF3ONS	756426-58-1	1.08 U	G1074-FS(3)	10.000	10/27/2020	0.520	1.08	5.41	
11Cl-PF3OUdS	763051-92-9	1.62 U	G1074-FS(3)	10.000	10/27/2020	0.570	1.62	5.41	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB29-0810
Battelle ID	G1075-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	13.93
Matrix	SO
Sample Size	1.64
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.44 U	G1075-FS(3)	10.000	10/27/2020	0.860	2.44	6.10	
PFHpA	375-85-9	1.83 U	G1075-FS(3)	10.000	10/27/2020	0.620	1.83	6.10	
PFOA	335-67-1	2.44 U	G1075-FS(3)	10.000	10/27/2020	0.740	2.44	6.10	
PFNA	375-95-1	1.22 U	G1075-FS(3)	10.000	10/27/2020	0.600	1.22	6.10	
PFDA	335-76-2	1.22 U	G1075-FS(3)	10.000	10/27/2020	0.560	1.22	6.10	
PFUnA	2058-94-8	1.22 U	G1075-FS(3)	10.000	10/27/2020	0.560	1.22	6.10	
PFDoA	307-55-1	2.44 U	G1075-FS(3)	10.000	10/27/2020	0.750	2.44	6.10	
PFTrDA	72629-94-8	1.22 U	G1075-FS(3)	10.000	10/27/2020	0.340	1.22	6.10	
PFTeDA	376-06-7	3.05 U	G1075-FS(3)	10.000	10/27/2020	1.32	3.05	6.10	
NMeFOSAA	2355-31-9	3.05 U	G1075-FS(3)	10.000	10/27/2020	1.24	3.05	6.10	
NEtFOSAA	2991-50-6	2.44 U	G1075-FS(3)	10.000	10/27/2020	0.910	2.44	6.10	
PFBS	375-73-5	1.22 U	G1075-FS(3)	10.000	10/27/2020	0.430	1.22	6.10	
PFHxS	355-46-4	2.44 U	G1075-FS(3)	10.000	10/27/2020	0.990	2.44	6.10	
PFOS	1763-23-1	3.61 J u	G1075-FS(3)	10.000	10/27/2020	0.840	2.44	6.10	EBL
HFPO-DA	13252-13-6	2.44 U	G1075-FS(3)	10.000	10/27/2020	0.780	2.44	6.10	
Adona	919005-14-4	2.44 U	G1075-FS(3)	10.000	10/27/2020	1.01	2.44	6.10	
9Cl-PF3ONS	756426-58-1	1.22 U	G1075-FS(3)	10.000	10/27/2020	0.590	1.22	6.10	
11Cl-PF3OUdS	763051-92-9	1.83 U	G1075-FS(3)	10.000	10/27/2020	0.640	1.83	6.10	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS24-000H
Battelle ID	G1076-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	10.97
Matrix	SO
Sample Size	1.81
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.21 U	G1076-FS(3)	10.000	10/27/2020	0.780	2.21	5.52	
PFHpA	375-85-9	1.66 U	G1076-FS(3)	10.000	10/27/2020	0.560	1.66	5.52	
PFOA	335-67-1	2.21 U	G1076-FS(3)	10.000	10/27/2020	0.670	2.21	5.52	
PFNA	375-95-1	1.10 U	G1076-FS(3)	10.000	10/27/2020	0.540	1.10	5.52	
PFDA	335-76-2	1.10 U	G1076-FS(3)	10.000	10/27/2020	0.510	1.10	5.52	
PFUnA	2058-94-8	3.85 J	G1076-FS(3)	10.000	10/27/2020	0.500	1.10	5.52	
PFDoA	307-55-1	2.21 U	G1076-FS(3)	10.000	10/27/2020	0.680	2.21	5.52	
PFTrDA	72629-94-8	2.40 J	G1076-FS(3)	10.000	10/27/2020	0.310	1.10	5.52	
PFTeDA	376-06-7	2.76 U	G1076-FS(3)	10.000	10/27/2020	1.19	2.76	5.52	
NMeFOSAA	2355-31-9	2.76 U	G1076-FS(3)	10.000	10/27/2020	1.13	2.76	5.52	
NEtFOSAA	2991-50-6	2.21 U	G1076-FS(3)	10.000	10/27/2020	0.830	2.21	5.52	
PFBS	375-73-5	1.10 U	G1076-FS(3)	10.000	10/27/2020	0.390	1.10	5.52	
PFHxS	355-46-4	2.21 U	G1076-FS(3)	10.000	10/27/2020	0.890	2.21	5.52	
PFOS	1763-23-1	7.10 U	G1076-FS(3)	10.000	10/27/2020	0.760	2.21	5.52	EBL
HFPO-DA	13252-13-6	2.21 U	G1076-FS(3)	10.000	10/27/2020	0.710	2.21	5.52	
Adona	919005-14-4	2.21 U	G1076-FS(3)	10.000	10/27/2020	0.920	2.21	5.52	
9Cl-PF3ONS	756426-58-1	1.10 U	G1076-FS(3)	10.000	10/27/2020	0.530	1.10	5.52	
11Cl-PF3OUdS	763051-92-9	1.66 U	G1076-FS(3)	10.000	10/27/2020	0.580	1.66	5.52	

NW 1/8/21

Analyzed by: Schultz, Stephanie
Printed: 11/2/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB24-0103
Battelle ID	G1077-FS
Sample Type	SA
Collection Date	10/02/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	12.80
Matrix	SO
Sample Size	1.68
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.38 U	G1077-FS(3)	10.000	10/27/2020	0.840	2.38	5.95	
PFHpA	375-85-9	1.79 U	G1077-FS(3)	10.000	10/27/2020	0.600	1.79	5.95	
PFOA	335-67-1	2.38 U	G1077-FS(3)	10.000	10/27/2020	0.720	2.38	5.95	
PFNA	375-95-1	0.913 J	G1077-FS(3)	10.000	10/27/2020	0.580	1.19	5.95	
PFDA	335-76-2	1.19 U	G1077-FS(3)	10.000	10/27/2020	0.550	1.19	5.95	
PFUnA	2058-94-8	0.816 J	G1077-FS(3)	10.000	10/27/2020	0.540	1.19	5.95	
PFDoA	307-55-1	2.38 U	G1077-FS(3)	10.000	10/27/2020	0.730	2.38	5.95	
PFTrDA	72629-94-8	1.19 U	G1077-FS(3)	10.000	10/27/2020	0.330	1.19	5.95	
PFTeDA	376-06-7	2.98 U	G1077-FS(3)	10.000	10/27/2020	1.29	2.98	5.95	
NMeFOSAA	2355-31-9	2.98 U	G1077-FS(3)	10.000	10/27/2020	1.21	2.98	5.95	
NEtFOSAA	2991-50-6	2.38 U	G1077-FS(3)	10.000	10/27/2020	0.890	2.38	5.95	
PFBS	375-73-5	1.19 U	G1077-FS(3)	10.000	10/27/2020	0.420	1.19	5.95	
PFHxS	355-46-4	2.38 U	G1077-FS(3)	10.000	10/27/2020	0.960	2.38	5.95	
PFOS	1763-23-1	39.5 U	G1077-FS(3)	10.000	10/27/2020	0.820	2.38	5.95	EBL
HFPO-DA	13252-13-6	2.38 U	G1077-FS(3)	10.000	10/27/2020	0.760	2.38	5.95	
Adona	919005-14-4	2.38 U	G1077-FS(3)	10.000	10/27/2020	0.990	2.38	5.95	
9Cl-PF3ONS	756426-58-1	1.19 U	G1077-FS(3)	10.000	10/27/2020	0.570	1.19	5.95	
11Cl-PF3OUdS	763051-92-9	1.79 U	G1077-FS(3)	10.000	10/27/2020	0.620	1.79	5.95	

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1245
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 8, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SS07-000H	G1222-FS	Soil
2	CBD-AOA-SB07-0809	G1223-FS	Soil

A Stage 2B/4 data validation was performed on the analytical data for two soil samples collected on October 5, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination

- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for soil samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB02-100920-SO	PFOS	13.0	U	All Samples
CBD-AOA-FB02-100920	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS07-000H
Battelle ID	G1222-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/07/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	15.75
Matrix	SO
Sample Size	1.69
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.05 J	G1222-FS(3)	10.000	10/10/2020	0.840	2.37	5.92	
PFHpA	375-85-9	1.39 J	G1222-FS(3)	10.000	10/10/2020	0.600	1.78	5.92	
PFOA	335-67-1	1.46 J	G1222-FS(3)	10.000	10/10/2020	0.720	2.37	5.92	
PFNA	375-95-1	2.00 J	G1222-FS(3)	10.000	10/10/2020	0.580	1.18	5.92	
PFDA	335-76-2	1.92 J	G1222-FS(3)	10.000	10/10/2020	0.550	1.18	5.92	
PFUnA	2058-94-8	32.9	G1222-FS(3)	10.000	10/10/2020	0.540	1.18	5.92	
PFDoA	307-55-1	5.23 J	G1222-FS(3)	10.000	10/10/2020	0.720	2.37	5.92	
PFTrDA	72629-94-8	144	G1222-FS(3)	10.000	10/10/2020	0.330	1.18	5.92	
PFTeDA	376-06-7	1.98 J	G1222-FS(3)	10.000	10/10/2020	1.28	2.96	5.92	
NMeFOSAA	2355-31-9	2.96 U	G1222-FS(3)	10.000	10/10/2020	1.21	2.96	5.92	
NEtFOSAA	2991-50-6	2.37 U	G1222-FS(3)	10.000	10/10/2020	0.890	2.37	5.92	
PFBS	375-73-5	1.18 U	G1222-FS(3)	10.000	10/10/2020	0.410	1.18	5.92	
PFHxS	355-46-4	7.17	G1222-FS(3)	10.000	10/10/2020	0.960	2.37	5.92	
PFOS	1763-23-1	34.3 U	G1222-FS(3)	10.000	10/10/2020	0.820	2.37	5.92	EBL
HFPO-DA	13252-13-6	2.37 U	G1222-FS(3)	10.000	10/10/2020	0.760	2.37	5.92	
Adona	919005-14-4	2.37 U	G1222-FS(3)	10.000	10/10/2020	0.980	2.37	5.92	
9Cl-PF3ONS	756426-58-1	1.18 U	G1222-FS(3)	10.000	10/10/2020	0.570	1.18	5.92	
11Cl-PF3OUdS	763051-92-9	1.78 U	G1222-FS(3)	10.000	10/10/2020	0.620	1.78	5.92	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB07-0809
Battelle ID	G1223-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/07/2020
Analytical Instrument	Sciex 5500 LC/MS/MS
% Moisture	34.33
Matrix	SO
Sample Size	1.23
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.55 J	G1223-FS(3)	10.000	10/10/2020	1.15	3.25	8.13	
PFHpA	375-85-9	2.44 U	G1223-FS(3)	10.000	10/10/2020	0.820	2.44	8.13	
PFOA	335-67-1	3.25 U	G1223-FS(3)	10.000	10/10/2020	0.990	3.25	8.13	
PFNA	375-95-1	1.18 J	G1223-FS(3)	10.000	10/10/2020	0.800	1.63	8.13	
PFDA	335-76-2	1.63 U	G1223-FS(3)	10.000	10/10/2020	0.750	1.63	8.13	
PFUnA	2058-94-8	1.63 U	G1223-FS(3)	10.000	10/10/2020	0.740	1.63	8.13	
PFDoA	307-55-1	3.25 U	G1223-FS(3)	10.000	10/10/2020	1.00	3.25	8.13	
PFTrDA	72629-94-8	1.63 U	G1223-FS(3)	10.000	10/10/2020	0.460	1.63	8.13	
PFTeDA	376-06-7	4.07 U	G1223-FS(3)	10.000	10/10/2020	1.76	4.07	8.13	
NMeFOSAA	2355-31-9	4.07 U	G1223-FS(3)	10.000	10/10/2020	1.66	4.07	8.13	
NEtFOSAA	2991-50-6	3.25 U	G1223-FS(3)	10.000	10/10/2020	1.22	3.25	8.13	
PFBS	375-73-5	1.63 U	G1223-FS(3)	10.000	10/10/2020	0.570	1.63	8.13	
PFHxS	355-46-4	3.19 J	G1223-FS(3)	10.000	10/10/2020	1.31	3.25	8.13	
PFOS	1763-23-1	16.3 U	G1223-FS(3)	10.000	10/10/2020	1.13	3.25	8.13	EBL
HFPO-DA	13252-13-6	3.25 U	G1223-FS(3)	10.000	10/10/2020	1.04	3.25	8.13	
Adona	919005-14-4	3.25 U	G1223-FS(3)	10.000	10/10/2020	1.35	3.25	8.13	
9Cl-PF3ONS	756426-58-1	1.63 U	G1223-FS(3)	10.000	10/10/2020	0.780	1.63	8.13	
11Cl-PF3OUdS	763051-92-9	2.44 U	G1223-FS(3)	10.000	10/10/2020	0.850	2.44	8.13	

MW 11/8/21

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1246
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 9, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SS18-000H	G1224-FS	Soil
2	CBD-AOA-SB18-0204	G1225-FS	Soil
3	CBD-AOA-SB18-0809	G1226-FS	Soil
4	CBD-AOA-SS19-000H	G1227-FS	Soil
5	CBD-AOA-SB19-0608	G1228-FS	Soil
6	CBD-AOA-SS20-000H	G1229-FS	Soil
7	CBD-AOA-SB20-0810	G1230-FS	Soil
8	CBD-AOA-SS17-000H	G1231-FS	Soil
9	CBD-AOA-SB17-0608	G1232-FS	Soil
10	CBD-AOA-SS11-000H	G1233-FS	Soil
11	CBD-AOA-SS11P-000H	G1234-FS	Soil
12	CBD-AOA-SB11-1315	G1235-FS	Soil
13	CBD-AOA-SS12-000H	G1236-FS	Soil
14	CBD-AOA-SB12-0103	G1237-FS	Soil

A Stage 2B/4 data validation was performed on the analytical data for fourteen soil samples collected on October 5, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for soil samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB02-100920-SO	PFOS	13.0	U	1-3, 5, 7, 10-13
CBD-AOA-FB02-100920	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.
- The ion ratio exceeded percent difference criteria and was flagged (Q) by the laboratory and further qualified estimated (J) by the reviewer for one compound in EDS Sample 4.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	CBD-AOA-SS11-000H ng/g	CBD-AOA-SS11P-000H ng/g	RPD	Qualifier
PFHxA	7.22	6.43	12%	None
PFHpA	4.66	4.28	9%	
PFOA	2.07	2.08	0%	
PFNA	2.98	4.13	32%	
PFDA	3.71	3.36	10%	
PFUnA	58.6	57.6	2%	
PFDoA	3.16	3.01	5%	
PFTrDA	48.8	48.0	2%	
PFHxS	6.75	4.93	31%	

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

BATTELLE
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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS18-000H
Battelle ID	G1224-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	8.06
Matrix	SO
Sample Size	1.86
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.15 U	G1224-FS(3)	10.000	10/28/2020	0.760	2.15	5.38
PFHpA	375-85-9	1.61 U	G1224-FS(3)	10.000	10/28/2020	0.540	1.61	5.38
PFOA	335-67-1	2.15 U	G1224-FS(3)	10.000	10/28/2020	0.650	2.15	5.38
PFNA	375-95-1	0.758 J	G1224-FS(3)	10.000	10/28/2020	0.530	1.08	5.38
PFDA	335-76-2	1.08 U	G1224-FS(3)	10.000	10/28/2020	0.500	1.08	5.38
PFUnA	2058-94-8	3.16 J	G1224-FS(3)	10.000	10/28/2020	0.490	1.08	5.38
PFDoA	307-55-1	2.15 U	G1224-FS(3)	10.000	10/28/2020	0.660	2.15	5.38
PFTrDA	72629-94-8	0.389 J	G1224-FS(3)	10.000	10/28/2020	0.300	1.08	5.38
PFTeDA	376-06-7	2.69 U	G1224-FS(3)	10.000	10/28/2020	1.16	2.69	5.38
NMeFOSAA	2355-31-9	2.69 U	G1224-FS(3)	10.000	10/28/2020	1.10	2.69	5.38
NEtFOSAA	2991-50-6	2.15 U	G1224-FS(3)	10.000	10/28/2020	0.800	2.15	5.38
PFBS	375-73-5	1.08 U	G1224-FS(3)	10.000	10/28/2020	0.380	1.08	5.38
PFHxS	355-46-4	1.41 J	G1224-FS(3)	10.000	10/28/2020	0.870	2.15	5.38
PFOS	1763-23-1	82.1 U	G1224-FS(3)	10.000	10/28/2020	0.740	2.15	5.38
HFPO-DA	13252-13-6	2.15 U	G1224-FS(3)	10.000	10/28/2020	0.690	2.15	5.38
Adona	919005-14-4	2.15 U	G1224-FS(3)	10.000	10/28/2020	0.890	2.15	5.38
9Cl-PF3ONS	756426-58-1	1.08 U	G1224-FS(3)	10.000	10/28/2020	0.520	1.08	5.38
11Cl-PF3OUdS	763051-92-9	1.61 U	G1224-FS(3)	10.000	10/28/2020	0.560	1.61	5.38

EBL

11/9/21
Analyzed by: Schultz, Stephanie

BATTELLE
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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB18-0204
Battelle ID	G1225-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	16.27
Matrix	SO
Sample Size	1.66
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	3.11 J	G1225-FS(3)	10.000	10/28/2020	0.850	2.41	6.02	
PFHpA	375-85-9	0.806 J	G1225-FS(3)	10.000	10/28/2020	0.610	1.81	6.02	
PFOA	335-67-1	75.9	G1225-FS(3)	10.000	10/28/2020	0.730	2.41	6.02	
PFNA	375-95-1	13.2	G1225-FS(3)	10.000	10/28/2020	0.590	1.20	6.02	
PFDA	335-76-2	1.20 U	G1225-FS(3)	10.000	10/28/2020	0.560	1.20	6.02	
PFUnA	2058-94-8	18.8	G1225-FS(3)	10.000	10/28/2020	0.550	1.20	6.02	
PFDoA	307-55-1	2.41 U	G1225-FS(3)	10.000	10/28/2020	0.740	2.41	6.02	
PFTrDA	72629-94-8	1.20 U	G1225-FS(3)	10.000	10/28/2020	0.340	1.20	6.02	
PFTeDA	376-06-7	3.01 U	G1225-FS(3)	10.000	10/28/2020	1.30	3.01	6.02	
NMeFOSAA	2355-31-9	3.01 U	G1225-FS(3)	10.000	10/28/2020	1.23	3.01	6.02	
NEtFOSAA	2991-50-6	2.41 U	G1225-FS(3)	10.000	10/28/2020	0.900	2.41	6.02	
PFBS	375-73-5	1.20 U	G1225-FS(3)	10.000	10/28/2020	0.420	1.20	6.02	
PFHxS	355-46-4	15.0	G1225-FS(3)	10.000	10/28/2020	0.970	2.41	6.02	
PFOS	1763-23-1	84.6 u	G1225-FS(3)	10.000	10/28/2020	0.830	2.41	6.02	EBL
HFPO-DA	13252-13-6	2.41 U	G1225-FS(3)	10.000	10/28/2020	0.770	2.41	6.02	
Adona	919005-14-4	2.41 U	G1225-FS(3)	10.000	10/28/2020	1.00	2.41	6.02	
9Cl-PF3ONS	756426-58-1	1.20 U	G1225-FS(3)	10.000	10/28/2020	0.580	1.20	6.02	
11Cl-PF3OUdS	763051-92-9	1.81 U	G1225-FS(3)	10.000	10/28/2020	0.630	1.81	6.02	

MW 1/9/21

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3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB18-0809
Battelle ID	G1226-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	33.38
Matrix	SO
Sample Size	1.25
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	3.20 U	G1226-FS(3)	10.000	10/28/2020	1.13	3.20	8.00	
PFHpA	375-85-9	2.40 U	G1226-FS(3)	10.000	10/28/2020	0.810	2.40	8.00	
PFOA	335-67-1	3.20 U	G1226-FS(3)	10.000	10/28/2020	0.970	3.20	8.00	
PFNA	375-95-1	1.60 U	G1226-FS(3)	10.000	10/28/2020	0.790	1.60	8.00	
PFDA	335-76-2	1.60 U	G1226-FS(3)	10.000	10/28/2020	0.740	1.60	8.00	
PFUnA	2058-94-8	1.60 U	G1226-FS(3)	10.000	10/28/2020	0.730	1.60	8.00	
PFDoA	307-55-1	3.20 U	G1226-FS(3)	10.000	10/28/2020	0.980	3.20	8.00	
PFTrDA	72629-94-8	6.11 J	G1226-FS(3)	10.000	10/28/2020	0.450	1.60	8.00	
PFTeDA	376-06-7	4.00 U	G1226-FS(3)	10.000	10/28/2020	1.73	4.00	8.00	
NMeFOSAA	2355-31-9	4.00 U	G1226-FS(3)	10.000	10/28/2020	1.63	4.00	8.00	
NEtFOSAA	2991-50-6	3.20 U	G1226-FS(3)	10.000	10/28/2020	1.20	3.20	8.00	
PFBS	375-73-5	1.60 U	G1226-FS(3)	10.000	10/28/2020	0.560	1.60	8.00	
PFHxS	355-46-4	3.20 U	G1226-FS(3)	10.000	10/28/2020	1.29	3.20	8.00	
PFOS	1763-23-1	6.10 J U	G1226-FS(3)	10.000	10/28/2020	1.11	3.20	8.00	EBL
HFPO-DA	13252-13-6	3.20 U	G1226-FS(3)	10.000	10/28/2020	1.03	3.20	8.00	
Adona	919005-14-4	3.20 U	G1226-FS(3)	10.000	10/28/2020	1.33	3.20	8.00	
9Cl-PF3ONS	756426-58-1	1.60 U	G1226-FS(3)	10.000	10/28/2020	0.770	1.60	8.00	
11Cl-PF3OUdS	763051-92-9	2.40 U	G1226-FS(3)	10.000	10/28/2020	0.840	2.40	8.00	

MW 11/9/21

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4

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS19-000H
Battelle ID	G1227-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	10.12
Matrix	SO
Sample Size	1.92
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	3.76 J	G1227-FS(3)	10.000	10/28/2020	0.740	2.08	5.21	
PFHpA	375-85-9	2.15 J	G1227-FS(3)	10.000	10/28/2020	0.530	1.56	5.21	
PFOA	335-67-1	8.07	G1227-FS(3)	10.000	10/28/2020	0.630	2.08	5.21	
PFNA	375-95-1	3.47 J	G1227-FS(3)	10.000	10/28/2020	0.510	1.04	5.21	
PFDA	335-76-2	13.3	G1227-FS(3)	10.000	10/28/2020	0.480	1.04	5.21	
PFUnA	2058-94-8	961	G1227-FS-D(5)	125.000	10/28/2020	5.95	13.0	65.1	
PFDoA	307-55-1	32.7	G1227-FS(3)	10.000	10/28/2020	0.640	2.08	5.21	
PFTrDA	72629-94-8	728	G1227-FS-D(5)	125.000	10/28/2020	3.65	13.0	65.1	
PFTeDA	376-06-7	14.0	G1227-FS(3)	10.000	10/28/2020	1.13	2.60	5.21	
NMeFOSAA	2355-31-9	8.05 J	G1227-FS(3)	10.000	10/28/2020	1.06	2.60	5.21	OT
NEtFOSAA	2991-50-6	2.55 J	G1227-FS(3)	10.000	10/28/2020	0.780	2.08	5.21	
PFBS	375-73-5	1.04 U	G1227-FS(3)	10.000	10/28/2020	0.360	1.04	5.21	
PFHxS	355-46-4	20.9	G1227-FS(3)	10.000	10/28/2020	0.840	2.08	5.21	
PFOS	1763-23-1	224	G1227-FS-D(5)	125.000	10/28/2020	9.01	26.0	65.1	
HFPO-DA	13252-13-6	2.08 U	G1227-FS(3)	10.000	10/28/2020	0.670	2.08	5.21	
Adona	919005-14-4	2.08 U	G1227-FS(3)	10.000	10/28/2020	0.860	2.08	5.21	
9Cl-PF3ONS	756426-58-1	1.04 U	G1227-FS(3)	10.000	10/28/2020	0.500	1.04	5.21	
11Cl-PF3OUdS	763051-92-9	1.56 U	G1227-FS(3)	10.000	10/28/2020	0.550	1.56	5.21	

MW 11/9/21

Analyzed by: Schultz, Stephanie
Printed: 11/3/2020

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5

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB19-0608
Battelle ID	G1228-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	24.42
Matrix	SO
Sample Size	1.55
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.71 J	G1228-FS(3)	10.000	10/28/2020	0.910	2.58	6.45	
PFHpA	375-85-9	1.16 J	G1228-FS(3)	10.000	10/28/2020	0.650	1.94	6.45	
PFOA	335-67-1	2.15 J	G1228-FS(3)	10.000	10/28/2020	0.780	2.58	6.45	
PFNA	375-95-1	1.29 U	G1228-FS(3)	10.000	10/28/2020	0.630	1.29	6.45	
PFDA	335-76-2	1.09 J	G1228-FS(3)	10.000	10/28/2020	0.600	1.29	6.45	
PFUnA	2058-94-8	1.29 U	G1228-FS(3)	10.000	10/28/2020	0.590	1.29	6.45	
PFDoA	307-55-1	2.58 U	G1228-FS(3)	10.000	10/28/2020	0.790	2.58	6.45	
PFTrDA	72629-94-8	1.29 U	G1228-FS(3)	10.000	10/28/2020	0.360	1.29	6.45	
PFTeDA	376-06-7	3.23 U	G1228-FS(3)	10.000	10/28/2020	1.39	3.23	6.45	
NMeFOSAA	2355-31-9	3.23 U	G1228-FS(3)	10.000	10/28/2020	1.32	3.23	6.45	
NEtFOSAA	2991-50-6	2.58 U	G1228-FS(3)	10.000	10/28/2020	0.970	2.58	6.45	
PFBS	375-73-5	1.29 U	G1228-FS(3)	10.000	10/28/2020	0.450	1.29	6.45	
PFHxS	355-46-4	6.22 J	G1228-FS(3)	10.000	10/28/2020	1.04	2.58	6.45	
PFOS	1763-23-1	123 U	G1228-FS(3)	10.000	10/28/2020	0.890	2.58	6.45	EBL
HFPO-DA	13252-13-6	2.58 U	G1228-FS(3)	10.000	10/28/2020	0.830	2.58	6.45	
Adona	919005-14-4	2.58 U	G1228-FS(3)	10.000	10/28/2020	1.07	2.58	6.45	
9Cl-PF3ONS	756426-58-1	1.29 U	G1228-FS(3)	10.000	10/28/2020	0.620	1.29	6.45	
11Cl-PF3OUdS	763051-92-9	1.94 U	G1228-FS(3)	10.000	10/28/2020	0.680	1.94	6.45	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS20-000H
Battelle ID	G1229-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	24.32
Matrix	SO
Sample Size	1.58
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	4.02 J	G1229-FS(3)	10.000	10/28/2020	0.890	2.53	6.33
PFHpA	375-85-9	2.10 J	G1229-FS(3)	10.000	10/28/2020	0.640	1.90	6.33
PFOA	335-67-1	4.06 J	G1229-FS(3)	10.000	10/28/2020	0.770	2.53	6.33
PFNA	375-95-1	16.1	G1229-FS(3)	10.000	10/28/2020	0.620	1.27	6.33
PFDA	335-76-2	6.80	G1229-FS(3)	10.000	10/28/2020	0.590	1.27	6.33
PFUnA	2058-94-8	101	G1229-FS(3)	10.000	10/28/2020	0.580	1.27	6.33
PFDoA	307-55-1	7.19	G1229-FS(3)	10.000	10/28/2020	0.770	2.53	6.33
PFTrDA	72629-94-8	124	G1229-FS(3)	10.000	10/28/2020	0.350	1.27	6.33
PFTeDA	376-06-7	2.81 J	G1229-FS(3)	10.000	10/28/2020	1.37	3.16	6.33
NMeFOSAA	2355-31-9	3.16 U	G1229-FS(3)	10.000	10/28/2020	1.29	3.16	6.33
NEtFOSAA	2991-50-6	2.53 U	G1229-FS(3)	10.000	10/28/2020	0.950	2.53	6.33
PFBS	375-73-5	1.27 U	G1229-FS(3)	10.000	10/28/2020	0.440	1.27	6.33
PFHxS	355-46-4	37.5	G1229-FS(3)	10.000	10/28/2020	1.02	2.53	6.33
PFOS	1763-23-1	231	G1229-FS-D(5)	125.000	10/28/2020	11.0	31.7	79.1
HFPO-DA	13252-13-6	2.53 U	G1229-FS(3)	10.000	10/28/2020	0.810	2.53	6.33
Adona	919005-14-4	2.53 U	G1229-FS(3)	10.000	10/28/2020	1.05	2.53	6.33
9Cl-PF3ONS	756426-58-1	1.27 U	G1229-FS(3)	10.000	10/28/2020	0.610	1.27	6.33
11Cl-PF3OUdS	763051-92-9	1.90 U	G1229-FS(3)	10.000	10/28/2020	0.660	1.90	6.33

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB20-0810
Battelle ID	G1230-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	33.25
Matrix	SO
Sample Size	1.38
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.90 U	G1230-FS(3)	10.000	10/28/2020	1.02	2.90	7.25	
PFHpA	375-85-9	2.17 U	G1230-FS(3)	10.000	10/28/2020	0.730	2.17	7.25	
PFOA	335-67-1	2.90 U	G1230-FS(3)	10.000	10/28/2020	0.880	2.90	7.25	
PFNA	375-95-1	1.45 U	G1230-FS(3)	10.000	10/28/2020	0.710	1.45	7.25	
PFDA	335-76-2	1.45 U	G1230-FS(3)	10.000	10/28/2020	0.670	1.45	7.25	
PFUnA	2058-94-8	0.897 J	G1230-FS(3)	10.000	10/28/2020	0.660	1.45	7.25	
PFDoA	307-55-1	2.90 U	G1230-FS(3)	10.000	10/28/2020	0.890	2.90	7.25	
PFTrDA	72629-94-8	1.45 U	G1230-FS(3)	10.000	10/28/2020	0.410	1.45	7.25	
PFTeDA	376-06-7	3.62 U	G1230-FS(3)	10.000	10/28/2020	1.57	3.62	7.25	
NMeFOSAA	2355-31-9	3.62 U	G1230-FS(3)	10.000	10/28/2020	1.48	3.62	7.25	
NEtFOSAA	2991-50-6	2.90 U	G1230-FS(3)	10.000	10/28/2020	1.08	2.90	7.25	
PFBS	375-73-5	1.45 U	G1230-FS(3)	10.000	10/28/2020	0.510	1.45	7.25	
PFHxS	355-46-4	1.52 J	G1230-FS(3)	10.000	10/28/2020	1.17	2.90	7.25	
PFOS	1763-23-1	4.63 J/U	G1230-FS(3)	10.000	10/28/2020	1.00	2.90	7.25	EBL
HFPO-DA	13252-13-6	2.90 U	G1230-FS(3)	10.000	10/28/2020	0.930	2.90	7.25	
Adona	919005-14-4	2.90 U	G1230-FS(3)	10.000	10/28/2020	1.20	2.90	7.25	
9Cl-PF3ONS	756426-58-1	1.45 U	G1230-FS(3)	10.000	10/28/2020	0.700	1.45	7.25	
11Cl-PF3OUdS	763051-92-9	2.17 U	G1230-FS(3)	10.000	10/28/2020	0.760	2.17	7.25	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS17-000H
Battelle ID	G1231-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	13.83
Matrix	SO
Sample Size	1.69
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	13.6	G1231-FS(3)	10.000	10/28/2020	0.840	2.37	5.92
PFHpA	375-85-9	10.8	G1231-FS(3)	10.000	10/28/2020	0.600	1.78	5.92
PFOA	335-67-1	25.4	G1231-FS(3)	10.000	10/28/2020	0.720	2.37	5.92
PFNA	375-95-1	152	G1231-FS(3)	10.000	10/28/2020	0.580	1.18	5.92
PFDA	335-76-2	9.57	G1231-FS(3)	10.000	10/28/2020	0.550	1.18	5.92
PFUnA	2058-94-8	154	G1231-FS(3)	10.000	10/28/2020	0.540	1.18	5.92
PFDoA	307-55-1	5.99	G1231-FS(3)	10.000	10/28/2020	0.720	2.37	5.92
PFTrDA	72629-94-8	89.6	G1231-FS(3)	10.000	10/28/2020	0.330	1.18	5.92
PFTeDA	376-06-7	1.42 J	G1231-FS(3)	10.000	10/28/2020	1.28	2.96	5.92
NMeFOSAA	2355-31-9	2.96 U	G1231-FS(3)	10.000	10/28/2020	1.21	2.96	5.92
NEtFOSAA	2991-50-6	2.37 U	G1231-FS(3)	10.000	10/28/2020	0.890	2.37	5.92
PFBS	375-73-5	0.668 J	G1231-FS(3)	10.000	10/28/2020	0.410	1.18	5.92
PFHxS	355-46-4	155	G1231-FS-D(5)	50.000	10/28/2020	4.78	11.8	29.6
PFOS	1763-23-1	4660	G1231-FS-D(7)	1250.000	10/28/2020	102	296	740
HFPO-DA	13252-13-6	2.37 U	G1231-FS(3)	10.000	10/28/2020	0.760	2.37	5.92
Adona	919005-14-4	2.37 U	G1231-FS(3)	10.000	10/28/2020	0.980	2.37	5.92
9Cl-PF3ONS	756426-58-1	1.18 U	G1231-FS(3)	10.000	10/28/2020	0.570	1.18	5.92
11Cl-PF3OUdS	763051-92-9	1.78 U	G1231-FS(3)	10.000	10/28/2020	0.620	1.78	5.92

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB17-0608
Battelle ID	G1232-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	25.10
Matrix	SO
Sample Size	1.54
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	32.2	G1232-FS(3)	10.000	10/28/2020	0.920	2.60	6.49
PFHpA	375-85-9	7.89	G1232-FS(3)	10.000	10/28/2020	0.660	1.95	6.49
PFOA	335-67-1	20.6	G1232-FS(3)	10.000	10/28/2020	0.790	2.60	6.49
PFNA	375-95-1	172	G1232-FS(3)	10.000	10/28/2020	0.640	1.30	6.49
PFDA	335-76-2	1.30 U	G1232-FS(3)	10.000	10/28/2020	0.600	1.30	6.49
PFUnA	2058-94-8	1.30 U	G1232-FS(3)	10.000	10/28/2020	0.590	1.30	6.49
PFDoA	307-55-1	2.60 U	G1232-FS(3)	10.000	10/28/2020	0.790	2.60	6.49
PFTrDA	72629-94-8	1.30 U	G1232-FS(3)	10.000	10/28/2020	0.360	1.30	6.49
PFTeDA	376-06-7	3.25 U	G1232-FS(3)	10.000	10/28/2020	1.40	3.25	6.49
NMeFOSAA	2355-31-9	3.25 U	G1232-FS(3)	10.000	10/28/2020	1.32	3.25	6.49
NEtFOSAA	2991-50-6	2.60 U	G1232-FS(3)	10.000	10/28/2020	0.970	2.60	6.49
PFBS	375-73-5	2.35 J	G1232-FS(3)	10.000	10/28/2020	0.450	1.30	6.49
PFHxS	355-46-4	124	G1232-FS(3)	10.000	10/28/2020	1.05	2.60	6.49
PFOS	1763-23-1	653	G1232-FS-D(5)	125.000	10/28/2020	11.2	32.5	81.2
HFPO-DA	13252-13-6	2.60 U	G1232-FS(3)	10.000	10/28/2020	0.830	2.60	6.49
Adona	919005-14-4	2.60 U	G1232-FS(3)	10.000	10/28/2020	1.08	2.60	6.49
9Cl-PF3ONS	756426-58-1	1.30 U	G1232-FS(3)	10.000	10/28/2020	0.630	1.30	6.49
11Cl-PF3OUdS	763051-92-9	1.95 U	G1232-FS(3)	10.000	10/28/2020	0.680	1.95	6.49

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Analyzed by: Schultz, Stephanie
Printed: 11/3/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS11-000H
Battelle ID	G1233-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	29.29
Matrix	SO
Sample Size	1.29
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	7.22 J	G1233-FS(3)	10.000	10/28/2020	1.10	3.10	7.75
PFHpA	375-85-9	4.66 J	G1233-FS(3)	10.000	10/28/2020	0.780	2.33	7.75
PFOA	335-67-1	2.07 J	G1233-FS(3)	10.000	10/28/2020	0.940	3.10	7.75
PFNA	375-95-1	2.98 J	G1233-FS(3)	10.000	10/28/2020	0.760	1.55	7.75
PFDA	335-76-2	3.71 J	G1233-FS(3)	10.000	10/28/2020	0.720	1.55	7.75
PFUnA	2058-94-8	58.6	G1233-FS(3)	10.000	10/28/2020	0.710	1.55	7.75
PFDoA	307-55-1	3.16 J	G1233-FS(3)	10.000	10/28/2020	0.950	3.10	7.75
PFTrDA	72629-94-8	48.8	G1233-FS(3)	10.000	10/28/2020	0.430	1.55	7.75
PFTeDA	376-06-7	3.88 U	G1233-FS(3)	10.000	10/28/2020	1.67	3.88	7.75
NMeFOSAA	2355-31-9	3.88 U	G1233-FS(3)	10.000	10/28/2020	1.58	3.88	7.75
NEtFOSAA	2991-50-6	3.10 U	G1233-FS(3)	10.000	10/28/2020	1.16	3.10	7.75
PFBS	375-73-5	1.55 U	G1233-FS(3)	10.000	10/28/2020	0.540	1.55	7.75
PFHxS	355-46-4	6.75 J	G1233-FS(3)	10.000	10/28/2020	1.25	3.10	7.75
PFOS	1763-23-1	128 u	G1233-FS(3)	10.000	10/28/2020	1.07	3.10	7.75
HFPO-DA	13252-13-6	3.10 U	G1233-FS(3)	10.000	10/28/2020	0.990	3.10	7.75
Adona	919005-14-4	3.10 U	G1233-FS(3)	10.000	10/28/2020	1.29	3.10	7.75
9Cl-PF3ONS	756426-58-1	1.55 U	G1233-FS(3)	10.000	10/28/2020	0.750	1.55	7.75
11Cl-PF3OUdS	763051-92-9	2.33 U	G1233-FS(3)	10.000	10/28/2020	0.810	2.33	7.75

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Analyzed by: Schultz, Stephanie

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS11P-000H
Battelle ID	G1234-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	42.59
Matrix	SO
Sample Size	1.14
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	6.43 J	G1234-FS(3)	10.000	10/28/2020	1.24	3.51	8.77	
PFHpA	375-85-9	4.28 J	G1234-FS(3)	10.000	10/28/2020	0.890	2.63	8.77	
PFOA	335-67-1	2.08 J	G1234-FS(3)	10.000	10/28/2020	1.06	3.51	8.77	
PFNA	375-95-1	4.13 J	G1234-FS(3)	10.000	10/28/2020	0.860	1.75	8.77	
PFDA	335-76-2	3.36 J	G1234-FS(3)	10.000	10/28/2020	0.810	1.75	8.77	
PFUnA	2058-94-8	57.6	G1234-FS(3)	10.000	10/28/2020	0.800	1.75	8.77	
PFDoA	307-55-1	3.01 J	G1234-FS(3)	10.000	10/28/2020	1.07	3.51	8.77	
PFTrDA	72629-94-8	48.0	G1234-FS(3)	10.000	10/28/2020	0.490	1.75	8.77	
PFTeDA	376-06-7	4.39 U	G1234-FS(3)	10.000	10/28/2020	1.89	4.39	8.77	
NMeFOSAA	2355-31-9	4.39 U	G1234-FS(3)	10.000	10/28/2020	1.79	4.39	8.77	
NEtFOSAA	2991-50-6	3.51 U	G1234-FS(3)	10.000	10/28/2020	1.31	3.51	8.77	
PFBS	375-73-5	1.75 U	G1234-FS(3)	10.000	10/28/2020	0.610	1.75	8.77	
PFHxS	355-46-4	4.93 J	G1234-FS(3)	10.000	10/28/2020	1.42	3.51	8.77	
PFOS	1763-23-1	114 U	G1234-FS(3)	10.000	10/28/2020	1.21	3.51	8.77	EBL
HFPO-DA	13252-13-6	3.51 U	G1234-FS(3)	10.000	10/28/2020	1.12	3.51	8.77	
Adona	919005-14-4	3.51 U	G1234-FS(3)	10.000	10/28/2020	1.46	3.51	8.77	
9Cl-PF3ONS	756426-58-1	1.75 U	G1234-FS(3)	10.000	10/28/2020	0.850	1.75	8.77	
11Cl-PF3OUdS	763051-92-9	2.63 U	G1234-FS(3)	10.000	10/28/2020	0.920	2.63	8.77	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB11-1315
Battelle ID	G1235-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	38.63
Matrix	SO
Sample Size	1.19
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	6.10 J	G1235-FS(3)	10.000	10/28/2020	1.19	3.36	8.40	
PFHpA	375-85-9	1.10 J	G1235-FS(3)	10.000	10/28/2020	0.850	2.52	8.40	
PFOA	335-67-1	4.04 J	G1235-FS(3)	10.000	10/28/2020	1.02	3.36	8.40	
PFNA	375-95-1	12.6	G1235-FS(3)	10.000	10/28/2020	0.830	1.68	8.40	
PFDA	335-76-2	1.68 U	G1235-FS(3)	10.000	10/28/2020	0.780	1.68	8.40	
PFUnA	2058-94-8	2.72 J	G1235-FS(3)	10.000	10/28/2020	0.770	1.68	8.40	
PFDoA	307-55-1	3.36 U	G1235-FS(3)	10.000	10/28/2020	1.03	3.36	8.40	
PFTrDA	72629-94-8	1.68 U	G1235-FS(3)	10.000	10/28/2020	0.470	1.68	8.40	
PFTeDA	376-06-7	4.20 U	G1235-FS(3)	10.000	10/28/2020	1.82	4.20	8.40	
NMeFOSAA	2355-31-9	4.20 U	G1235-FS(3)	10.000	10/28/2020	1.71	4.20	8.40	
NEtFOSAA	2991-50-6	3.36 U	G1235-FS(3)	10.000	10/28/2020	1.26	3.36	8.40	
PFBS	375-73-5	1.68 U	G1235-FS(3)	10.000	10/28/2020	0.590	1.68	8.40	
PFHxS	355-46-4	9.95	G1235-FS(3)	10.000	10/28/2020	1.36	3.36	8.40	
PFOS	1763-23-1	115	G1235-FS(3)	10.000	10/28/2020	1.16	3.36	8.40	EBL
HFPO-DA	13252-13-6	3.36 U	G1235-FS(3)	10.000	10/28/2020	1.08	3.36	8.40	
Adona	919005-14-4	3.36 U	G1235-FS(3)	10.000	10/28/2020	1.39	3.36	8.40	
9Cl-PF3ONS	756426-58-1	1.68 U	G1235-FS(3)	10.000	10/28/2020	0.810	1.68	8.40	
11Cl-PF3OUdS	763051-92-9	2.52 U	G1235-FS(3)	10.000	10/28/2020	0.880	2.52	8.40	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS12-000H
Battelle ID	G1236-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	14.57
Matrix	SO
Sample Size	1.59
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.52 U	G1236-FS(3)	10.000	10/28/2020	0.890	2.52	6.29	
PFHpA	375-85-9	1.89 U	G1236-FS(3)	10.000	10/28/2020	0.640	1.89	6.29	
PFOA	335-67-1	2.52 U	G1236-FS(3)	10.000	10/28/2020	0.760	2.52	6.29	
PFNA	375-95-1	1.12 J	G1236-FS(3)	10.000	10/28/2020	0.620	1.26	6.29	
PFDA	335-76-2	3.61 J	G1236-FS(3)	10.000	10/28/2020	0.580	1.26	6.29	
PFUnA	2058-94-8	101	G1236-FS(3)	10.000	10/28/2020	0.570	1.26	6.29	
PFDoA	307-55-1	2.45 J	G1236-FS(3)	10.000	10/28/2020	0.770	2.52	6.29	
PFTrDA	72629-94-8	48.0	G1236-FS(3)	10.000	10/28/2020	0.350	1.26	6.29	
PFTeDA	376-06-7	3.14 U	G1236-FS(3)	10.000	10/28/2020	1.36	3.14	6.29	
NMeFOSAA	2355-31-9	3.14 U	G1236-FS(3)	10.000	10/28/2020	1.28	3.14	6.29	
NEtFOSAA	2991-50-6	2.52 U	G1236-FS(3)	10.000	10/28/2020	0.940	2.52	6.29	
PFBS	375-73-5	1.26 U	G1236-FS(3)	10.000	10/28/2020	0.440	1.26	6.29	
PFHxS	355-46-4	2.24 J	G1236-FS(3)	10.000	10/28/2020	1.02	2.52	6.29	
PFOS	1763-23-1	36.2 u	G1236-FS(3)	10.000	10/28/2020	0.870	2.52	6.29	EBL
HFPO-DA	13252-13-6	2.52 U	G1236-FS(3)	10.000	10/28/2020	0.810	2.52	6.29	
Adona	919005-14-4	2.52 U	G1236-FS(3)	10.000	10/28/2020	1.04	2.52	6.29	
9Cl-PF3ONS	756426-58-1	1.26 U	G1236-FS(3)	10.000	10/28/2020	0.610	1.26	6.29	
11Cl-PF3OUdS	763051-92-9	1.89 U	G1236-FS(3)	10.000	10/28/2020	0.660	1.89	6.29	

MW 11/9/21

Analyzed by: Schultz, Stephanie
Printed: 11/3/2020

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14

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB12-0103
Battelle ID	G1237-FS
Sample Type	SA
Collection Date	10/05/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	11.44
Matrix	SO
Sample Size	1.74
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.11 J	G1237-FS(3)	10.000	10/28/2020	0.810	2.30	5.75
PFHpA	375-85-9	1.51 J	G1237-FS(3)	10.000	10/28/2020	0.580	1.72	5.75
PFOA	335-67-1	7.01	G1237-FS(3)	10.000	10/28/2020	0.700	2.30	5.75
PFNA	375-95-1	25.0	G1237-FS(3)	10.000	10/28/2020	0.560	1.15	5.75
PFDA	335-76-2	19.2	G1237-FS(3)	10.000	10/28/2020	0.530	1.15	5.75
PFUnA	2058-94-8	119	G1237-FS-D(5)	50.000	10/28/2020	2.63	5.75	28.7
PFDoA	307-55-1	2.09 J	G1237-FS(3)	10.000	10/28/2020	0.700	2.30	5.75
PFTrDA	72629-94-8	39.9	G1237-FS(3)	10.000	10/28/2020	0.320	1.15	5.75
PFTeDA	376-06-7	2.87 U	G1237-FS(3)	10.000	10/28/2020	1.24	2.87	5.75
NMeFOSAA	2355-31-9	2.87 U	G1237-FS(3)	10.000	10/28/2020	1.17	2.87	5.75
NEtFOSAA	2991-50-6	2.30 U	G1237-FS(3)	10.000	10/28/2020	0.860	2.30	5.75
PFBS	375-73-5	1.15 U	G1237-FS(3)	10.000	10/28/2020	0.400	1.15	5.75
PFHxS	355-46-4	7.49	G1237-FS(3)	10.000	10/28/2020	0.930	2.30	5.75
PFOS	1763-23-1	568	G1237-FS-D(5)	50.000	10/28/2020	3.98	11.5	28.7
HFPO-DA	13252-13-6	2.30 U	G1237-FS(3)	10.000	10/28/2020	0.740	2.30	5.75
Adona	919005-14-4	2.30 U	G1237-FS(3)	10.000	10/28/2020	0.950	2.30	5.75
9Cl-PF3ONS	756426-58-1	1.15 U	G1237-FS(3)	10.000	10/28/2020	0.550	1.15	5.75
11Cl-PF3OUdS	763051-92-9	1.72 U	G1237-FS(3)	10.000	10/28/2020	0.600	1.72	5.75

11/9/21
Analyzed by: Schultz, Stephanie

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1255
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 9, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SS13-000H	G1374-FS	Soil
2	CBD-AOA-SB13-0103	G1375-FS	Soil
3	CBD-AOA-SS16-000H	G1376-FS	Soil
4	CBD-AOA-SB16-0608	G1377-FS	Soil
5	CBD-AOA-SS26-000H	G1378-FS	Soil
6	CBD-AOA-SB26-0810	G1379-FS	Soil
7	CBD-AOA-SB26-1012	G1380-FS	Soil
7MS	CBD-AOA-SB26-1012MS	G1381-FSMS	Soil
7MSD	CBD-AOA-SB26-1012MSD	G1382-FSMSD	Soil
8	CBD-AOA-SS27-000H	G1388-FS	Soil
9	CBD-AOA-SB27-1012	G1389-FS	Soil
10	CBD-AOA-SB27P-1012	G1390-FS	Soil

A Stage 2B/4 data validation was performed on the analytical data for ten soil samples collected on October 6, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for soil samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB02-100920-SO	PFOS	13.0	U	1, 3, 4, 8, 9, 10
CBD-AOA-FB02-100920	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples exhibited acceptable percent recoveries (%R) and RPD values except for the following.

MS/MSD Sample ID	Compound	MS %R/MSD %R/ RPD	Qualifier
7	PFOS	150%/400%/90	None - 4X Rule Applies

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	CBD-AOA-SB27-1012 ng/g	CBD-AOA-SB27P-1012 ng/g	RPD	Qualifier
None	ND	ND	-	-

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 2/13/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS13-000H
Battelle ID	G1374-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	12.35
Matrix	SO
Sample Size	1.79
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.23 U	G1374-FS(3)	10.000	10/28/2020	0.790	2.23	5.59
PFHpA	375-85-9	1.68 U	G1374-FS(3)	10.000	10/28/2020	0.565	1.68	5.59
PFOA	335-67-1	2.23 U	G1374-FS(3)	10.000	10/28/2020	0.678	2.23	5.59
PFNA	375-95-1	1.12 U	G1374-FS(3)	10.000	10/28/2020	0.549	1.12	5.59
PFDA	335-76-2	0.670 J	G1374-FS(3)	10.000	10/28/2020	0.517	1.12	5.59
PFUnA	2058-94-8	25.5	G1374-FS(3)	10.000	10/28/2020	0.511	1.12	5.59
PFDoA	307-55-1	1.57 J	G1374-FS(3)	10.000	10/28/2020	0.684	2.23	5.59
PFTrDA	72629-94-8	47.6	G1374-FS(3)	10.000	10/28/2020	0.313	1.12	5.59
PFTeDA	376-06-7	2.79 U	G1374-FS(3)	10.000	10/28/2020	1.21	2.79	5.59
NMeFOSAA	2355-31-9	2.79 U	G1374-FS(3)	10.000	10/28/2020	1.14	2.79	5.59
NEtFOSAA	2991-50-6	2.23 U	G1374-FS(3)	10.000	10/28/2020	0.836	2.23	5.59
PFBS	375-73-5	1.12 U	G1374-FS(3)	10.000	10/28/2020	0.391	1.12	5.59
PFHxS	355-46-4	1.37 J	G1374-FS(3)	10.000	10/28/2020	0.903	2.23	5.59
PFOS	1763-23-1	6.18 U	G1374-FS(3)	10.000	10/28/2020	0.773	2.23	5.59
HFPO-DA	13252-13-6	2.23 U	G1374-FS(3)	10.000	10/28/2020	0.716	2.23	5.59
Adona	919005-14-4	2.23 U	G1374-FS(3)	10.000	10/28/2020	0.927	2.23	5.59
9Cl-PF3ONS	756426-58-1	1.12 U	G1374-FS(3)	10.000	10/28/2020	0.539	1.12	5.59
11Cl-PF3OUdS	763051-92-9	1.68 U	G1374-FS(3)	10.000	10/28/2020	0.585	1.68	5.59

EBL

MW 11/9/21

Analyzed by: Schultz, Stephanie
Printed: 11/4/2020

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

2

Client ID	CBD-AOA-SB13-0103
Battelle ID	G1375-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	10.66
Matrix	SO
Sample Size	1.81
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.21 U	G1375-FS(3)	10.000	10/28/2020	0.781	2.21	5.52
PFHpA	375-85-9	0.644 J	G1375-FS(3)	10.000	10/28/2020	0.559	1.66	5.52
PFOA	335-67-1	1.24 J	G1375-FS(3)	10.000	10/28/2020	0.671	2.21	5.52
PFNA	375-95-1	4.20 J	G1375-FS(3)	10.000	10/28/2020	0.543	1.10	5.52
PFDA	335-76-2	22.9	G1375-FS(3)	10.000	10/28/2020	0.512	1.10	5.52
PFUnA	2058-94-8	237	G1375-FS-D(5)	125.000	10/28/2020	6.31	13.8	69.1
PFDoA	307-55-1	3.91 J	G1375-FS(3)	10.000	10/28/2020	0.676	2.21	5.52
PFTrDA	72629-94-8	96.4	G1375-FS(3)	10.000	10/28/2020	0.309	1.10	5.52
PFTeDA	376-06-7	1.21 J	G1375-FS(3)	10.000	10/28/2020	1.19	2.76	5.52
NMeFOSAA	2355-31-9	2.76 U	G1375-FS(3)	10.000	10/28/2020	1.13	2.76	5.52
NEtFOSAA	2991-50-6	2.21 U	G1375-FS(3)	10.000	10/28/2020	0.827	2.21	5.52
PFBS	375-73-5	1.10 U	G1375-FS(3)	10.000	10/28/2020	0.387	1.10	5.52
PFHxS	355-46-4	2.09 J	G1375-FS(3)	10.000	10/28/2020	0.893	2.21	5.52
PFOS	1763-23-1	613	G1375-FS-D(5)	125.000	10/28/2020	9.56	27.6	69.1
HFPO-DA	13252-13-6	2.21 U	G1375-FS(3)	10.000	10/28/2020	0.708	2.21	5.52
Adona	919005-14-4	2.21 U	G1375-FS(3)	10.000	10/28/2020	0.917	2.21	5.52
9Cl-PF3ONS	756426-58-1	1.10 U	G1375-FS(3)	10.000	10/28/2020	0.533	1.10	5.52
11Cl-PF3OUdS	763051-92-9	1.66 U	G1375-FS(3)	10.000	10/28/2020	0.579	1.66	5.52

nw 11/9/21

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

3

Client ID	CBD-AOA-SS16-000H
Battelle ID	G1376-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	17.36
Matrix	SO
Sample Size	1.57
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.55 U	G1376-FS(3)	10.000	10/28/2020	0.901	2.55	6.37	
PFHpA	375-85-9	1.91 U	G1376-FS(3)	10.000	10/28/2020	0.645	1.91	6.37	
PFOA	335-67-1	2.55 U	G1376-FS(3)	10.000	10/28/2020	0.773	2.55	6.37	
PFNA	375-95-1	1.27 U	G1376-FS(3)	10.000	10/28/2020	0.625	1.27	6.37	
PFDA	335-76-2	0.770 J	G1376-FS(3)	10.000	10/28/2020	0.590	1.27	6.37	
PFUnA	2058-94-8	30.6	G1376-FS(3)	10.000	10/28/2020	0.582	1.27	6.37	
PFDoA	307-55-1	0.909 J	G1376-FS(3)	10.000	10/28/2020	0.780	2.55	6.37	
PFTrDA	72629-94-8	18.1	G1376-FS(3)	10.000	10/28/2020	0.357	1.27	6.37	
PFTeDA	376-06-7	3.18 U	G1376-FS(3)	10.000	10/28/2020	1.38	3.18	6.37	
NMeFOSAA	2355-31-9	3.18 U	G1376-FS(3)	10.000	10/28/2020	1.30	3.18	6.37	
NEtFOSAA	2991-50-6	2.55 U	G1376-FS(3)	10.000	10/28/2020	0.953	2.55	6.37	
PFBS	375-73-5	1.27 U	G1376-FS(3)	10.000	10/28/2020	0.446	1.27	6.37	
PFHxS	355-46-4	2.55 U	G1376-FS(3)	10.000	10/28/2020	1.03	2.55	6.37	
PFOS	1763-23-1	16.1 U	G1376-FS(3)	10.000	10/28/2020	0.882	2.55	6.37	EBL
HFPO-DA	13252-13-6	2.55 U	G1376-FS(3)	10.000	10/28/2020	0.817	2.55	6.37	
Adona	919005-14-4	2.55 U	G1376-FS(3)	10.000	10/28/2020	1.06	2.55	6.37	
9Cl-PF3ONS	756426-58-1	1.27 U	G1376-FS(3)	10.000	10/28/2020	0.614	1.27	6.37	
11Cl-PF3OUdS	763051-92-9	1.91 U	G1376-FS(3)	10.000	10/28/2020	0.668	1.91	6.37	

MW 1/9/21

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

4

Client ID	CBD-AOA-SB16-0608
Battelle ID	G1377-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	16.47
Matrix	SO
Sample Size	1.57
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.55 U	G1377-FS(3)	10.000	10/28/2020	0.901	2.55	6.37	
PFHpA	375-85-9	1.91 U	G1377-FS(3)	10.000	10/28/2020	0.645	1.91	6.37	
PFOA	335-67-1	2.55 U	G1377-FS(3)	10.000	10/28/2020	0.773	2.55	6.37	
PFNA	375-95-1	1.27 U	G1377-FS(3)	10.000	10/28/2020	0.625	1.27	6.37	
PFDA	335-76-2	1.27 U	G1377-FS(3)	10.000	10/28/2020	0.590	1.27	6.37	
PFUnA	2058-94-8	1.27 U	G1377-FS(3)	10.000	10/28/2020	0.582	1.27	6.37	
PFDoA	307-55-1	2.55 U	G1377-FS(3)	10.000	10/28/2020	0.780	2.55	6.37	
PFTrDA	72629-94-8	1.27 U	G1377-FS(3)	10.000	10/28/2020	0.357	1.27	6.37	
PFTeDA	376-06-7	3.18 U	G1377-FS(3)	10.000	10/28/2020	1.38	3.18	6.37	
NMeFOSAA	2355-31-9	3.18 U	G1377-FS(3)	10.000	10/28/2020	1.30	3.18	6.37	
NEtFOSAA	2991-50-6	2.55 U	G1377-FS(3)	10.000	10/28/2020	0.953	2.55	6.37	
PFBS	375-73-5	1.27 U	G1377-FS(3)	10.000	10/28/2020	0.446	1.27	6.37	
PFHxS	355-46-4	2.55 U	G1377-FS(3)	10.000	10/28/2020	1.03	2.55	6.37	
PFOS	1763-23-1	6.69 u	G1377-FS(3)	10.000	10/28/2020	0.882	2.55	6.37	FBL
HFPO-DA	13252-13-6	2.55 U	G1377-FS(3)	10.000	10/28/2020	0.817	2.55	6.37	
Adona	919005-14-4	2.55 U	G1377-FS(3)	10.000	10/28/2020	1.06	2.55	6.37	
9Cl-PF3ONS	756426-58-1	1.27 U	G1377-FS(3)	10.000	10/28/2020	0.614	1.27	6.37	
11Cl-PF3OUdS	763051-92-9	1.91 U	G1377-FS(3)	10.000	10/28/2020	0.668	1.91	6.37	

MW 11/9/21

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

5

Client ID	CBD-AOA-SS26-000H
Battelle ID	G1378-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	16.09
Matrix	SO
Sample Size	1.70
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	3.10 J	G1378-FS(3)	10.000	10/28/2020	0.832	2.35	5.88
PFHpA	375-85-9	2.31 J	G1378-FS(3)	10.000	10/28/2020	0.595	1.76	5.88
PFOA	335-67-1	20.2	G1378-FS(3)	10.000	10/28/2020	0.714	2.35	5.88
PFNA	375-95-1	1.95 J	G1378-FS(3)	10.000	10/28/2020	0.578	1.18	5.88
PFDA	335-76-2	2.36 J	G1378-FS(3)	10.000	10/28/2020	0.545	1.18	5.88
PFUnA	2058-94-8	85.7	G1378-FS(3)	10.000	10/28/2020	0.538	1.18	5.88
PFDoA	307-55-1	3.20 J	G1378-FS(3)	10.000	10/28/2020	0.720	2.35	5.88
PFTrDA	72629-94-8	103	G1378-FS(3)	10.000	10/28/2020	0.329	1.18	5.88
PFTeDA	376-06-7	1.38 J	G1378-FS(3)	10.000	10/28/2020	1.27	2.94	5.88
NMeFOSAA	2355-31-9	5.73 J	G1378-FS(3)	10.000	10/28/2020	1.20	2.94	5.88
NEtFOSAA	2991-50-6	2.35 U	G1378-FS(3)	10.000	10/28/2020	0.880	2.35	5.88
PFBS	375-73-5	1.18 U	G1378-FS(3)	10.000	10/28/2020	0.412	1.18	5.88
PFHxS	355-46-4	31.6	G1378-FS(3)	10.000	10/28/2020	0.951	2.35	5.88
PFOS	1763-23-1	1160	G1378-FS-D(5)	250.000	10/28/2020	20.4	58.8	147
HFPO-DA	13252-13-6	2.35 U	G1378-FS(3)	10.000	10/28/2020	0.754	2.35	5.88
Adona	919005-14-4	2.35 U	G1378-FS(3)	10.000	10/28/2020	0.976	2.35	5.88
9Cl-PF3ONS	756426-58-1	1.18 U	G1378-FS(3)	10.000	10/28/2020	0.567	1.18	5.88
11Cl-PF3OUdS	763051-92-9	1.76 U	G1378-FS(3)	10.000	10/28/2020	0.616	1.76	5.88

nw 11/9/21

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

6

Client ID	CBD-AOA-SB26-0810
Battelle ID	G1379-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	14.49
Matrix	SO
Sample Size	1.62
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.47 U	G1379-FS(3)	10.000	10/28/2020	0.873	2.47	6.17
PFHpA	375-85-9	1.85 U	G1379-FS(3)	10.000	10/28/2020	0.625	1.85	6.17
PFOA	335-67-1	2.77 J	G1379-FS(3)	10.000	10/28/2020	0.749	2.47	6.17
PFNA	375-95-1	12.0	G1379-FS(3)	10.000	10/28/2020	0.606	1.23	6.17
PFDA	335-76-2	4.10 J	G1379-FS(3)	10.000	10/28/2020	0.572	1.23	6.17
PFUnA	2058-94-8	10.4	G1379-FS(3)	10.000	10/28/2020	0.564	1.23	6.17
PFDoA	307-55-1	2.47 U	G1379-FS(3)	10.000	10/28/2020	0.756	2.47	6.17
PFTrDA	72629-94-8	1.23 U	G1379-FS(3)	10.000	10/28/2020	0.346	1.23	6.17
PFTeDA	376-06-7	3.09 U	G1379-FS(3)	10.000	10/28/2020	1.33	3.09	6.17
NMeFOSAA	2355-31-9	3.09 U	G1379-FS(3)	10.000	10/28/2020	1.26	3.09	6.17
NEtFOSAA	2991-50-6	2.47 U	G1379-FS(3)	10.000	10/28/2020	0.923	2.47	6.17
PFBS	375-73-5	1.23 U	G1379-FS(3)	10.000	10/28/2020	0.432	1.23	6.17
PFHxS	355-46-4	3.45 J	G1379-FS(3)	10.000	10/28/2020	0.998	2.47	6.17
PFOS	1763-23-1	392	G1379-FS-D(5)	125.000	10/28/2020	10.7	30.9	77.2
HFPO-DA	13252-13-6	2.47 U	G1379-FS(3)	10.000	10/28/2020	0.791	2.47	6.17
Adona	919005-14-4	2.47 U	G1379-FS(3)	10.000	10/28/2020	1.02	2.47	6.17
9Cl-PF3ONS	756426-58-1	1.23 U	G1379-FS(3)	10.000	10/28/2020	0.595	1.23	6.17
11Cl-PF3OUdS	763051-92-9	1.85 U	G1379-FS(3)	10.000	10/28/2020	0.647	1.85	6.17

MW 11/9/21

Analyzed by: Schultz, Stephanie
Printed: 11/4/2020

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

7

Client ID	CBD-AOA-SB26-1012
Battelle ID	G1380-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	18.77
Matrix	SO
Sample Size	1.57
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.55 U	G1380-FS(3)	10.000	10/28/2020	0.901	2.55	6.37
PFHpA	375-85-9	0.722 J	G1380-FS(3)	10.000	10/28/2020	0.645	1.91	6.37
PFOA	335-67-1	9.76	G1380-FS(3)	10.000	10/28/2020	0.773	2.55	6.37
PFNA	375-95-1	18.2	G1380-FS(3)	10.000	10/28/2020	0.625	1.27	6.37
PFDA	335-76-2	4.09 J	G1380-FS(3)	10.000	10/28/2020	0.590	1.27	6.37
PFUnA	2058-94-8	113	G1380-FS(3)	10.000	10/28/2020	0.582	1.27	6.37
PFDoA	307-55-1	2.55 U	G1380-FS(3)	10.000	10/28/2020	0.780	2.55	6.37
PFTrDA	72629-94-8	21.2	G1380-FS(3)	10.000	10/28/2020	0.357	1.27	6.37
PFTeDA	376-06-7	3.18 U	G1380-FS(3)	10.000	10/28/2020	1.38	3.18	6.37
NMeFOSAA	2355-31-9	3.18 U	G1380-FS(3)	10.000	10/28/2020	1.30	3.18	6.37
NEtFOSAA	2991-50-6	2.55 U	G1380-FS(3)	10.000	10/28/2020	0.953	2.55	6.37
PFBS	375-73-5	1.27 U	G1380-FS(3)	10.000	10/28/2020	0.446	1.27	6.37
PFHxS	355-46-4	11.7	G1380-FS(3)	10.000	10/28/2020	1.03	2.55	6.37
PFOS	1763-23-1	309	G1380-FS-D(5)	125.000	10/28/2020	11.0	31.8	79.6
HFPO-DA	13252-13-6	2.55 U	G1380-FS(3)	10.000	10/28/2020	0.817	2.55	6.37
Adona	919005-14-4	2.55 U	G1380-FS(3)	10.000	10/28/2020	1.06	2.55	6.37
9Cl-PF3ONS	756426-58-1	1.27 U	G1380-FS(3)	10.000	10/28/2020	0.614	1.27	6.37
11Cl-PF3OUdS	763051-92-9	1.91 U	G1380-FS(3)	10.000	10/28/2020	0.668	1.91	6.37

NW 11/9/21
Analyzed by: Schultz, Stephanie
Printed: 11/4/2020

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

8

Client ID	CBD-AOA-SS27-000H
Battelle ID	G1388-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	17.53
Matrix	SO
Sample Size	1.61
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	0.995 J	G1388-FS(3)	10.000	10/28/2020	0.878	2.48	6.21	
PFHpA	375-85-9	0.921 J	G1388-FS(3)	10.000	10/28/2020	0.629	1.86	6.21	
PFOA	335-67-1	3.16 J	G1388-FS(3)	10.000	10/28/2020	0.754	2.48	6.21	
PFNA	375-95-1	8.46	G1388-FS(3)	10.000	10/28/2020	0.610	1.24	6.21	
PFDA	335-76-2	1.66 J	G1388-FS(3)	10.000	10/28/2020	0.575	1.24	6.21	
PFUnA	2058-94-8	9.41	G1388-FS(3)	10.000	10/28/2020	0.568	1.24	6.21	
PFDoA	307-55-1	2.48 U	G1388-FS(3)	10.000	10/28/2020	0.760	2.48	6.21	
PFTrDA	72629-94-8	3.05 J	G1388-FS(3)	10.000	10/28/2020	0.348	1.24	6.21	
PFTeDA	376-06-7	3.11 U	G1388-FS(3)	10.000	10/28/2020	1.34	3.11	6.21	
NMeFOSAA	2355-31-9	3.11 U	G1388-FS(3)	10.000	10/28/2020	1.27	3.11	6.21	
NEtFOSAA	2991-50-6	2.48 U	G1388-FS(3)	10.000	10/28/2020	0.929	2.48	6.21	
PFBS	375-73-5	1.24 U	G1388-FS(3)	10.000	10/28/2020	0.435	1.24	6.21	
PFHxS	355-46-4	4.14 J	G1388-FS(3)	10.000	10/28/2020	1.00	2.48	6.21	
PFOS	1763-23-1	64.2 U	G1388-FS(3)	10.000	10/28/2020	0.860	2.48	6.21	EBL
HFPO-DA	13252-13-6	2.48 U	G1388-FS(3)	10.000	10/28/2020	0.796	2.48	6.21	
Adona	919005-14-4	2.48 U	G1388-FS(3)	10.000	10/28/2020	1.03	2.48	6.21	
9Cl-PF3ONS	756426-58-1	1.24 U	G1388-FS(3)	10.000	10/28/2020	0.599	1.24	6.21	
11Cl-PF3OUdS	763051-92-9	1.86 U	G1388-FS(3)	10.000	10/28/2020	0.651	1.86	6.21	

MW 11/9/21
Analyzed by: Schultz, Stephanie
Printed: 11/4/2020

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It can be done

9

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB27-1012
Battelle ID	G1389-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	12.88
Matrix	SO
Sample Size	1.63
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.45 U	G1389-FS(3)	10.000	10/28/2020	0.867	2.45	6.13	
PFHpA	375-85-9	1.84 U	G1389-FS(3)	10.000	10/28/2020	0.621	1.84	6.13	
PFOA	335-67-1	2.45 U	G1389-FS(3)	10.000	10/28/2020	0.745	2.45	6.13	
PFNA	375-95-1	1.23 U	G1389-FS(3)	10.000	10/28/2020	0.602	1.23	6.13	
PFDA	335-76-2	1.23 U	G1389-FS(3)	10.000	10/28/2020	0.568	1.23	6.13	
PFUnA	2058-94-8	1.23 U	G1389-FS(3)	10.000	10/28/2020	0.561	1.23	6.13	
PFDoA	307-55-1	2.45 U	G1389-FS(3)	10.000	10/28/2020	0.751	2.45	6.13	
PFTrDA	72629-94-8	1.23 U	G1389-FS(3)	10.000	10/28/2020	0.344	1.23	6.13	
PFTeDA	376-06-7	3.07 U	G1389-FS(3)	10.000	10/28/2020	1.33	3.07	6.13	
NMeFOSAA	2355-31-9	3.07 U	G1389-FS(3)	10.000	10/28/2020	1.25	3.07	6.13	
NEtFOSAA	2991-50-6	2.45 U	G1389-FS(3)	10.000	10/28/2020	0.918	2.45	6.13	
PFBS	375-73-5	1.23 U	G1389-FS(3)	10.000	10/28/2020	0.429	1.23	6.13	
PFHxS	355-46-4	2.45 U	G1389-FS(3)	10.000	10/28/2020	0.991	2.45	6.13	
PFOS	1763-23-1	2.45 ~~1.49~~ U	G1389-FS(3)	10.000	10/28/2020	0.849	2.45	6.13	EBL
HFPO-DA	13252-13-6	2.45 U	G1389-FS(3)	10.000	10/28/2020	0.787	2.45	6.13	
Adona	919005-14-4	2.45 U	G1389-FS(3)	10.000	10/28/2020	1.02	2.45	6.13	
9Cl-PF3ONS	756426-58-1	1.23 U	G1389-FS(3)	10.000	10/28/2020	0.591	1.23	6.13	
11Cl-PF3OUdS	763051-92-9	1.84 U	G1389-FS(3)	10.000	10/28/2020	0.643	1.84	6.13	

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It can be done

10

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB27P-1012
Battelle ID	G1390-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	12.74
Matrix	SO
Sample Size	1.85
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.16 U	G1390-FS(3)	10.000	10/28/2020	0.764	2.16	5.41	
PFHpA	375-85-9	1.62 U	G1390-FS(3)	10.000	10/28/2020	0.547	1.62	5.41	
PFOA	335-67-1	2.16 U	G1390-FS(3)	10.000	10/28/2020	0.656	2.16	5.41	
PFNA	375-95-1	1.08 U	G1390-FS(3)	10.000	10/28/2020	0.531	1.08	5.41	
PFDA	335-76-2	1.08 U	G1390-FS(3)	10.000	10/28/2020	0.501	1.08	5.41	
PFUnA	2058-94-8	1.08 U	G1390-FS(3)	10.000	10/28/2020	0.494	1.08	5.41	
PFDoA	307-55-1	2.16 U	G1390-FS(3)	10.000	10/28/2020	0.662	2.16	5.41	
PFTrDA	72629-94-8	1.08 U	G1390-FS(3)	10.000	10/28/2020	0.303	1.08	5.41	
PFTeDA	376-06-7	2.70 U	G1390-FS(3)	10.000	10/28/2020	1.17	2.70	5.41	
NMeFOSAA	2355-31-9	2.70 U	G1390-FS(3)	10.000	10/28/2020	1.10	2.70	5.41	
NEtFOSAA	2991-50-6	2.16 U	G1390-FS(3)	10.000	10/28/2020	0.809	2.16	5.41	
PFBS	375-73-5	1.08 U	G1390-FS(3)	10.000	10/28/2020	0.378	1.08	5.41	
PFHxS	355-46-4	2.16 U	G1390-FS(3)	10.000	10/28/2020	0.874	2.16	5.41	
PFOS	1763-23-1	2.16 ~~1.70~~ U	G1390-FS(3)	10.000	10/28/2020	0.748	2.16	5.41	EBL
HFPO-DA	13252-13-6	2.16 U	G1390-FS(3)	10.000	10/28/2020	0.693	2.16	5.41	
Adona	919005-14-4	2.16 U	G1390-FS(3)	10.000	10/28/2020	0.897	2.16	5.41	
9Cl-PF3ONS	756426-58-1	1.08 U	G1390-FS(3)	10.000	10/28/2020	0.521	1.08	5.41	
11Cl-PF3OUdS	763051-92-9	1.62 U	G1390-FS(3)	10.000	10/28/2020	0.566	1.62	5.41	

MW 11/9/21

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1256
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 9, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SS05-000H	G1383-FS	Soil
1MS	CBD-AOA-SS05-000HMS	G1384-FSMS	Soil
1MSD	CBD-AOA-SS05-000HMSD	G1385-FSMSD	Soil
2	CBD-AOA-SB05-1113	G1386-FS	Soil
3	CBD-AOA-SB05P-1113	G1387-FS	Soil
4	CBD-AOA-SS14-000H	G1391-FS	Soil
5	CBD-AOA-SB14-1012	G1392-FS	Soil
6	CBD-AOA-SS15-000H	G1393-FS	Soil
7	CBD-AOA-SB15-0810	G1394-FS	Soil
8	CBD-AOA-SB15-1113	G1395-FS	Soil
9	CBD-AOA-SB15P-1113	G1396-FS	Soil

A Stage 2B/4 data validation was performed on the analytical data for nine soil samples collected on October 6, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for soil samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB02-100920-SO	PFOS	13.0	U	All Samples
CBD-AOA-FB02-100920	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples exhibited acceptable percent recoveries (%R) and RPD values.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	CBD-AOA-SB05-1113 ng/g	CBD-AOA-SB05P-1113 ng/g	RPD	Qualifier
PFUnA	0.857	1.08	23%	None

Compound	CBD-AOA-SB15-1113 ng/g	CBD-AOA-SB15P-1113 ng/g	RPD	Qualifier
PFNA	5.29	6.35	18%	None
PFHxS	2.40	2.56	6%	

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS05-000H
Battelle ID	G1383-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	16.03
Matrix	SO
Sample Size	1.70
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.12 J	G1383-FS(3)	10.000	10/28/2020	0.832	2.35	5.88	
PFHpA	375-85-9	1.16 J	G1383-FS(3)	10.000	10/28/2020	0.595	1.76	5.88	
PFOA	335-67-1	2.35 U	G1383-FS(3)	10.000	10/28/2020	0.714	2.35	5.88	
PFNA	375-95-1	0.839 J	G1383-FS(3)	10.000	10/28/2020	0.578	1.18	5.88	
PFDA	335-76-2	1.18 U	G1383-FS(3)	10.000	10/28/2020	0.545	1.18	5.88	
PFUnA	2058-94-8	3.86 J	G1383-FS(3)	10.000	10/28/2020	0.538	1.18	5.88	
PFDoA	307-55-1	2.35 U	G1383-FS(3)	10.000	10/28/2020	0.720	2.35	5.88	
PFTrDA	72629-94-8	2.15 J	G1383-FS(3)	10.000	10/28/2020	0.329	1.18	5.88	
PFTeDA	376-06-7	2.94 U	G1383-FS(3)	10.000	10/28/2020	1.27	2.94	5.88	
NMeFOSAA	2355-31-9	2.94 U	G1383-FS(3)	10.000	10/28/2020	1.20	2.94	5.88	
NEtFOSAA	2991-50-6	2.35 U	G1383-FS(3)	10.000	10/28/2020	0.880	2.35	5.88	
PFBS	375-73-5	1.18 U	G1383-FS(3)	10.000	10/28/2020	0.412	1.18	5.88	
PFHxS	355-46-4	2.35 U	G1383-FS(3)	10.000	10/28/2020	0.951	2.35	5.88	
PFOS	1763-23-1	11.0 u	G1383-FS(3)	10.000	10/28/2020	0.814	2.35	5.88	EBL
HFPO-DA	13252-13-6	2.35 U	G1383-FS(3)	10.000	10/28/2020	0.754	2.35	5.88	
Adona	919005-14-4	2.35 U	G1383-FS(3)	10.000	10/28/2020	0.976	2.35	5.88	
9Cl-PF3ONS	756426-58-1	1.18 U	G1383-FS(3)	10.000	10/28/2020	0.567	1.18	5.88	
11Cl-PF3OUdS	763051-92-9	1.76 U	G1383-FS(3)	10.000	10/28/2020	0.616	1.76	5.88	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB05-1113
Battelle ID	G1386-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	15.51
Matrix	SO
Sample Size	1.70
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.35 U	G1386-FS(3)	10.000	10/28/2020	0.832	2.35	5.88	
PFHpA	375-85-9	1.76 U	G1386-FS(3)	10.000	10/28/2020	0.595	1.76	5.88	
PFOA	335-67-1	2.35 U	G1386-FS(3)	10.000	10/28/2020	0.714	2.35	5.88	
PFNA	375-95-1	1.18 U	G1386-FS(3)	10.000	10/28/2020	0.578	1.18	5.88	
PFDA	335-76-2	1.18 U	G1386-FS(3)	10.000	10/28/2020	0.545	1.18	5.88	
PFUnA	2058-94-8	0.857 J	G1386-FS(3)	10.000	10/28/2020	0.538	1.18	5.88	
PFDoA	307-55-1	2.35 U	G1386-FS(3)	10.000	10/28/2020	0.720	2.35	5.88	
PFTrDA	72629-94-8	1.18 U	G1386-FS(3)	10.000	10/28/2020	0.329	1.18	5.88	
PFTeDA	376-06-7	2.94 U	G1386-FS(3)	10.000	10/28/2020	1.27	2.94	5.88	
NMeFOSAA	2355-31-9	2.94 U	G1386-FS(3)	10.000	10/28/2020	1.20	2.94	5.88	
NEtFOSAA	2991-50-6	2.35 U	G1386-FS(3)	10.000	10/28/2020	0.880	2.35	5.88	
PFBS	375-73-5	1.18 U	G1386-FS(3)	10.000	10/28/2020	0.412	1.18	5.88	
PFHxS	355-46-4	2.35 U	G1386-FS(3)	10.000	10/28/2020	0.951	2.35	5.88	
PFOS	1763-23-1	11.0 u	G1386-FS(3)	10.000	10/28/2020	0.814	2.35	5.88	EBL
HFPO-DA	13252-13-6	2.35 U	G1386-FS(3)	10.000	10/28/2020	0.754	2.35	5.88	
Adona	919005-14-4	2.35 U	G1386-FS(3)	10.000	10/28/2020	0.976	2.35	5.88	
9Cl-PF3ONS	756426-58-1	1.18 U	G1386-FS(3)	10.000	10/28/2020	0.567	1.18	5.88	
11Cl-PF3OUdS	763051-92-9	1.76 U	G1386-FS(3)	10.000	10/28/2020	0.616	1.76	5.88	

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Analyzed by: Schultz, Stephanie
Printed: 11/4/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB05P-1113
Battelle ID	G1387-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	14.73
Matrix	SO
Sample Size	1.58
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.53 U	G1387-FS(3)	10.000	10/28/2020	0.895	2.53	6.33
PFHpA	375-85-9	1.90 U	G1387-FS(3)	10.000	10/28/2020	0.641	1.90	6.33
PFOA	335-67-1	2.53 U	G1387-FS(3)	10.000	10/28/2020	0.768	2.53	6.33
PFNA	375-95-1	1.27 U	G1387-FS(3)	10.000	10/28/2020	0.622	1.27	6.33
PFDA	335-76-2	1.27 U	G1387-FS(3)	10.000	10/28/2020	0.586	1.27	6.33
PFUnA	2058-94-8	1.08 J	G1387-FS(3)	10.000	10/28/2020	0.578	1.27	6.33
PFDoA	307-55-1	2.53 U	G1387-FS(3)	10.000	10/28/2020	0.775	2.53	6.33
PFTrDA	72629-94-8	1.27 U	G1387-FS(3)	10.000	10/28/2020	0.354	1.27	6.33
PFTeDA	376-06-7	3.16 U	G1387-FS(3)	10.000	10/28/2020	1.37	3.16	6.33
NMeFOSAA	2355-31-9	3.16 U	G1387-FS(3)	10.000	10/28/2020	1.29	3.16	6.33
NEtFOSAA	2991-50-6	2.53 U	G1387-FS(3)	10.000	10/28/2020	0.947	2.53	6.33
PFBS	375-73-5	1.27 U	G1387-FS(3)	10.000	10/28/2020	0.443	1.27	6.33
PFHxS	355-46-4	2.53 U	G1387-FS(3)	10.000	10/28/2020	1.02	2.53	6.33
PFOS	1763-23-1	12.9 u	G1387-FS(3)	10.000	10/28/2020	0.876	2.53	6.33
HFPO-DA	13252-13-6	2.53 U	G1387-FS(3)	10.000	10/28/2020	0.811	2.53	6.33
Adona	919005-14-4	2.53 U	G1387-FS(3)	10.000	10/28/2020	1.05	2.53	6.33
9Cl-PF3ONS	756426-58-1	1.27 U	G1387-FS(3)	10.000	10/28/2020	0.610	1.27	6.33
11Cl-PF3OUdS	763051-92-9	1.90 U	G1387-FS(3)	10.000	10/28/2020	0.663	1.90	6.33

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS14-000H
Battelle ID	G1391-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	10.03
Matrix	SO
Sample Size	1.86
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.15 U	G1391-FS(3)	10.000	10/28/2020	0.760	2.15	5.38	
PFHpA	375-85-9	1.61 U	G1391-FS(3)	10.000	10/28/2020	0.544	1.61	5.38	
PFOA	335-67-1	2.15 U	G1391-FS(3)	10.000	10/28/2020	0.653	2.15	5.38	
PFNA	375-95-1	1.08 U	G1391-FS(3)	10.000	10/28/2020	0.528	1.08	5.38	
PFDA	335-76-2	1.08 U	G1391-FS(3)	10.000	10/28/2020	0.498	1.08	5.38	
PFUnA	2058-94-8	1.02 J	G1391-FS(3)	10.000	10/28/2020	0.491	1.08	5.38	
PFDoA	307-55-1	2.15 U	G1391-FS(3)	10.000	10/28/2020	0.658	2.15	5.38	
PFTrDA	72629-94-8	0.640 J	G1391-FS(3)	10.000	10/28/2020	0.301	1.08	5.38	
PFTeDA	376-06-7	2.69 U	G1391-FS(3)	10.000	10/28/2020	1.16	2.69	5.38	
NMeFOSAA	2355-31-9	2.69 U	G1391-FS(3)	10.000	10/28/2020	1.10	2.69	5.38	
NEtFOSAA	2991-50-6	2.15 U	G1391-FS(3)	10.000	10/28/2020	0.804	2.15	5.38	
PFBS	375-73-5	1.08 U	G1391-FS(3)	10.000	10/28/2020	0.376	1.08	5.38	
PFHxS	355-46-4	2.15 U	G1391-FS(3)	10.000	10/28/2020	0.869	2.15	5.38	
PFOS	1763-23-1	3.87 J U	G1391-FS(3)	10.000	10/28/2020	0.744	2.15	5.38	EBL
HFPO-DA	13252-13-6	2.15 U	G1391-FS(3)	10.000	10/28/2020	0.689	2.15	5.38	
Adona	919005-14-4	2.15 U	G1391-FS(3)	10.000	10/28/2020	0.892	2.15	5.38	
9Cl-PF3ONS	756426-58-1	1.08 U	G1391-FS(3)	10.000	10/28/2020	0.518	1.08	5.38	
11Cl-PF3OUdS	763051-92-9	1.61 U	G1391-FS(3)	10.000	10/28/2020	0.563	1.61	5.38	

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Printed: 11/4/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB14-1012
Battelle ID	G1392-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	15.75
Matrix	SO
Sample Size	1.72
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.33 U	G1392-FS(3)	10.000	10/28/2020	0.822	2.33	5.81
PFHpA	375-85-9	1.74 U	G1392-FS(3)	10.000	10/28/2020	0.588	1.74	5.81
PFOA	335-67-1	2.33 U	G1392-FS(3)	10.000	10/28/2020	0.706	2.33	5.81
PFNA	375-95-1	1.16 U	G1392-FS(3)	10.000	10/28/2020	0.571	1.16	5.81
PFDA	335-76-2	1.16 U	G1392-FS(3)	10.000	10/28/2020	0.538	1.16	5.81
PFUnA	2058-94-8	1.16 U	G1392-FS(3)	10.000	10/28/2020	0.531	1.16	5.81
PFDoA	307-55-1	2.33 U	G1392-FS(3)	10.000	10/28/2020	0.712	2.33	5.81
PFTrDA	72629-94-8	1.16 U	G1392-FS(3)	10.000	10/28/2020	0.326	1.16	5.81
PFTeDA	376-06-7	2.91 U	G1392-FS(3)	10.000	10/28/2020	1.26	2.91	5.81
NMeFOSAA	2355-31-9	2.91 U	G1392-FS(3)	10.000	10/28/2020	1.19	2.91	5.81
NEtFOSAA	2991-50-6	2.33 U	G1392-FS(3)	10.000	10/28/2020	0.870	2.33	5.81
PFBS	375-73-5	1.16 U	G1392-FS(3)	10.000	10/28/2020	0.407	1.16	5.81
PFHxS	355-46-4	2.33 U	G1392-FS(3)	10.000	10/28/2020	0.940	2.33	5.81
PFOS	1763-23-1	6.58 U	G1392-FS(3)	10.000	10/28/2020	0.805	2.33	5.81
HFPO-DA	13252-13-6	2.33 U	G1392-FS(3)	10.000	10/28/2020	0.745	2.33	5.81
Adona	919005-14-4	2.33 U	G1392-FS(3)	10.000	10/28/2020	0.965	2.33	5.81
9Cl-PF3ONS	756426-58-1	1.16 U	G1392-FS(3)	10.000	10/28/2020	0.560	1.16	5.81
11Cl-PF3OUdS	763051-92-9	1.74 U	G1392-FS(3)	10.000	10/28/2020	0.609	1.74	5.81

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Analyzed by: Schultz, Stephanie
Printed: 11/4/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS15-000H
Battelle ID	G1393-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	15.65
Matrix	SO
Sample Size	1.68
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.38 U	G1393-FS(3)	10.000	10/28/2020	0.842	2.38	5.95	
PFHpA	375-85-9	1.79 U	G1393-FS(3)	10.000	10/28/2020	0.602	1.79	5.95	
PFOA	335-67-1	2.38 U	G1393-FS(3)	10.000	10/28/2020	0.723	2.38	5.95	
PFNA	375-95-1	1.19 U	G1393-FS(3)	10.000	10/28/2020	0.585	1.19	5.95	
PFDA	335-76-2	1.19 U	G1393-FS(3)	10.000	10/28/2020	0.551	1.19	5.95	
PFUnA	2058-94-8	17.9	G1393-FS(3)	10.000	10/28/2020	0.544	1.19	5.95	
PFDoA	307-55-1	3.45 J	G1393-FS(3)	10.000	10/28/2020	0.729	2.38	5.95	
PFTrDA	72629-94-8	101	G1393-FS(3)	10.000	10/28/2020	0.333	1.19	5.95	
PFTeDA	376-06-7	2.98 U	G1393-FS(3)	10.000	10/28/2020	1.29	2.98	5.95	
NMeFOSAA	2355-31-9	2.98 U	G1393-FS(3)	10.000	10/28/2020	1.21	2.98	5.95	
NEtFOSAA	2991-50-6	2.38 U	G1393-FS(3)	10.000	10/28/2020	0.890	2.38	5.95	
PFBS	375-73-5	1.19 U	G1393-FS(3)	10.000	10/28/2020	0.417	1.19	5.95	
PFHxS	355-46-4	0.998 J	G1393-FS(3)	10.000	10/28/2020	0.962	2.38	5.95	
PFOS	1763-23-1	6.51	G1393-FS(3)	10.000	10/28/2020	0.824	2.38	5.95	EBL
HFPO-DA	13252-13-6	2.38 U	G1393-FS(3)	10.000	10/28/2020	0.763	2.38	5.95	
Adona	919005-14-4	2.38 U	G1393-FS(3)	10.000	10/28/2020	0.988	2.38	5.95	
9Cl-PF3ONS	756426-58-1	1.19 U	G1393-FS(3)	10.000	10/28/2020	0.574	1.19	5.95	
11Cl-PF3OUdS	763051-92-9	1.79 U	G1393-FS(3)	10.000	10/28/2020	0.624	1.79	5.95	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB15-0810
Battelle ID	G1394-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	13.04
Matrix	SO
Sample Size	1.75
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.29 U	G1394-FS(3)	10.000	10/28/2020	0.808	2.29	5.71	
PFHpA	375-85-9	1.71 U	G1394-FS(3)	10.000	10/28/2020	0.578	1.71	5.71	
PFOA	335-67-1	2.29 U	G1394-FS(3)	10.000	10/28/2020	0.694	2.29	5.71	
PFNA	375-95-1	2.98 J	G1394-FS(3)	10.000	10/28/2020	0.561	1.14	5.71	
PFDA	335-76-2	1.14 U	G1394-FS(3)	10.000	10/28/2020	0.529	1.14	5.71	
PFUnA	2058-94-8	1.14 U	G1394-FS(3)	10.000	10/28/2020	0.522	1.14	5.71	
PFDoA	307-55-1	2.29 U	G1394-FS(3)	10.000	10/28/2020	0.699	2.29	5.71	
PFTrDA	72629-94-8	1.14 U	G1394-FS(3)	10.000	10/28/2020	0.320	1.14	5.71	
PFTeDA	376-06-7	2.86 U	G1394-FS(3)	10.000	10/28/2020	1.23	2.86	5.71	
NMeFOSAA	2355-31-9	2.86 U	G1394-FS(3)	10.000	10/28/2020	1.17	2.86	5.71	
NEtFOSAA	2991-50-6	2.29 U	G1394-FS(3)	10.000	10/28/2020	0.855	2.29	5.71	
PFBS	375-73-5	1.14 U	G1394-FS(3)	10.000	10/28/2020	0.400	1.14	5.71	
PFHxS	355-46-4	2.10 J	G1394-FS(3)	10.000	10/28/2020	0.923	2.29	5.71	
PFOS	1763-23-1	5.29 J+	G1394-FS(3)	10.000	10/28/2020	0.791	2.29	5.71	EBL
HFPO-DA	13252-13-6	2.29 U	G1394-FS(3)	10.000	10/28/2020	0.733	2.29	5.71	
Adona	919005-14-4	2.29 U	G1394-FS(3)	10.000	10/28/2020	0.949	2.29	5.71	
9Cl-PF3ONS	756426-58-1	1.14 U	G1394-FS(3)	10.000	10/28/2020	0.551	1.14	5.71	
11Cl-PF3OUdS	763051-92-9	1.71 U	G1394-FS(3)	10.000	10/28/2020	0.599	1.71	5.71	

MW 1/9/21

Analyzed by: Schultz, Stephanie
Printed: 11/4/2020

BATTELLE
It can be done

8

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB15-1113
Battelle ID	G1395-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	15.28
Matrix	SO
Sample Size	1.65
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.42 U	G1395-FS(3)	10.000	10/28/2020	0.857	2.42	6.06	
PFHpA	375-85-9	1.82 U	G1395-FS(3)	10.000	10/28/2020	0.613	1.82	6.06	
PFOA	335-67-1	2.42 U	G1395-FS(3)	10.000	10/28/2020	0.736	2.42	6.06	
PFNA	375-95-1	5.29 J	G1395-FS(3)	10.000	10/28/2020	0.595	1.21	6.06	
PFDA	335-76-2	1.21 U	G1395-FS(3)	10.000	10/28/2020	0.561	1.21	6.06	
PFUnA	2058-94-8	1.21 U	G1395-FS(3)	10.000	10/28/2020	0.554	1.21	6.06	
PFDoA	307-55-1	2.42 U	G1395-FS(3)	10.000	10/28/2020	0.742	2.42	6.06	
PFTrDA	72629-94-8	1.21 U	G1395-FS(3)	10.000	10/28/2020	0.339	1.21	6.06	
PFTeDA	376-06-7	3.03 U	G1395-FS(3)	10.000	10/28/2020	1.31	3.03	6.06	
NMeFOSAA	2355-31-9	3.03 U	G1395-FS(3)	10.000	10/28/2020	1.24	3.03	6.06	
NEtFOSAA	2991-50-6	2.42 U	G1395-FS(3)	10.000	10/28/2020	0.907	2.42	6.06	
PFBS	375-73-5	1.21 U	G1395-FS(3)	10.000	10/28/2020	0.424	1.21	6.06	
PFHxS	355-46-4	2.40 J	G1395-FS(3)	10.000	10/28/2020	0.979	2.42	6.06	
PFOS	1763-23-1	15.2 u	G1395-FS(3)	10.000	10/28/2020	0.839	2.42	6.06	EBL
HFPO-DA	13252-13-6	2.42 U	G1395-FS(3)	10.000	10/28/2020	0.777	2.42	6.06	
Adona	919005-14-4	2.42 U	G1395-FS(3)	10.000	10/28/2020	1.01	2.42	6.06	
9Cl-PF3ONS	756426-58-1	1.21 U	G1395-FS(3)	10.000	10/28/2020	0.584	1.21	6.06	
11Cl-PF3OUdS	763051-92-9	1.82 U	G1395-FS(3)	10.000	10/28/2020	0.635	1.82	6.06	

11/9/21

Analyzed by: Schultz, Stephanie
Printed: 11/4/2020

BATTELLE
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9

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB15P-1113
Battelle ID	G1396-FS
Sample Type	SA
Collection Date	10/06/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	15.89
Matrix	SO
Sample Size	1.62
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.47 U	G1396-FS(3)	10.000	10/28/2020	0.873	2.47	6.17
PFHpA	375-85-9	1.85 U	G1396-FS(3)	10.000	10/28/2020	0.625	1.85	6.17
PFOA	335-67-1	2.47 U	G1396-FS(3)	10.000	10/28/2020	0.749	2.47	6.17
PFNA	375-95-1	6.35	G1396-FS(3)	10.000	10/28/2020	0.606	1.23	6.17
PFDA	335-76-2	1.23 U	G1396-FS(3)	10.000	10/28/2020	0.572	1.23	6.17
PFUnA	2058-94-8	1.23 U	G1396-FS(3)	10.000	10/28/2020	0.564	1.23	6.17
PFDoA	307-55-1	2.47 U	G1396-FS(3)	10.000	10/28/2020	0.756	2.47	6.17
PFTrDA	72629-94-8	1.23 U	G1396-FS(3)	10.000	10/28/2020	0.346	1.23	6.17
PFTeDA	376-06-7	3.09 U	G1396-FS(3)	10.000	10/28/2020	1.33	3.09	6.17
NMeFOSAA	2355-31-9	3.09 U	G1396-FS(3)	10.000	10/28/2020	1.26	3.09	6.17
NEtFOSAA	2991-50-6	2.47 U	G1396-FS(3)	10.000	10/28/2020	0.923	2.47	6.17
PFBS	375-73-5	1.23 U	G1396-FS(3)	10.000	10/28/2020	0.432	1.23	6.17
PFHxS	355-46-4	2.56 J	G1396-FS(3)	10.000	10/28/2020	0.998	2.47	6.17
PFOS	1763-23-1	14.7 u	G1396-FS(3)	10.000	10/28/2020	0.854	2.47	6.17
HFPO-DA	13252-13-6	2.47 U	G1396-FS(3)	10.000	10/28/2020	0.791	2.47	6.17
Adona	919005-14-4	2.47 U	G1396-FS(3)	10.000	10/28/2020	1.02	2.47	6.17
9Cl-PF3ONS	756426-58-1	1.23 U	G1396-FS(3)	10.000	10/28/2020	0.595	1.23	6.17
11Cl-PF3OUdS	763051-92-9	1.85 U	G1396-FS(3)	10.000	10/28/2020	0.647	1.85	6.17

EBL

11/9/20

Analyzed by: Schultz, Stephanie
Printed: 11/4/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1283
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 9, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SS23-000H	G1517-FS	Soil
2	CBD-AOA-SB23-1516	G1518-FS	Soil
2MS	CBD-AOA-SB23-1516MS	G1519-FSMS	Soil
2MSD	CBD-AOA-SB23-1516MSD	G1520-FSMSD	Soil
3	CBD-AOA-SS28-000H	G1521-FS	Soil
4	CBD-AOA-SB28-0809	G1522-FS	Soil
5	CBD-AOA-SB28-1516	G1523-FS	Soil

A Stage 2B/4 data validation was performed on the analytical data for five soil samples collected on October 9, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for soil samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB02-100920-SO	PFOS	13.0	U	All Samples
CBD-AOA-FB02-100920	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples exhibited acceptable percent recoveries (%R) and RPD values.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS23-000H
Battelle ID	G1517-FS
Sample Type	SA
Collection Date	10/09/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	12.14
Matrix	SO
Sample Size	1.83
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.19 U	G1517-FS(3)	10.000	11/2/2020	0.773	2.19	5.46
PFHpA	375-85-9	1.64 U	G1517-FS(3)	10.000	11/2/2020	0.553	1.64	5.46
PFOA	335-67-1	2.19 U	G1517-FS(3)	10.000	11/2/2020	0.663	2.19	5.46
PFNA	375-95-1	1.14 J	G1517-FS(3)	10.000	11/2/2020	0.537	1.09	5.46
PFDA	335-76-2	1.09 U	G1517-FS(3)	10.000	11/2/2020	0.506	1.09	5.46
PFUnA	2058-94-8	1.05 J	G1517-FS(3)	10.000	11/2/2020	0.499	1.09	5.46
PFDoA	307-55-1	2.19 U	G1517-FS(3)	10.000	11/2/2020	0.669	2.19	5.46
PFTrDA	72629-94-8	1.09 U	G1517-FS(3)	10.000	11/2/2020	0.306	1.09	5.46
PFTeDA	376-06-7	2.73 U	G1517-FS(3)	10.000	11/2/2020	1.18	2.73	5.46
NMeFOSAA	2355-31-9	2.73 U	G1517-FS(3)	10.000	11/2/2020	1.11	2.73	5.46
NEtFOSAA	2991-50-6	2.19 U	G1517-FS(3)	10.000	11/2/2020	0.817	2.19	5.46
PFBS	375-73-5	1.09 U	G1517-FS(3)	10.000	11/2/2020	0.383	1.09	5.46
PFHxS	355-46-4	2.19 U	G1517-FS(3)	10.000	11/2/2020	0.883	2.19	5.46
PFOS	1763-23-1	16.1 u	G1517-FS(3)	10.000	11/2/2020	0.756	2.19	5.46
HFPO-DA	13252-13-6	2.19 U	G1517-FS(3)	10.000	11/2/2020	0.701	2.19	5.46
Adona	919005-14-4	2.19 U	G1517-FS(3)	10.000	11/2/2020	0.907	2.19	5.46
9Cl-PF3ONS	756426-58-1	1.09 U	G1517-FS(3)	10.000	11/2/2020	0.527	1.09	5.46
11Cl-PF3OUdS	763051-92-9	1.64 U	G1517-FS(3)	10.000	11/2/2020	0.573	1.64	5.46

EBL

MW 1/9/21

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB23-1516
Battelle ID	G1518-FS
Sample Type	SA
Collection Date	10/09/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	25.93
Matrix	SO
Sample Size	1.54
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.60 U	G1518-FS(3)	10.000	11/2/2020	0.918	2.60	6.49	
PFHpA	375-85-9	1.95 U	G1518-FS(3)	10.000	11/2/2020	0.657	1.95	6.49	
PFOA	335-67-1	2.60 U	G1518-FS(3)	10.000	11/2/2020	0.788	2.60	6.49	
PFNA	375-95-1	1.30 U	G1518-FS(3)	10.000	11/2/2020	0.638	1.30	6.49	
PFDA	335-76-2	1.30 U	G1518-FS(3)	10.000	11/2/2020	0.601	1.30	6.49	
PFUnA	2058-94-8	1.30 U	G1518-FS(3)	10.000	11/2/2020	0.594	1.30	6.49	
PFDoA	307-55-1	2.60 U	G1518-FS(3)	10.000	11/2/2020	0.795	2.60	6.49	
PFTrDA	72629-94-8	1.30 U	G1518-FS(3)	10.000	11/2/2020	0.364	1.30	6.49	
PFTeDA	376-06-7	3.25 U	G1518-FS(3)	10.000	11/2/2020	1.40	3.25	6.49	
NMeFOSAA	2355-31-9	3.25 U	G1518-FS(3)	10.000	11/2/2020	1.32	3.25	6.49	
NEtFOSAA	2991-50-6	2.60 U	G1518-FS(3)	10.000	11/2/2020	0.971	2.60	6.49	
PFBS	375-73-5	1.30 U	G1518-FS(3)	10.000	11/2/2020	0.455	1.30	6.49	
PFHxS	355-46-4	2.60 U	G1518-FS(3)	10.000	11/2/2020	1.05	2.60	6.49	
PFOS	1763-23-1	2.60 ~~1.30~~ U	G1518-FS(3)	10.000	11/2/2020	0.899	2.60	6.49	EBL
HFPO-DA	13252-13-6	2.60 U	G1518-FS(3)	10.000	11/2/2020	0.832	2.60	6.49	
Adona	919005-14-4	2.60 U	G1518-FS(3)	10.000	11/2/2020	1.08	2.60	6.49	
9Cl-PF3ONS	756426-58-1	1.30 U	G1518-FS(3)	10.000	11/2/2020	0.626	1.30	6.49	
11Cl-PF3OUdS	763051-92-9	1.95 U	G1518-FS(3)	10.000	11/2/2020	0.681	1.95	6.49	

MW 1/9/21

BATTELLE
It can be done

3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SS28-000H
Battelle ID	G1521-FS
Sample Type	SA
Collection Date	10/09/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	7.86
Matrix	SO
Sample Size	1.93
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.07 U	G1521-FS(3)	10.000	11/2/2020	0.733	2.07	5.18	
PFHpA	375-85-9	1.55 U	G1521-FS(3)	10.000	11/2/2020	0.524	1.55	5.18	
PFOA	335-67-1	2.07 U	G1521-FS(3)	10.000	11/2/2020	0.629	2.07	5.18	
PFNA	375-95-1	1.04 U	G1521-FS(3)	10.000	11/2/2020	0.509	1.04	5.18	
PFDA	335-76-2	1.04 U	G1521-FS(3)	10.000	11/2/2020	0.480	1.04	5.18	
PFUnA	2058-94-8	1.04 U	G1521-FS(3)	10.000	11/2/2020	0.474	1.04	5.18	
PFDoA	307-55-1	2.07 U	G1521-FS(3)	10.000	11/2/2020	0.634	2.07	5.18	
PFTrDA	72629-94-8	1.04 U	G1521-FS(3)	10.000	11/2/2020	0.290	1.04	5.18	
PFTeDA	376-06-7	2.59 U	G1521-FS(3)	10.000	11/2/2020	1.12	2.59	5.18	
NMeFOSAA	2355-31-9	2.59 U	G1521-FS(3)	10.000	11/2/2020	1.06	2.59	5.18	
NEtFOSAA	2991-50-6	2.07 U	G1521-FS(3)	10.000	11/2/2020	0.775	2.07	5.18	
PFBS	375-73-5	1.04 U	G1521-FS(3)	10.000	11/2/2020	0.363	1.04	5.18	
PFHxS	355-46-4	2.07 U	G1521-FS(3)	10.000	11/2/2020	0.837	2.07	5.18	
PFOS	1763-23-1	2.07 ~~1.89~~ U	G1521-FS(3)	10.000	11/2/2020	0.717	2.07	5.18	EBL
HFPO-DA	13252-13-6	2.07 U	G1521-FS(3)	10.000	11/2/2020	0.664	2.07	5.18	
Adona	919005-14-4	2.07 U	G1521-FS(3)	10.000	11/2/2020	0.860	2.07	5.18	
9Cl-PF3ONS	756426-58-1	1.04 U	G1521-FS(3)	10.000	11/2/2020	0.499	1.04	5.18	
11Cl-PF3OUdS	763051-92-9	1.55 U	G1521-FS(3)	10.000	11/2/2020	0.543	1.55	5.18	

MW 11/9/21

Analyzed by: Schultz, Stephanie
Printed: 11/6/2020

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

4

Client ID	CBD-AOA-SB28-0809
Battelle ID	G1522-FS
Sample Type	SA
Collection Date	10/09/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	7.31
Matrix	SO
Sample Size	1.98
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.02 U	G1522-FS(3)	10.000	11/2/2020	0.714	2.02	5.05	
PFHpA	375-85-9	1.52 U	G1522-FS(3)	10.000	11/2/2020	0.511	1.52	5.05	
PFOA	335-67-1	2.02 U	G1522-FS(3)	10.000	11/2/2020	0.613	2.02	5.05	
PFNA	375-95-1	1.01 U	G1522-FS(3)	10.000	11/2/2020	0.496	1.01	5.05	
PFDA	335-76-2	1.01 U	G1522-FS(3)	10.000	11/2/2020	0.468	1.01	5.05	
PFUnA	2058-94-8	1.01 U	G1522-FS(3)	10.000	11/2/2020	0.462	1.01	5.05	
PFDoA	307-55-1	2.02 U	G1522-FS(3)	10.000	11/2/2020	0.618	2.02	5.05	
PFTrDA	72629-94-8	1.01 U	G1522-FS(3)	10.000	11/2/2020	0.283	1.01	5.05	
PFTeDA	376-06-7	2.53 U	G1522-FS(3)	10.000	11/2/2020	1.09	2.53	5.05	
NMeFOSAA	2355-31-9	2.53 U	G1522-FS(3)	10.000	11/2/2020	1.03	2.53	5.05	
NEtFOSAA	2991-50-6	2.02 U	G1522-FS(3)	10.000	11/2/2020	0.756	2.02	5.05	
PFBS	375-73-5	1.01 U	G1522-FS(3)	10.000	11/2/2020	0.354	1.01	5.05	
PFHxS	355-46-4	2.02 U	G1522-FS(3)	10.000	11/2/2020	0.816	2.02	5.05	
PFOS	1763-23-1	2.83 U	G1522-FS(3)	10.000	11/2/2020	0.699	2.02	5.05	EBL
HFPO-DA	13252-13-6	2.02 U	G1522-FS(3)	10.000	11/2/2020	0.647	2.02	5.05	
Adona	919005-14-4	2.02 U	G1522-FS(3)	10.000	11/2/2020	0.838	2.02	5.05	
9Cl-PF3ONS	756426-58-1	1.01 U	G1522-FS(3)	10.000	11/2/2020	0.487	1.01	5.05	
11Cl-PF3OUdS	763051-92-9	1.52 U	G1522-FS(3)	10.000	11/2/2020	0.529	1.52	5.05	

NW 11/9/21

BATTELLE
It can be done

5

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SB28-1516
Battelle ID	G1523-FS
Sample Type	SA
Collection Date	10/09/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	15.02
Matrix	SO
Sample Size	1.59
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.52 U	G1523-FS(3)	10.000	11/2/2020	0.889	2.52	6.29
PFHpA	375-85-9	1.89 U	G1523-FS(3)	10.000	11/2/2020	0.636	1.89	6.29
PFOA	335-67-1	2.52 U	G1523-FS(3)	10.000	11/2/2020	0.764	2.52	6.29
PFNA	375-95-1	1.26 U	G1523-FS(3)	10.000	11/2/2020	0.618	1.26	6.29
PFDA	335-76-2	1.26 U	G1523-FS(3)	10.000	11/2/2020	0.582	1.26	6.29
PFUnA	2058-94-8	1.26 U	G1523-FS(3)	10.000	11/2/2020	0.575	1.26	6.29
PFDoA	307-55-1	2.52 U	G1523-FS(3)	10.000	11/2/2020	0.770	2.52	6.29
PFTrDA	72629-94-8	1.26 U	G1523-FS(3)	10.000	11/2/2020	0.352	1.26	6.29
PFTeDA	376-06-7	3.14 U	G1523-FS(3)	10.000	11/2/2020	1.36	3.14	6.29
NMeFOSAA	2355-31-9	3.14 U	G1523-FS(3)	10.000	11/2/2020	1.28	3.14	6.29
NEtFOSAA	2991-50-6	2.52 U	G1523-FS(3)	10.000	11/2/2020	0.941	2.52	6.29
PFBS	375-73-5	1.26 U	G1523-FS(3)	10.000	11/2/2020	0.440	1.26	6.29
PFHxS	355-46-4	2.52 U	G1523-FS(3)	10.000	11/2/2020	1.02	2.52	6.29
PFOS	1763-23-1	15.2	G1523-FS(3)	10.000	11/2/2020	0.870	2.52	6.29
HFPO-DA	13252-13-6	2.52 U	G1523-FS(3)	10.000	11/2/2020	0.806	2.52	6.29
Adona	919005-14-4	2.52 U	G1523-FS(3)	10.000	11/2/2020	1.04	2.52	6.29
9Cl-PF3ONS	756426-58-1	1.26 U	G1523-FS(3)	10.000	11/2/2020	0.606	1.26	6.29
11Cl-PF3OUdS	763051-92-9	1.89 U	G1523-FS(3)	10.000	11/2/2020	0.659	1.89	6.29

EBL

11/9/21

Analyzed by: Schultz, Stephanie
Printed: 11/6/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1284
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 10, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-FB02-100920	G1524-FS	Water
2	CBD-AOA-EB02-100920-SO	G1525-FS	Water

A Stage 2B/4 data validation was performed on the analytical data for one aqueous equipment blank sample and one aqueous field blank sample collected on October 9, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries

- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for water samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-FB02-100920	None - ND	-	-	-
CBD-AOA-EB02-100920-SO	PFOS	13.0	None	Applies to other packages

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R) except for EDS #2 as 13C2-PFTeDA recovered low at 47% and this compound was qualified estimated (UJ).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- The ion ratio exceeded percent difference criteria and was flagged (Q) by the laboratory and further qualified estimated (J) by the reviewer for one compound in EDS Sample 2.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/20

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-FB02-100920
Battelle ID	G1524-FS
Sample Type	SA
Collection Date	10/09/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.39 U	G1524-FS(0)	1.000	11/2/2020	0.488	1.39	4.63
PFHpA	375-85-9	0.926 U	G1524-FS(0)	1.000	11/2/2020	0.244	0.926	4.63
PFOA	335-67-1	1.39 U	G1524-FS(0)	1.000	11/2/2020	0.473	1.39	4.63
PFNA	375-95-1	0.926 U	G1524-FS(0)	1.000	11/2/2020	0.286	0.926	4.63
PFDA	335-76-2	0.463 U	G1524-FS(0)	1.000	11/2/2020	0.131	0.463	4.63
PFUnA	2058-94-8	0.463 U	G1524-FS(0)	1.000	11/2/2020	0.203	0.463	4.63
PFDoA	307-55-1	0.463 U	G1524-FS(0)	1.000	11/2/2020	0.178	0.463	4.63
PFTrDA	72629-94-8	0.463 U	G1524-FS(0)	1.000	11/2/2020	0.143	0.463	4.63
PFTeDA	376-06-7	1.85 U	G1524-FS(0)	1.000	11/2/2020	0.679	1.85	4.63
NMeFOSAA	2355-31-9	0.926 U	G1524-FS(0)	1.000	11/2/2020	0.324	0.926	4.63
NEtFOSAA	2991-50-6	0.926 U	G1524-FS(0)	1.000	11/2/2020	0.463	0.926	4.63
PFBS	375-73-5	0.463 U	G1524-FS(0)	1.000	11/2/2020	0.133	0.463	4.63
PFHxS	355-46-4	0.370 U	G1524-FS(0)	1.000	11/2/2020	0.104	0.370	4.63
PFOS	1763-23-1	0.926 U	G1524-FS(0)	1.000	11/2/2020	0.405	0.926	4.63
HFPO-DA	13252-13-6	0.463 U	G1524-FS(0)	1.000	11/2/2020	0.230	0.463	4.63
Adona	919005-14-4	0.926 U	G1524-FS(0)	1.000	11/2/2020	0.245	0.926	4.63
9Cl-PF3ONS	756426-58-1	0.463 U	G1524-FS(0)	1.000	11/2/2020	0.248	0.463	4.63
11Cl-PF3OUdS	763051-92-9	0.926 U	G1524-FS(0)	1.000	11/2/2020	0.214	0.926	4.63

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB02-100920-SO
Battelle ID	G1525-FS
Sample Type	SA
Collection Date	10/09/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.39 U	G1525-FS(0)	1.000	11/2/2020	0.488	1.39	4.63	
PFHpA	375-85-9	0.926 U	G1525-FS(0)	1.000	11/2/2020	0.244	0.926	4.63	
PFOA	335-67-1	1.39 U	G1525-FS(0)	1.000	11/2/2020	0.473	1.39	4.63	
PFNA	375-95-1	0.926 U	G1525-FS(0)	1.000	11/2/2020	0.286	0.926	4.63	
PFDA	335-76-2	0.463 U	G1525-FS(0)	1.000	11/2/2020	0.131	0.463	4.63	
PFUnA	2058-94-8	0.463 U	G1525-FS(0)	1.000	11/2/2020	0.203	0.463	4.63	
PFDoA	307-55-1	0.463 U	G1525-FS(0)	1.000	11/2/2020	0.178	0.463	4.63	
PFTrDA	72629-94-8	0.463 U	G1525-FS(0)	1.000	11/2/2020	0.143	0.463	4.63	
PFTeDA	376-06-7	1.85 UJ	G1525-FS(0)	1.000	11/2/2020	0.679	1.85	4.63	SSL
NMeFOSAA	2355-31-9	0.926 U	G1525-FS(0)	1.000	11/2/2020	0.324	0.926	4.63	
NEtFOSAA	2991-50-6	0.926 U	G1525-FS(0)	1.000	11/2/2020	0.463	0.926	4.63	
PFBS	375-73-5	0.463 U	G1525-FS(0)	1.000	11/2/2020	0.133	0.463	4.63	
PFHxS	355-46-4	0.370 U	G1525-FS(0)	1.000	11/2/2020	0.104	0.370	4.63	
PFOS	1763-23-1	13.0 J	G1525-FS(0)	1.000	11/2/2020	0.405	0.926	4.63	OT
HFPO-DA	13252-13-6	0.463 U	G1525-FS(0)	1.000	11/2/2020	0.230	0.463	4.63	
Adona	919005-14-4	0.926 U	G1525-FS(0)	1.000	11/2/2020	0.245	0.926	4.63	
9Cl-PF3ONS	756426-58-1	0.463 U	G1525-FS(0)	1.000	11/2/2020	0.248	0.463	4.63	
11Cl-PF3OUdS	763051-92-9	0.926 U	G1525-FS(0)	1.000	11/2/2020	0.214	0.926	4.63	

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB02-100920-SO
Battelle ID	G1525-FS
Sample Type	SA
Collection Date	10/09/2020
Extraction Date	10/14/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	54	G1525-FS(0)	11/2/2020
13C4-PFHpA	59	G1525-FS(0)	11/2/2020
13C8-PFOA	58	G1525-FS(0)	11/2/2020
13C9-PFNA	76	G1525-FS(0)	11/2/2020
13C6-PFDA	72	G1525-FS(0)	11/2/2020
13C7-PFUnA	63	G1525-FS(0)	11/2/2020
13C2-PFDoA	56	G1525-FS(0)	11/2/2020
13C2-PFTeDA	47	G1525-FS(0)	11/2/2020
d3-MeFOSAA	86	G1525-FS(0)	11/2/2020
d5-EtFOSAA	122	G1525-FS(0)	11/2/2020
13C3-PFBS	147	G1525-FS(0)	11/2/2020
13C3-PFHxS	117	G1525-FS(0)	11/2/2020
13C8-PFOS	87	G1525-FS(0)	11/2/2020
13C3-HFPO-DA	65	G1525-FS(0)	11/2/2020

NW 1/10/21

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1297
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 10, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SD04-000H	G1648-FS	Sediment
1MS	CBD-AOA-SD04-000HMS	G1649-FS	Sediment
1MSD	CBD-AOA-SD04-000HMSD	G1650-FS	Sediment
2	CBD-AOA-SD02-000H	G1653-FS	Sediment
3	CBD-AOA-SD08-000H	G1659-FS	Sediment
4	CBD-AOA-SD08P-000H	G1660-FS	Sediment
5	CBD-AOA-SD06-000H	G1662-FS	Sediment

A Stage 2B/4 data validation was performed on the analytical data for five sediment samples collected on October 13, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes. There were no qualifications.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for sediment samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-101320-SD	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples exhibited acceptable percent recoveries (%R) and RPD values.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	CBD-AOA-SD08-000H ng/g	CBD-AOA-SD08P-000H ng/g	RPD	Qualifier
PFUnA	1.24	1.11	11%	None
PFTrDA	1.10	0.975	12%	
PFOS	7.49	6.10	20%	

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SD04-000H
Battelle ID	G1648-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/20/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	22.42
Matrix	SD
Sample Size	1.51
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.65 U	G1648-FS(3)	10.000	11/2/2020	0.936	2.65	6.62
PFHpA	375-85-9	1.99 U	G1648-FS(3)	10.000	11/2/2020	0.670	1.99	6.62
PFOA	335-67-1	2.65 U	G1648-FS(3)	10.000	11/2/2020	0.804	2.65	6.62
PFNA	375-95-1	1.32 U	G1648-FS(3)	10.000	11/2/2020	0.650	1.32	6.62
PFDA	335-76-2	1.32 U	G1648-FS(3)	10.000	11/2/2020	0.613	1.32	6.62
PFUnA	2058-94-8	1.32 U	G1648-FS(3)	10.000	11/2/2020	0.605	1.32	6.62
PFDoA	307-55-1	2.65 U	G1648-FS(3)	10.000	11/2/2020	0.811	2.65	6.62
PFTrDA	72629-94-8	1.32 U	G1648-FS(3)	10.000	11/2/2020	0.371	1.32	6.62
PFTeDA	376-06-7	3.31 U	G1648-FS(3)	10.000	11/2/2020	1.43	3.31	6.62
NMeFOSAA	2355-31-9	3.31 U	G1648-FS(3)	10.000	11/2/2020	1.35	3.31	6.62
NEtFOSAA	2991-50-6	2.65 U	G1648-FS(3)	10.000	11/2/2020	0.991	2.65	6.62
PFBS	375-73-5	1.32 U	G1648-FS(3)	10.000	11/2/2020	0.464	1.32	6.62
PFHxS	355-46-4	2.65 U	G1648-FS(3)	10.000	11/2/2020	1.07	2.65	6.62
PFOS	1763-23-1	1.63 J	G1648-FS(3)	10.000	11/2/2020	0.917	2.65	6.62
HFPO-DA	13252-13-6	2.65 U	G1648-FS(3)	10.000	11/2/2020	0.849	2.65	6.62
Adona	919005-14-4	2.65 U	G1648-FS(3)	10.000	11/2/2020	1.10	2.65	6.62
9Cl-PF3ONS	756426-58-1	1.32 U	G1648-FS(3)	10.000	11/2/2020	0.638	1.32	6.62
11Cl-PF3OUdS	763051-92-9	1.99 U	G1648-FS(3)	10.000	11/2/2020	0.694	1.99	6.62

MW 11/10/21

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SD02-000H
Battelle ID	G1653-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/20/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	48.56
Matrix	SD
Sample Size	1.05
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	3.81 U	G1653-FS(3)	10.000	11/2/2020	1.35	3.81	9.52
PFHpA	375-85-9	2.86 U	G1653-FS(3)	10.000	11/2/2020	0.964	2.86	9.52
PFOA	335-67-1	3.81 U	G1653-FS(3)	10.000	11/2/2020	1.16	3.81	9.52
PFNA	375-95-1	1.90 U	G1653-FS(3)	10.000	11/2/2020	0.935	1.90	9.52
PFDA	335-76-2	1.90 U	G1653-FS(3)	10.000	11/2/2020	0.882	1.90	9.52
PFUnA	2058-94-8	1.90 U	G1653-FS(3)	10.000	11/2/2020	0.870	1.90	9.52
PFDoA	307-55-1	3.81 U	G1653-FS(3)	10.000	11/2/2020	1.17	3.81	9.52
PFTrDA	72629-94-8	1.90 U	G1653-FS(3)	10.000	11/2/2020	0.533	1.90	9.52
PFTeDA	376-06-7	4.76 U	G1653-FS(3)	10.000	11/2/2020	2.06	4.76	9.52
NMeFOSAA	2355-31-9	4.76 U	G1653-FS(3)	10.000	11/2/2020	1.94	4.76	9.52
NEtFOSAA	2991-50-6	3.81 U	G1653-FS(3)	10.000	11/2/2020	1.42	3.81	9.52
PFBS	375-73-5	1.90 U	G1653-FS(3)	10.000	11/2/2020	0.667	1.90	9.52
PFHxS	355-46-4	3.81 U	G1653-FS(3)	10.000	11/2/2020	1.54	3.81	9.52
PFOS	1763-23-1	2.64 J	G1653-FS(3)	10.000	11/2/2020	1.32	3.81	9.52
HFPO-DA	13252-13-6	3.81 U	G1653-FS(3)	10.000	11/2/2020	1.22	3.81	9.52
Adona	919005-14-4	3.81 U	G1653-FS(3)	10.000	11/2/2020	1.58	3.81	9.52
9Cl-PF3ONS	756426-58-1	1.90 U	G1653-FS(3)	10.000	11/2/2020	0.918	1.90	9.52
11Cl-PF3OUdS	763051-92-9	2.86 U	G1653-FS(3)	10.000	11/2/2020	0.998	2.86	9.52

NW 11/10/21

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3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SD08-000H
Battelle ID	G1659-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/20/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	19.26
Matrix	SD
Sample Size	1.52
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.63 U	G1659-FS(3)	10.000	11/2/2020	0.930	2.63	6.58
PFHpA	375-85-9	1.97 U	G1659-FS(3)	10.000	11/2/2020	0.666	1.97	6.58
PFOA	335-67-1	2.63 U	G1659-FS(3)	10.000	11/2/2020	0.799	2.63	6.58
PFNA	375-95-1	1.32 U	G1659-FS(3)	10.000	11/2/2020	0.646	1.32	6.58
PFDA	335-76-2	1.32 U	G1659-FS(3)	10.000	11/2/2020	0.609	1.32	6.58
PFUnA	2058-94-8	1.24 J	G1659-FS(3)	10.000	11/2/2020	0.601	1.32	6.58
PFDoA	307-55-1	2.63 U	G1659-FS(3)	10.000	11/2/2020	0.805	2.63	6.58
PFTrDA	72629-94-8	1.10 J	G1659-FS(3)	10.000	11/2/2020	0.368	1.32	6.58
PFTeDA	376-06-7	3.29 U	G1659-FS(3)	10.000	11/2/2020	1.42	3.29	6.58
NMeFOSAA	2355-31-9	3.29 U	G1659-FS(3)	10.000	11/2/2020	1.34	3.29	6.58
NEtFOSAA	2991-50-6	2.63 U	G1659-FS(3)	10.000	11/2/2020	0.984	2.63	6.58
PFBS	375-73-5	1.32 U	G1659-FS(3)	10.000	11/2/2020	0.461	1.32	6.58
PFHxS	355-46-4	2.63 U	G1659-FS(3)	10.000	11/2/2020	1.06	2.63	6.58
PFOS	1763-23-1	7.49	G1659-FS(3)	10.000	11/2/2020	0.911	2.63	6.58
HFPO-DA	13252-13-6	2.63 U	G1659-FS(3)	10.000	11/2/2020	0.843	2.63	6.58
Adona	919005-14-4	2.63 U	G1659-FS(3)	10.000	11/2/2020	1.09	2.63	6.58
9Cl-PF3ONS	756426-58-1	1.32 U	G1659-FS(3)	10.000	11/2/2020	0.634	1.32	6.58
11Cl-PF3OUdS	763051-92-9	1.97 U	G1659-FS(3)	10.000	11/2/2020	0.689	1.97	6.58

MJ 11/10/21

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4

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SD08P-000H
Battelle ID	G1660-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/20/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	19.72
Matrix	SD
Sample Size	1.66
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.41 U	G1660-FS(3)	10.000	11/2/2020	0.852	2.41	6.02
PFHpA	**375-85-9**	**1.81 U**	**G1660-FS(3)**	**10.000**	**11/2/2020**	**0.610**	**1.81**	**6.02**
PFOA	335-67-1	2.41 U	G1660-FS(3)	10.000	11/2/2020	0.731	2.41	6.02
PFNA	**375-95-1**	**1.20 U**	**G1660-FS(3)**	**10.000**	**11/2/2020**	**0.592**	**1.20**	**6.02**
PFDA	335-76-2	1.20 U	G1660-FS(3)	10.000	11/2/2020	0.558	1.20	6.02
PFUnA	**2058-94-8**	**1.11 J**	**G1660-FS(3)**	**10.000**	**11/2/2020**	**0.551**	**1.20**	**6.02**
PFDoA	307-55-1	2.41 U	G1660-FS(3)	10.000	11/2/2020	0.737	2.41	6.02
PFTrDA	**72629-94-8**	**0.975 J**	**G1660-FS(3)**	**10.000**	**11/2/2020**	**0.337**	**1.20**	**6.02**
PFTeDA	376-06-7	3.01 U	G1660-FS(3)	10.000	11/2/2020	1.30	3.01	6.02
NMeFOSAA	**2355-31-9**	**3.01 U**	**G1660-FS(3)**	**10.000**	**11/2/2020**	**1.23**	**3.01**	**6.02**
NEtFOSAA	2991-50-6	2.41 U	G1660-FS(3)	10.000	11/2/2020	0.901	2.41	6.02
PFBS	**375-73-5**	**1.20 U**	**G1660-FS(3)**	**10.000**	**11/2/2020**	**0.422**	**1.20**	**6.02**
PFHxS	355-46-4	2.41 U	G1660-FS(3)	10.000	11/2/2020	0.973	2.41	6.02
PFOS	**1763-23-1**	**6.10**	**G1660-FS(3)**	**10.000**	**11/2/2020**	**0.834**	**2.41**	**6.02**
HFPO-DA	13252-13-6	2.41 U	G1660-FS(3)	10.000	11/2/2020	0.772	2.41	6.02
Adona	**919005-14-4**	**2.41 U**	**G1660-FS(3)**	**10.000**	**11/2/2020**	**1.00**	**2.41**	**6.02**
9Cl-PF3ONS	756426-58-1	1.20 U	G1660-FS(3)	10.000	11/2/2020	0.581	1.20	6.02
11Cl-PF3OUdS	**763051-92-9**	**1.81 U**	**G1660-FS(3)**	**10.000**	**11/2/2020**	**0.631**	**1.81**	**6.02**

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5

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SD06-000H
Battelle ID	G1662-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/20/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	24.08
Matrix	SD
Sample Size	1.48
Size Unit-Basis	g

Analyte	CAS No.	Result (ng/g_Dry)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.70 U	G1662-FS(3)	10.000	11/2/2020	0.955	2.70	6.76
PFHpA	375-85-9	2.03 U	G1662-FS(3)	10.000	11/2/2020	0.684	2.03	6.76
PFOA	335-67-1	2.70 U	G1662-FS(3)	10.000	11/2/2020	0.820	2.70	6.76
PFNA	375-95-1	1.19 J	G1662-FS(3)	10.000	11/2/2020	0.664	1.35	6.76
PFDA	335-76-2	1.35 U	G1662-FS(3)	10.000	11/2/2020	0.626	1.35	6.76
PFUnA	2058-94-8	3.39 J	G1662-FS(3)	10.000	11/2/2020	0.618	1.35	6.76
PFDoA	307-55-1	2.70 U	G1662-FS(3)	10.000	11/2/2020	0.827	2.70	6.76
PFTrDA	72629-94-8	5.23 J	G1662-FS(3)	10.000	11/2/2020	0.378	1.35	6.76
PFTeDA	376-06-7	3.38 U	G1662-FS(3)	10.000	11/2/2020	1.46	3.38	6.76
NMeFOSAA	2355-31-9	3.38 U	G1662-FS(3)	10.000	11/2/2020	1.38	3.38	6.76
NEtFOSAA	2991-50-6	2.70 U	G1662-FS(3)	10.000	11/2/2020	1.01	2.70	6.76
PFBS	375-73-5	1.35 U	G1662-FS(3)	10.000	11/2/2020	0.473	1.35	6.76
PFHxS	355-46-4	1.40 J	G1662-FS(3)	10.000	11/2/2020	1.09	2.70	6.76
PFOS	1763-23-1	34.9	G1662-FS(3)	10.000	11/2/2020	0.935	2.70	6.76
HFPO-DA	13252-13-6	2.70 U	G1662-FS(3)	10.000	11/2/2020	0.866	2.70	6.76
Adona	919005-14-4	2.70 U	G1662-FS(3)	10.000	11/2/2020	1.12	2.70	6.76
9Cl-PF3ONS	756426-58-1	1.35 U	G1662-FS(3)	10.000	11/2/2020	0.651	1.35	6.76
11Cl-PF3OUdS	763051-92-9	2.03 U	G1662-FS(3)	10.000	11/2/2020	0.708	2.03	6.76

11/9/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1298
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 10, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SW07-1020	G1644-FS	Water
2	CBD-AOA-SW05-1020	G1645-FS	Water
3	CBD-AOA-SW03-1020	G1646-FS	Water
4	CBD-AOA-SW04-1020	G1647-FS	Water
5	CBD-AOA-SW02-1020	G1651-FS	Water
6	CBD-AOA-SW02P-1020	G1652-FS	Water
7	CBD-AOA-SW01-1020	G1654-FS	Water
8	CBD-AOA-FB03-101320	G1655-FS	Water
9	CBD-AOA-EB03-101320-SW	G1656-FS	Water
10	CBD-AOA-EB03-101320-SD	G1657-FS	Water
11	CBD-AOA-SW08-1020	G1658-FS	Water
12	CBD-AOA-SW06-1020	G1661-FS	Water
13	CBD-AOA-SW11-1020	G1663-FS	Water
14	CBD-AOA-SW11P-1020	G1664-FS	Water
15	CBD-AOA-SW10-1020	G1665-FS	Water
15MS	CBD-AOA-SW10-1020MS	G1666-FSMS	Water
15MSD	CBD-AOA-SW10-1020MSD	G1667-FSMSD	Water
16	CBD-AOA-SW09-1020	G1668-FS	Water

A Stage 2B/4 data validation was performed on the analytical data for thirteen water samples, two aqueous equipment blank samples, and one aqueous field blank sample collected on October 13, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for water samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-FB03-101320	None - ND	-	-	-
CBD-AOA-EB01-101320-SW	None - ND	-	-	-
CBD-AOA-EB01-101320-SD	None - ND	-	-	-

Surrogate Spike Recoveries

- Several samples exhibited surrogates recoveries outside of QC limits. See summary pages behind Form Is for specifics. All associated compounds were qualified estimated (J/UJ).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples exhibited acceptable percent recoveries (%R) and RPD values except for the following.

MS/MSD Sample ID	Compound	MS %R/MSD %R/ RPD	Qualifier
15	PFHxA	OK/0%/200	None - 4X Rule Applies
	PFHpA	0%/0%/200	None - 4X Rule Applies
	PFOA	OK/0%/200	None - 4X Rule Applies
	PFNA	0%/0%/200	None - 4X Rule Applies
	PFUnA	22%/0%/200	J
	PFTrDA	242%/267%/OK	J
	PFHxS	470%/0%/200	None - 4X Rule Applies
	PFOS	22%/0%/200	None - 4X Rule Applies

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was unacceptable for PFUnA in one field duplicate pair. These results were qualified as estimated (J).

Compound	CBD-AOA-SW02-1020 ng/L	CBD-AOA-SW02P-1020 ng/L	RPD	Qualifier
PFHxA	9.51	10.6	11%	None
PFHpA	4.36	4.64	6%	
PFOA	10.1	11.1	9%	
PFNA	5.16	4.70	9%	
PFDA	0.369	0.472U	NC	
PFUnA	2.17	0.801	92%	None - <5X LOQ
PFTrDA	0.329	0.472U	NC	None
PFBS	2.41	3.33	32%	None - <5X LOQ
PFHxS	56.8	56.8	0%	None
PFOS	58.4	42.4	32%	None - <5X LOQ

Compound	CBD-AOA-SW11-1020 ng/L	CBD-AOA-SW11P-1020 ng/L	RPD	Qualifier
PFHxA	452	494	9%	None
PFHpA	365	360	1%	
PFOA	550	578	5%	
PFNA	354	443	22%	
PFDA	32.1	38.6	18%	
PFUnA	81.4	114	33%	J
PFDoA	1.75	1.69	3%	None
PFTrDA	23.4	26.4	12%	
PFBS	45.0	51.2	13%	
PFHxS	1760	1730	2%	
PFOS	4370	3820	13%	

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW07-1020
Battelle ID	G1644-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	124 J	G1644-FS(0)	1.000	11/3/2020	0.497	1.42	4.72	SSL
PFHpA	375-85-9	58.5 J	G1644-FS(0)	1.000	11/3/2020	0.248	0.943	4.72	SSL
PFOA	335-67-1	124	G1644-FS(0)	1.000	11/3/2020	0.482	1.42	4.72	
PFNA	375-95-1	228	G1644-FS(0)	1.000	11/3/2020	0.292	0.943	4.72	
PFDA	335-76-2	4.35 J	G1644-FS(0)	1.000	11/3/2020	0.134	0.472	4.72	
PFUnA	2058-94-8	13.7	G1644-FS(0)	1.000	11/3/2020	0.207	0.472	4.72	
PFDoA	307-55-1	0.472 U	G1644-FS(0)	1.000	11/3/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	0.472 U	G1644-FS(0)	1.000	11/3/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89 U	G1644-FS(0)	1.000	11/3/2020	0.692	1.89	4.72	
NMeFOSAA	2355-31-9	0.943 U	G1644-FS(0)	1.000	11/3/2020	0.330	0.943	4.72	
NEtFOSAA	2991-50-6	0.943 U	G1644-FS(0)	1.000	11/3/2020	0.472	0.943	4.72	
PFBS	375-73-5	23.3	G1644-FS(0)	1.000	11/3/2020	0.136	0.472	4.72	
PFHxS	355-46-4	353	G1644-FS-D(3)	5.000	11/3/2020	0.528	1.89	23.6	
PFOS	1763-23-1	1140	G1644-FS-D(5)	12.500	11/3/2020	5.15	11.8	59.0	
HFPO-DA	13252-13-6	0.472 U	G1644-FS(0)	1.000	11/3/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943 U	G1644-FS(0)	1.000	11/3/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472 U	G1644-FS(0)	1.000	11/3/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943 U	G1644-FS(0)	1.000	11/3/2020	0.218	0.943	4.72	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW07-1020
Battelle ID	G1644-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	38 N	G1644-FS(0)	11/3/2020
13C4-PFHpA	44 N	G1644-FS(0)	11/3/2020
13C8-PFOA	64	G1644-FS(0)	11/3/2020
13C9-PFNA	64	G1644-FS(0)	11/3/2020
13C6-PFDA	82	G1644-FS(0)	11/3/2020
13C7-PFUnA	82	G1644-FS(0)	11/3/2020
13C2-PFDoA	74	G1644-FS(0)	11/3/2020
13C2-PFTeDA	58	G1644-FS(0)	11/3/2020
d3-MeFOSAA	101 D	G1644-FS-D(5)	11/3/2020
d5-EtFOSAA	109 D	G1644-FS-D(5)	11/3/2020
13C3-PFBS	88 D	G1644-FS-D(5)	11/3/2020
13C3-PFHxS	96 D	G1644-FS-D(5)	11/3/2020
13C8-PFOS	96 D	G1644-FS-D(5)	11/3/2020
13C3-HFPO-DA	69	G1644-FS(0)	11/3/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW05-1020
Battelle ID	G1645-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	128 J	G1645-FS(0)	1.000	11/3/2020	0.507	1.44	4.81	SSL
PFHpA	375-85-9	57.1 J	G1645-FS(0)	1.000	11/3/2020	0.253	0.962	4.81	SSL
PFOA	335-67-1	127	G1645-FS(0)	1.000	11/3/2020	0.491	1.44	4.81	
PFNA	375-95-1	243	G1645-FS(0)	1.000	11/3/2020	0.297	0.962	4.81	
PFDA	335-76-2	5.22	G1645-FS(0)	1.000	11/3/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	16.5	G1645-FS(0)	1.000	11/3/2020	0.211	0.481	4.81	
PFDoA	307-55-1	0.481 U	G1645-FS(0)	1.000	11/3/2020	0.185	0.481	4.81	
PFTrDA	72629-94-8	0.481 U	G1645-FS(0)	1.000	11/3/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92 J UJ	G1645-FS(0)	1.000	11/3/2020	0.705	1.92	4.81	SSL
NMeFOSAA	2355-31-9	0.962 U	G1645-FS(0)	1.000	11/3/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962 U	G1645-FS(0)	1.000	11/3/2020	0.481	0.962	4.81	
PFBS	375-73-5	19.5	G1645-FS(0)	1.000	11/3/2020	0.138	0.481	4.81	
PFHxS	355-46-4	282 J	G1645-FS-D(3)	5.000	11/3/2020	0.538	1.92	24.0	
PFOS	1763-23-1	1230 J	G1645-FS-D(7)	31.250	11/3/2020	13.1	30.0	150	
HFPO-DA	13252-13-6	0.481 U	G1645-FS(0)	1.000	11/3/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962 U	G1645-FS(0)	1.000	11/3/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481 U	G1645-FS(0)	1.000	11/3/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962 U	G1645-FS(0)	1.000	11/3/2020	0.222	0.962	4.81	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW05-1020
Battelle ID	G1645-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	33 J	G1645-FS(0)	11/3/2020
13C4-PFHpA	41 J	G1645-FS(0)	11/3/2020
13C8-PFOA	53	G1645-FS(0)	11/3/2020
13C9-PFNA	65	G1645-FS(0)	11/3/2020
13C6-PFDA	68	G1645-FS(0)	11/3/2020
13C7-PFUnA	61	G1645-FS(0)	11/3/2020
13C2-PFDoA	54	G1645-FS(0)	11/3/2020
13C2-PFTeDA	22 J	G1645-FS(0)	11/3/2020
d3-MeFOSAA	83 D	G1645-FS-D(7)	11/3/2020
d5-EtFOSAA	95 D	G1645-FS-D(7)	11/3/2020
13C3-PFBS	88 D	G1645-FS-D(7)	11/3/2020
13C3-PFHxS	93 D	G1645-FS-D(7)	11/3/2020
13C8-PFOS	98 D	G1645-FS-D(7)	11/3/2020
13C3-HFPO-DA	62	G1645-FS(0)	11/3/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW03-1020
Battelle ID	G1646-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	34.3 J	G1646-FS(0)	1.000	11/3/2020	0.527	1.50	5.00	SSL
PFHpA	375-85-9	17.9 J	G1646-FS(0)	1.000	11/3/2020	0.263	1.00	5.00	SSL
PFOA	335-67-1	80.4	G1646-FS(0)	1.000	11/3/2020	0.511	1.50	5.00	
PFNA	375-95-1	23.2	G1646-FS(0)	1.000	11/3/2020	0.309	1.00	5.00	
PFDA	335-76-2	0.283 J	G1646-FS(0)	1.000	11/3/2020	0.142	0.500	5.00	
PFUnA	2058-94-8	0.699 J	G1646-FS(0)	1.000	11/3/2020	0.219	0.500	5.00	
PFDoA	307-55-1	0.500 U	G1646-FS(0)	1.000	11/3/2020	0.192	0.500	5.00	
PFTrDA	72629-94-8	0.500 U	G1646-FS(0)	1.000	11/3/2020	0.154	0.500	5.00	
PFTeDA	376-06-7	2.00 ~~U~~ UJ	G1646-FS(0)	1.000	11/3/2020	0.733	2.00	5.00	SSL
NMeFOSAA	2355-31-9	1.00 U	G1646-FS(0)	1.000	11/3/2020	0.350	1.00	5.00	
NEtFOSAA	2991-50-6	1.00 U	G1646-FS(0)	1.000	11/3/2020	0.500	1.00	5.00	
PFBS	375-73-5	6.97	G1646-FS(0)	1.000	11/3/2020	0.144	0.500	5.00	
PFHxS	355-46-4	137	G1646-FS(0)	1.000	11/3/2020	0.112	0.400	5.00	
PFOS	1763-23-1	137	G1646-FS-D(3)	5.000	11/3/2020	2.19	5.00	25.0	
HFPO-DA	13252-13-6	0.500 U	G1646-FS(0)	1.000	11/3/2020	0.248	0.500	5.00	
Adona	919005-14-4	1.00 U	G1646-FS(0)	1.000	11/3/2020	0.265	1.00	5.00	
9Cl-PF3ONS	756426-58-1	0.500 U	G1646-FS(0)	1.000	11/3/2020	0.268	0.500	5.00	
11Cl-PF3OUdS	763051-92-9	1.00 U	G1646-FS(0)	1.000	11/3/2020	0.231	1.00	5.00	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW03-1020
Battelle ID	G1646-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	34 N	G1646-FS(0)	11/3/2020
13C4-PFHpA	43 N	G1646-FS(0)	11/3/2020
13C8-PFOA	57	G1646-FS(0)	11/3/2020
13C9-PFNA	69	G1646-FS(0)	11/3/2020
13C6-PFDA	75	G1646-FS(0)	11/3/2020
13C7-PFUnA	73	G1646-FS(0)	11/3/2020
13C2-PFDoA	67	G1646-FS(0)	11/3/2020
13C2-PFTeDA	43	G1646-FS(0)	11/3/2020
d3-MeFOSAA	96	G1646-FS-D(3)	11/3/2020
d5-EtFOSAA	102	G1646-FS-D(3)	11/3/2020
13C3-PFBS	72	G1646-FS-D(3)	11/3/2020
13C3-PFHxS	78	G1646-FS-D(3)	11/3/2020
13C8-PFOS	88	G1646-FS-D(3)	11/3/2020
13C3-HFPO-DA	57	G1646-FS(0)	11/3/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW04-1020
Battelle ID	G1647-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.247
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	24.0 J	G1647-FS(0)	1.000	11/3/2020	0.533	1.52	5.06	SSL
PFHpA	375-85-9	10.1 J	G1647-FS(0)	1.000	11/3/2020	0.266	1.01	5.06	SSL
PFOA	335-67-1	23.9	G1647-FS(0)	1.000	11/3/2020	0.517	1.52	5.06	
PFNA	375-95-1	18.6	G1647-FS(0)	1.000	11/3/2020	0.313	1.01	5.06	
PFDA	335-76-2	0.506 U	G1647-FS(0)	1.000	11/3/2020	0.144	0.506	5.06	
PFUnA	2058-94-8	0.723 J	G1647-FS(0)	1.000	11/3/2020	0.222	0.506	5.06	
PFDoA	307-55-1	0.506 U UJ	G1647-FS(0)	1.000	11/3/2020	0.194	0.506	5.06	SSL
PFTrDA	72629-94-8	0.506 U	G1647-FS(0)	1.000	11/3/2020	0.156	0.506	5.06	
PFTeDA	376-06-7	2.02 U UJ	G1647-FS(0)	1.000	11/3/2020	0.742	2.02	5.06	SSL
NMeFOSAA	2355-31-9	1.01 U	G1647-FS(0)	1.000	11/3/2020	0.354	1.01	5.06	
NEtFOSAA	2991-50-6	1.01 U	G1647-FS(0)	1.000	11/3/2020	0.506	1.01	5.06	
PFBS	375-73-5	5.57	G1647-FS(0)	1.000	11/3/2020	0.146	0.506	5.06	
PFHxS	355-46-4	90.6	G1647-FS(0)	1.000	11/3/2020	0.113	0.405	5.06	
PFOS	1763-23-1	165 J	G1647-FS-D(3)	5.000	11/3/2020	2.21	5.06	25.3	
HFPO-DA	13252-13-6	0.506 U	G1647-FS(0)	1.000	11/3/2020	0.251	0.506	5.06	
Adona	919005-14-4	1.01 U	G1647-FS(0)	1.000	11/3/2020	0.268	1.01	5.06	
9Cl-PF3ONS	756426-58-1	0.506 U	G1647-FS(0)	1.000	11/3/2020	0.271	0.506	5.06	
11Cl-PF3OUdS	763051-92-9	1.01 U	G1647-FS(0)	1.000	11/3/2020	0.234	1.01	5.06	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW04-1020
Battelle ID	G1647-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	36	N	G1647-FS(0)	11/3/2020
13C4-PFHpA	48	N	G1647-FS(0)	11/3/2020
13C8-PFOA	67		G1647-FS(0)	11/3/2020
13C9-PFNA	65		G1647-FS(0)	11/3/2020
13C6-PFDA	71		G1647-FS(0)	11/3/2020
13C7-PFUnA	60		G1647-FS(0)	11/3/2020
13C2-PFDoA	46	N	G1647-FS(0)	11/3/2020
13C2-PFTeDA	18	N	G1647-FS(0)	11/3/2020
d3-MeFOSAA	87	D	G1647-FS-D(3)	11/3/2020
d5-EtFOSAA	97	D	G1647-FS-D(3)	11/3/2020
13C3-PFBS	69	D	G1647-FS-D(3)	11/3/2020
13C3-PFHxS	78	D	G1647-FS-D(3)	11/3/2020
13C8-PFOS	86	D	G1647-FS-D(3)	11/3/2020
13C3-HFPO-DA	59		G1647-FS(0)	11/3/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW02-1020
Battelle ID	G1651-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	9.51	J	G1651-FS(0)	1.000	11/2/2020	0.497	1.42	4.72	SSL
PFHpA	375-85-9	4.36	J	G1651-FS(0)	1.000	11/2/2020	0.248	0.943	4.72	
PFOA	335-67-1	10.1		G1651-FS(0)	1.000	11/2/2020	0.482	1.42	4.72	
PFNA	375-95-1	5.16		G1651-FS(0)	1.000	11/2/2020	0.292	0.943	4.72	
PFDA	335-76-2	0.369	J	G1651-FS(0)	1.000	11/2/2020	0.134	0.472	4.72	
PFUnA	2058-94-8	2.17		G1651-FS(0)	1.000	11/2/2020	0.207	0.472	4.72	
PFDoA	307-55-1	0.472	UJ	G1651-FS(0)	1.000	11/2/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	0.329	J	G1651-FS(0)	1.000	11/2/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89	UJ	G1651-FS(0)	1.000	11/2/2020	0.692	1.89	4.72	
NMeFOSAA	2355-31-9	0.943	U	G1651-FS(0)	1.000	11/2/2020	0.330	0.943	4.72	
NEtFOSAA	2991-50-6	0.943	U	G1651-FS(0)	1.000	11/2/2020	0.472	0.943	4.72	
PFBS	375-73-5	2.41	J	G1651-FS(0)	1.000	11/2/2020	0.136	0.472	4.72	
PFHxS	355-46-4	56.8		G1651-FS(0)	1.000	11/2/2020	0.106	0.377	4.72	
PFOS	1763-23-1	58.4		G1651-FS(0)	1.000	11/2/2020	0.412	0.943	4.72	
HFPO-DA	13252-13-6	0.472	UJ	G1651-FS(0)	1.000	11/2/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943	U	G1651-FS(0)	1.000	11/2/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472	U	G1651-FS(0)	1.000	11/2/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943	U	G1651-FS(0)	1.000	11/2/2020	0.218	0.943	4.72	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW02-1020
Battelle ID	G1651-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	17	N	G1651-FS(0)	11/2/2020
13C4-PFHpA	22	N	G1651-FS(0)	11/2/2020
13C8-PFOA	26	N	G1651-FS(0)	11/2/2020
13C9-PFNA	33	N	G1651-FS(0)	11/2/2020
13C6-PFDA	29	N	G1651-FS(0)	11/2/2020
13C7-PFUnA	24	N	G1651-FS(0)	11/2/2020
13C2-PFDoA	22	N	G1651-FS(0)	11/2/2020
13C2-PFTeDA	12	N	G1651-FS(0)	11/2/2020
d3-MeFOSAA	28	N	G1651-FS(0)	11/2/2020
d5-EtFOSAA	30	N	G1651-FS(0)	11/2/2020
13C3-PFBS	34	N	G1651-FS(0)	11/2/2020
13C3-PFHxS	34	N	G1651-FS(0)	11/2/2020
13C8-PFOS	32	N	G1651-FS(0)	11/2/2020
13C3-HFPO-DA	29	N	G1651-FS(0)	11/2/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW02P-1020
Battelle ID	G1652-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	10.6 J	G1652-FS(0)	1.000	11/2/2020	0.497	1.42	4.72	SSL
PFHpA	375-85-9	4.64 J	G1652-FS(0)	1.000	11/2/2020	0.248	0.943	4.72	SSL
PFOA	335-67-1	11.1	G1652-FS(0)	1.000	11/2/2020	0.482	1.42	4.72	
PFNA	375-95-1	4.70 J	G1652-FS(0)	1.000	11/2/2020	0.292	0.943	4.72	
PFDA	335-76-2	0.472 U	G1652-FS(0)	1.000	11/2/2020	0.134	0.472	4.72	
PFUnA	2058-94-8	0.801 J	G1652-FS(0)	1.000	11/2/2020	0.207	0.472	4.72	
PFDoA	307-55-1	0.472 U	G1652-FS(0)	1.000	11/2/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	0.472 U	G1652-FS(0)	1.000	11/2/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89 UJ	G1652-FS(0)	1.000	11/2/2020	0.692	1.89	4.72	SSL
NMeFOSAA	2355-31-9	0.943 U	G1652-FS(0)	1.000	11/2/2020	0.330	0.943	4.72	
NEtFOSAA	2991-50-6	0.943 U	G1652-FS(0)	1.000	11/2/2020	0.472	0.943	4.72	
PFBS	375-73-5	3.33 J	G1652-FS(0)	1.000	11/2/2020	0.136	0.472	4.72	
PFHxS	355-46-4	56.8	G1652-FS(0)	1.000	11/2/2020	0.106	0.377	4.72	
PFOS	1763-23-1	42.4	G1652-FS(0)	1.000	11/2/2020	0.412	0.943	4.72	
HFPO-DA	13252-13-6	0.472 U	G1652-FS(0)	1.000	11/2/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943 U	G1652-FS(0)	1.000	11/2/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472 U	G1652-FS(0)	1.000	11/2/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943 U	G1652-FS(0)	1.000	11/2/2020	0.218	0.943	4.72	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW02P-1020
Battelle ID	G1652-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	37 N	G1652-FS(0)	11/2/2020
13C4-PFHpA	48 N	G1652-FS(0)	11/2/2020
13C8-PFOA	61	G1652-FS(0)	11/2/2020
13C9-PFNA	72	G1652-FS(0)	11/2/2020
13C6-PFDA	75	G1652-FS(0)	11/2/2020
13C7-PFUnA	68	G1652-FS(0)	11/2/2020
13C2-PFDoA	62	G1652-FS(0)	11/2/2020
13C2-PFTeDA	41 N	G1652-FS(0)	11/2/2020
d3-MeFOSAA	98	G1652-FS(0)	11/2/2020
d5-EtFOSAA	100	G1652-FS(0)	11/2/2020
13C3-PFBS	56	G1652-FS(0)	11/2/2020
13C3-PFHxS	71	G1652-FS(0)	11/2/2020
13C8-PFOS	79	G1652-FS(0)	11/2/2020
13C3-HFPO-DA	68	G1652-FS(0)	11/2/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW01-1020
Battelle ID	G1654-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.84 J	G1654-FS(0)	1.000	11/2/2020	0.488	1.39	4.63	SSL
PFHpA	375-85-9	1.44 J	G1654-FS(0)	1.000	11/2/2020	0.244	0.926	4.63	
PFOA	335-67-1	2.93 J	G1654-FS(0)	1.000	11/2/2020	0.473	1.39	4.63	↓
PFNA	375-95-1	1.33 J	G1654-FS(0)	1.000	11/2/2020	0.286	0.926	4.63	
PFDA	335-76-2	0.463 U	G1654-FS(0)	1.000	11/2/2020	0.131	0.463	4.63	
PFUnA	2058-94-8	0.464 J	G1654-FS(0)	1.000	11/2/2020	0.203	0.463	4.63	SSL
PFDoA	307-55-1	0.463 UJ	G1654-FS(0)	1.000	11/2/2020	0.178	0.463	4.63	SSL
PFTrDA	72629-94-8	0.463 U	G1654-FS(0)	1.000	11/2/2020	0.143	0.463	4.63	
PFTeDA	376-06-7	1.85 UJ	G1654-FS(0)	1.000	11/2/2020	0.679	1.85	4.63	SSL
NMeFOSAA	2355-31-9	0.926 U	G1654-FS(0)	1.000	11/2/2020	0.324	0.926	4.63	
NEtFOSAA	2991-50-6	0.926 U	G1654-FS(0)	1.000	11/2/2020	0.463	0.926	4.63	
PFBS	375-73-5	1.74 J	G1654-FS(0)	1.000	11/2/2020	0.133	0.463	4.63	SSL
PFHxS	355-46-4	19.0	G1654-FS(0)	1.000	11/2/2020	0.104	0.370	4.63	
PFOS	1763-23-1	12.8 J	G1654-FS(0)	1.000	11/2/2020	0.405	0.926	4.63	SSL
HFPO-DA	13252-13-6	0.463 UJ	G1654-FS(0)	1.000	11/2/2020	0.230	0.463	4.63	SSL
Adona	919005-14-4	0.926 U	G1654-FS(0)	1.000	11/2/2020	0.245	0.926	4.63	
9Cl-PF3ONS	756426-58-1	0.463 U	G1654-FS(0)	1.000	11/2/2020	0.248	0.463	4.63	
11Cl-PF3OUdS	763051-92-9	0.926 U	G1654-FS(0)	1.000	11/2/2020	0.214	0.926	4.63	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW01-1020
Battelle ID	G1654-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	28 M	G1654-FS(0)	11/2/2020
13C4-PFHpA	36 M	G1654-FS(0)	11/2/2020
13C8-PFOA	45 M	G1654-FS(0)	11/2/2020
13C9-PFNA	52	G1654-FS(0)	11/2/2020
13C6-PFDA	54	G1654-FS(0)	11/2/2020
13C7-PFUnA	49 M	G1654-FS(0)	11/2/2020
13C2-PFDoA	42 M	G1654-FS(0)	11/2/2020
13C2-PFTeDA	34 M	G1654-FS(0)	11/2/2020
d3-MeFOSAA	55	G1654-FS(0)	11/2/2020
d5-EtFOSAA	56	G1654-FS(0)	11/2/2020
13C3-PFBS	44 M	G1654-FS(0)	11/2/2020
13C3-PFHxS	56	G1654-FS(0)	11/2/2020
13C8-PFOS	49 M	G1654-FS(0)	11/2/2020
13C3-HFPO-DA	49 M	G1654-FS(0)	11/2/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-FB03-101320
Battelle ID	G1655-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.44 U	G1655-FS(0)	1.000	11/2/2020	0.507	1.44	4.81
PFHpA	375-85-9	0.962 U	G1655-FS(0)	1.000	11/2/2020	0.253	0.962	4.81
PFOA	335-67-1	1.44 U	G1655-FS(0)	1.000	11/2/2020	0.491	1.44	4.81
PFNA	375-95-1	0.962 U	G1655-FS(0)	1.000	11/2/2020	0.297	0.962	4.81
PFDA	335-76-2	0.481 U	G1655-FS(0)	1.000	11/2/2020	0.137	0.481	4.81
PFUnA	2058-94-8	0.481 U	G1655-FS(0)	1.000	11/2/2020	0.211	0.481	4.81
PFDoA	307-55-1	0.481 U	G1655-FS(0)	1.000	11/2/2020	0.185	0.481	4.81
PFTrDA	72629-94-8	0.481 U	G1655-FS(0)	1.000	11/2/2020	0.148	0.481	4.81
PFTeDA	376-06-7	1.92 U	G1655-FS(0)	1.000	11/2/2020	0.705	1.92	4.81
NMeFOSAA	2355-31-9	0.962 U	G1655-FS(0)	1.000	11/2/2020	0.337	0.962	4.81
NEtFOSAA	2991-50-6	0.962 U	G1655-FS(0)	1.000	11/2/2020	0.481	0.962	4.81
PFBS	375-73-5	0.481 U	G1655-FS(0)	1.000	11/2/2020	0.138	0.481	4.81
PFHxS	355-46-4	0.385 U	G1655-FS(0)	1.000	11/2/2020	0.108	0.385	4.81
PFOS	1763-23-1	0.962 U	G1655-FS(0)	1.000	11/2/2020	0.420	0.962	4.81
HFPO-DA	13252-13-6	0.481 U	G1655-FS(0)	1.000	11/2/2020	0.238	0.481	4.81
Adona	919005-14-4	0.962 U	G1655-FS(0)	1.000	11/2/2020	0.255	0.962	4.81
9Cl-PF3ONS	756426-58-1	0.481 U	G1655-FS(0)	1.000	11/2/2020	0.258	0.481	4.81
11Cl-PF3OUdS	763051-92-9	0.962 U	G1655-FS(0)	1.000	11/2/2020	0.222	0.962	4.81

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB01-101320-SW
Battelle ID	G1656-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.39 U	G1656-FS(0)	1.000	11/2/2020	0.488	1.39	4.63
PFHpA	375-85-9	0.926 U	G1656-FS(0)	1.000	11/2/2020	0.244	0.926	4.63
PFOA	335-67-1	1.39 U	G1656-FS(0)	1.000	11/2/2020	0.473	1.39	4.63
PFNA	375-95-1	0.926 U	G1656-FS(0)	1.000	11/2/2020	0.286	0.926	4.63
PFDA	335-76-2	0.463 U	G1656-FS(0)	1.000	11/2/2020	0.131	0.463	4.63
PFUnA	2058-94-8	0.463 U	G1656-FS(0)	1.000	11/2/2020	0.203	0.463	4.63
PFDoA	307-55-1	0.463 U	G1656-FS(0)	1.000	11/2/2020	0.178	0.463	4.63
PFTrDA	72629-94-8	0.463 U	G1656-FS(0)	1.000	11/2/2020	0.143	0.463	4.63
PFTeDA	376-06-7	1.85 U	G1656-FS(0)	1.000	11/2/2020	0.679	1.85	4.63
NMeFOSAA	2355-31-9	0.926 U	G1656-FS(0)	1.000	11/2/2020	0.324	0.926	4.63
NEtFOSAA	2991-50-6	0.926 U	G1656-FS(0)	1.000	11/2/2020	0.463	0.926	4.63
PFBS	375-73-5	0.463 U	G1656-FS(0)	1.000	11/2/2020	0.133	0.463	4.63
PFHxS	355-46-4	0.370 U	G1656-FS(0)	1.000	11/2/2020	0.104	0.370	4.63
PFOS	1763-23-1	0.926 U	G1656-FS(0)	1.000	11/2/2020	0.405	0.926	4.63
HFPO-DA	13252-13-6	0.463 U	G1656-FS(0)	1.000	11/2/2020	0.230	0.463	4.63
Adona	919005-14-4	0.926 U	G1656-FS(0)	1.000	11/2/2020	0.245	0.926	4.63
9Cl-PF3ONS	756426-58-1	0.463 U	G1656-FS(0)	1.000	11/2/2020	0.248	0.463	4.63
11Cl-PF3OUdS	763051-92-9	0.926 U	G1656-FS(0)	1.000	11/2/2020	0.214	0.926	4.63

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB01-101320-SD
Battelle ID	G1657-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.39 U	G1657-FS(0)	1.000	11/2/2020	0.488	1.39	4.63
PFHpA	375-85-9	0.926 U	G1657-FS(0)	1.000	11/2/2020	0.244	0.926	4.63
PFOA	335-67-1	1.39 U	G1657-FS(0)	1.000	11/2/2020	0.473	1.39	4.63
PFNA	375-95-1	0.926 U	G1657-FS(0)	1.000	11/2/2020	0.286	0.926	4.63
PFDA	335-76-2	0.463 U	G1657-FS(0)	1.000	11/2/2020	0.131	0.463	4.63
PFUnA	2058-94-8	0.463 U	G1657-FS(0)	1.000	11/2/2020	0.203	0.463	4.63
PFDoA	307-55-1	0.463 U	G1657-FS(0)	1.000	11/2/2020	0.178	0.463	4.63
PFTrDA	72629-94-8	0.463 U	G1657-FS(0)	1.000	11/2/2020	0.143	0.463	4.63
PFTeDA	376-06-7	1.85 U	G1657-FS(0)	1.000	11/2/2020	0.679	1.85	4.63
NMeFOSAA	2355-31-9	0.926 U	G1657-FS(0)	1.000	11/2/2020	0.324	0.926	4.63
NEtFOSAA	2991-50-6	0.926 U	G1657-FS(0)	1.000	11/2/2020	0.463	0.926	4.63
PFBS	375-73-5	0.463 U	G1657-FS(0)	1.000	11/2/2020	0.133	0.463	4.63
PFHxS	355-46-4	0.370 U	G1657-FS(0)	1.000	11/2/2020	0.104	0.370	4.63
PFOS	1763-23-1	0.926 U	G1657-FS(0)	1.000	11/2/2020	0.405	0.926	4.63
HFPO-DA	13252-13-6	0.463 U	G1657-FS(0)	1.000	11/2/2020	0.230	0.463	4.63
Adona	919005-14-4	0.926 U	G1657-FS(0)	1.000	11/2/2020	0.245	0.926	4.63
9Cl-PF3ONS	756426-58-1	0.463 U	G1657-FS(0)	1.000	11/2/2020	0.248	0.463	4.63
11Cl-PF3OUdS	763051-92-9	0.926 U	G1657-FS(0)	1.000	11/2/2020	0.214	0.926	4.63

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW08-1020
Battelle ID	G1658-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	384 D	G1658-FS-D(3)	5.000	11/3/2020	2.49	7.08	23.6
PFHpA	375-85-9	310	G1658-FS(0)	1.000	11/3/2020	0.248	0.943	4.72
PFOA	335-67-1	453 D	G1658-FS-D(3)	5.000	11/3/2020	2.41	7.08	23.6
PFNA	375-95-1	407 D	G1658-FS-D(3)	5.000	11/3/2020	1.46	4.72	23.6
PFDA	335-76-2	37.6	G1658-FS(0)	1.000	11/3/2020	0.134	0.472	4.72
PFUnA	2058-94-8	116 D	G1658-FS-D(3)	5.000	11/3/2020	1.03	2.36	23.6
PFDoA	307-55-1	1.43 J	G1658-FS(0)	1.000	11/3/2020	0.181	0.472	4.72
PFTrDA	72629-94-8	12.1	G1658-FS(0)	1.000	11/3/2020	0.145	0.472	4.72
PFTeDA	376-06-7	1.89 U	G1658-FS(0)	1.000	11/3/2020	0.692	1.89	4.72
NMeFOSAA	2355-31-9	0.943 U	G1658-FS(0)	1.000	11/3/2020	0.330	0.943	4.72
NEtFOSAA	2991-50-6	0.943 U	G1658-FS(0)	1.000	11/3/2020	0.472	0.943	4.72
PFBS	375-73-5	51.1	G1658-FS(0)	1.000	11/3/2020	0.136	0.472	4.72
PFHxS	355-46-4	1700 D	G1658-FS-D(7)	62.500	11/3/2020	6.60	23.6	295
PFOS	1763-23-1	4980 D	G1658-FS-D(7)	62.500	11/3/2020	25.8	59.0	295
HFPO-DA	13252-13-6	0.472 U	G1658-FS(0)	1.000	11/3/2020	0.234	0.472	4.72
Adona	919005-14-4	0.943 U	G1658-FS(0)	1.000	11/3/2020	0.250	0.943	4.72
9Cl-PF3ONS	756426-58-1	0.472 U	G1658-FS(0)	1.000	11/3/2020	0.253	0.472	4.72
11Cl-PF3OUdS	763051-92-9	0.943 U	G1658-FS(0)	1.000	11/3/2020	0.218	0.943	4.72

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW06-1020
Battelle ID	G1661-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	392	G1661-FS-D(3)	5.000	11/3/2020	2.53	7.21	24.0	
PFHpA	375-85-9	305	G1661-FS(0)	1.000	11/3/2020	0.253	0.962	4.81	
PFOA	335-67-1	521 D	G1661-FS-D(5)	25.000	11/3/2020	12.3	36.1	120	
PFNA	375-95-1	416 D	G1661-FS-D(3)	5.000	11/3/2020	1.49	4.81	24.0	
PFDA	335-76-2	40.2	G1661-FS(0)	1.000	11/3/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	112 D	G1661-FS-D(3)	5.000	11/3/2020	1.05	2.40	24.0	
PFDoA	307-55-1	1.51 J	G1661-FS(0)	1.000	11/3/2020	0.185	0.481	4.81	SSL
PFTrDA	72629-94-8	30.8	G1661-FS(0)	1.000	11/3/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92 UJ	G1661-FS(0)	1.000	11/3/2020	0.705	1.92	4.81	SSL
NMeFOSAA	2355-31-9	0.962 U	G1661-FS(0)	1.000	11/3/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962 U	G1661-FS(0)	1.000	11/3/2020	0.481	0.962	4.81	
PFBS	375-73-5	51.2	G1661-FS(0)	1.000	11/3/2020	0.138	0.481	4.81	
PFHxS	355-46-4	1520 D	G1661-FS-D(5)	25.000	11/3/2020	2.69	9.62	120	
PFOS	1763-23-1	4140 D	G1661-FS-D(7)	62.500	11/3/2020	26.3	60.1	300	
HFPO-DA	13252-13-6	0.481 U	G1661-FS(0)	1.000	11/3/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962 U	G1661-FS(0)	1.000	11/3/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481 U	G1661-FS(0)	1.000	11/3/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962 U	G1661-FS(0)	1.000	11/3/2020	0.222	0.962	4.81	

mw 1/10/21

Analyzed by: Schumitz, Denise
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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW06-1020
Battelle ID	G1661-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	75	D	G1661-FS-D(5)	11/3/2020
13C4-PFHpA	75	D	G1661-FS-D(5)	11/3/2020
13C8-PFOA	71	D	G1661-FS-D(5)	11/3/2020
13C9-PFNA	95	D	G1661-FS-D(5)	11/3/2020
13C6-PFDA	69		G1661-FS(0)	11/3/2020
13C7-PFUnA	66		G1661-FS(0)	11/3/2020
13C2-PFDoA	43	N	G1661-FS(0)	11/3/2020
13C2-PFTeDA	6	N	G1661-FS(0)	11/3/2020
d3-MeFOSAA	97	D	G1661-FS-D(7)	11/3/2020
d5-EtFOSAA	101	D	G1661-FS-D(7)	11/3/2020
13C3-PFBS	91	D	G1661-FS-D(7)	11/3/2020
13C3-PFHxS	101	D	G1661-FS-D(7)	11/3/2020
13C8-PFOS	95	D	G1661-FS-D(7)	11/3/2020
13C3-HFPO-DA	61	D	G1661-FS-D(5)	11/3/2020

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13

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW11-1020
Battelle ID	G1663-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	452 D	G1663-FS-D(3)	5.000	11/3/2020	2.49	7.08	23.6	
PFHpA	375-85-9	365 D	G1663-FS-D(3)	5.000	11/3/2020	1.24	4.72	23.6	
PFOA	335-67-1	550 D	G1663-FS-D(5)	12.500	11/3/2020	6.03	17.7	59.0	
PFNA	375-95-1	354 D	G1663-FS-D(3)	5.000	11/3/2020	1.48	4.72	23.6	
PFDA	335-76-2	32.1	G1663-FS(0)	1.000	11/3/2020	0.134	0.472	4.72	
PFUnA	2058-94-8	81.4 J	G1663-FS(0)	1.000	11/3/2020	0.207	0.472	4.72	FD
PFDoA	307-55-1	1.75 J	G1663-FS(0)	1.000	11/3/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	23.4	G1663-FS(0)	1.000	11/3/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89 J UJ	G1663-FS(0)	1.000	11/3/2020	0.692	1.89	4.72	SSL
NMeFOSAA	2355-31-9	0.943 U	G1663-FS(0)	1.000	11/3/2020	0.330	0.943	4.72	
NEtFOSAA	2991-50-6	0.943 U	G1663-FS(0)	1.000	11/3/2020	0.472	0.943	4.72	
PFBS	375-73-5	45.0	G1663-FS(0)	1.000	11/3/2020	0.136	0.472	4.72	
PFHxS	355-46-4	1760 D	G1663-FS-D(7)	31.250	11/3/2020	3.30	11.8	147	
PFOS	1763-23-1	4370 D	G1663-FS-D(9)	156.250	11/3/2020	64.4	147	737	
HFPO-DA	13252-13-6	0.472 U	G1663-FS(0)	1.000	11/3/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943 U	G1663-FS(0)	1.000	11/3/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472 U	G1663-FS(0)	1.000	11/3/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943 U	G1663-FS(0)	1.000	11/3/2020	0.218	0.943	4.72	

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13

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW11-1020
Battelle ID	G1663-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	72 D	G1663-FS-D(5)	11/3/2020
13C4-PFHpA	71 D	G1663-FS-D(5)	11/3/2020
13C8-PFOA	72 D	G1663-FS-D(5)	11/3/2020
13C9-PFNA	94 D	G1663-FS-D(5)	11/3/2020
13C6-PFDA	76	G1663-FS(0)	11/3/2020
13C7-PFUnA	79	G1663-FS(0)	11/3/2020
13C2-PFDoA	61	G1663-FS(0)	11/3/2020
13C2-PFTeDA	36 M	G1663-FS(0)	11/3/2020
d3-MeFOSAA	83 D	G1663-FS-D(9)	11/3/2020
d5-EtFOSAA	97 D	G1663-FS-D(9)	11/3/2020
13C3-PFBS	78 D	G1663-FS-D(9)	11/3/2020
13C3-PFHxS	91 D	G1663-FS-D(9)	11/3/2020
13C8-PFOS	85 D	G1663-FS-D(9)	11/3/2020
13C3-HFPO-DA	64 D	G1663-FS-D(5)	11/3/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW11P-1020
Battelle ID	G1664-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	494 D	G1664-FS-D(3)	5.000	11/3/2020	2.44	6.94	23.1	
PFHpA	375-85-9	360 D	G1664-FS-D(3)	5.000	11/3/2020	1.22	4.63	23.1	
PFOA	335-67-1	578 D	G1664-FS-D(5)	12.500	11/3/2020	5.91	17.4	57.9	
PFNA	375-95-1	443 D	G1664-FS-D(3)	5.000	11/3/2020	1.43	4.63	23.1	
PFDA	335-76-2	38.6	G1664-FS(0)	1.000	11/3/2020	0.131	0.463	4.63	
PFUnA	2058-94-8	114 J	G1664-FS(0)	1.000	11/3/2020	0.203	0.463	4.63	FD
PFDoA	307-55-1	1.69 J	G1664-FS(0)	1.000	11/3/2020	0.178	0.463	4.63	
PFTrDA	72629-94-8	26.4	G1664-FS(0)	1.000	11/3/2020	0.143	0.463	4.63	
PFTeDA	376-06-7	1.85 ✓ UJ	G1664-FS(0)	1.000	11/3/2020	0.679	1.85	4.63	SSL
NMeFOSAA	2355-31-9	0.926 U	G1664-FS(0)	1.000	11/3/2020	0.324	0.926	4.63	
NEtFOSAA	2991-50-6	0.926 U	G1664-FS(0)	1.000	11/3/2020	0.463	0.926	4.63	
PFBS	375-73-5	51.2	G1664-FS(0)	1.000	11/3/2020	0.133	0.463	4.63	
PFHxS	355-46-4	1730 D	G1664-FS-D(7)	62.500	11/3/2020	6.48	23.1	289	
PFOS	1763-23-1	3820 D	G1664-FS-D(7)	62.500	11/3/2020	25.3	57.9	289	
HFPO-DA	13252-13-6	0.463 U	G1664-FS(0)	1.000	11/3/2020	0.230	0.463	4.63	
Adona	919005-14-4	0.926 U	G1664-FS(0)	1.000	11/3/2020	0.245	0.926	4.63	
9Cl-PF3ONS	756426-58-1	0.463 U	G1664-FS(0)	1.000	11/3/2020	0.248	0.463	4.63	
11Cl-PF3OUdS	763051-92-9	0.926 U	G1664-FS(0)	1.000	11/3/2020	0.214	0.926	4.63	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW11P-1020
Battelle ID	G1664-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	79	D	G1664-FS-D(5)	11/3/2020
13C4-PFHpA	68	D	G1664-FS-D(5)	11/3/2020
13C8-PFOA	80	D	G1664-FS-D(5)	11/3/2020
13C9-PFNA	88	D	G1664-FS-D(5)	11/3/2020
13C6-PFDA	73		G1664-FS(0)	11/3/2020
13C7-PFUnA	77		G1664-FS(0)	11/3/2020
13C2-PFDoA	61		G1664-FS(0)	11/3/2020
13C2-PFTeDA	25	N	G1664-FS(0)	11/3/2020
d3-MeFOSAA	91	D	G1664-FS-D(7)	11/3/2020
d5-EtFOSAA	89	D	G1664-FS-D(7)	11/3/2020
13C3-PFBS	81	D	G1664-FS-D(7)	11/3/2020
13C3-PFHxS	89	D	G1664-FS-D(7)	11/3/2020
13C8-PFOS	92	D	G1664-FS-D(7)	11/3/2020
13C3-HFPO-DA	67	D	G1664-FS-D(5)	11/3/2020

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Analyzed by: Schumitz, Denise
Printed: 11/10/2020

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It can be done

IS

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW10-1020
Battelle ID	G1665-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.275
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	363	G1665-FS-D(3)	5.000	11/3/2020	2.40	6.82	22.7	
PFHpA	375-85-9	295	G1665-FS(0)	1.000	11/3/2020	0.239	0.909	4.55	
PFOA	335-67-1	413	G1665-FS-D(3)	5.000	11/3/2020	2.32	6.82	22.7	
PFNA	375-95-1	495	G1665-FS-D(3)	5.000	11/3/2020	1.40	4.55	22.7	
PFDA	335-76-2	27.6	G1665-FS(0)	1.000	11/3/2020	0.129	0.455	4.55	
PFUnA	2058-94-8	99.0 J	G1665-FS-D(3)	5.000	11/3/2020	0.995	2.27	22.7	MSL
PFDoA	307-55-1	0.419 J	G1665-FS(0)	1.000	11/3/2020	0.175	0.455	4.55	
PFTrDA	72629-94-8	4.00 J	G1665-FS(0)	1.000	11/3/2020	0.140	0.455	4.55	MSH
PFTeDA	376-06-7	1.82 U	G1665-FS(0)	1.000	11/3/2020	0.666	1.82	4.55	
NMeFOSAA	2355-31-9	0.909 U	G1665-FS(0)	1.000	11/3/2020	0.318	0.909	4.55	
NEtFOSAA	2991-50-6	0.909 U	G1665-FS(0)	1.000	11/3/2020	0.455	0.909	4.55	
PFBS	375-73-5	64.1	G1665-FS(0)	1.000	11/3/2020	0.131	0.455	4.55	
PFHxS	355-46-4	1130	G1665-FS-D(7)	31.250	11/3/2020	3.18	11.4	142	
PFOS	1763-23-1	4050	G1665-FS-D(9)	156.250	11/3/2020	82.1	142	710	
HFPO-DA	13252-13-6	0.455 U	G1665-FS(0)	1.000	11/3/2020	0.225	0.455	4.55	
Adona	919005-14-4	0.909 U	G1665-FS(0)	1.000	11/3/2020	0.241	0.909	4.55	
9Cl-PF3ONS	756426-58-1	0.455 U	G1665-FS(0)	1.000	11/3/2020	0.244	0.455	4.55	
11Cl-PF3OUdS	763051-92-9	0.909 U	G1665-FS(0)	1.000	11/3/2020	0.210	0.909	4.55	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW09-1020
Battelle ID	G1668-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	190	G1668-FS(0)	1.000	11/3/2020	0.527	1.50	5.00	
PFHpA	375-85-9	223	G1668-FS(0)	1.000	11/3/2020	0.263	1.00	5.00	
PFOA	335-67-1	140 D	G1668-FS-D(3)	5.000	11/3/2020	2.56	7.50	25.0	
PFNA	375-95-1	120	G1668-FS(0)	1.000	11/3/2020	0.309	1.00	5.00	
PFDA	335-76-2	20.0	G1668-FS(0)	1.000	11/3/2020	0.142	0.500	5.00	
PFUnA	2058-94-8	185 D	G1668-FS-D(3)	5.000	11/3/2020	1.10	2.50	25.0	
PFDoA	307-55-1	3.14 J	G1668-FS(0)	1.000	11/3/2020	0.192	0.500	5.00	SSL
PFTrDA	72629-94-8	13.9	G1668-FS(0)	1.000	11/3/2020	0.154	0.500	5.00	
PFTeDA	376-06-7	2.00 U UJ	G1668-FS(0)	1.000	11/3/2020	0.733	2.00	5.00	SSL
NMeFOSAA	2355-31-9	1.00 U	G1668-FS(0)	1.000	11/3/2020	0.350	1.00	5.00	
NEtFOSAA	2991-50-6	1.00 U	G1668-FS(0)	1.000	11/3/2020	0.500	1.00	5.00	
PFBS	375-73-5	18.4	G1668-FS(0)	1.000	11/3/2020	0.144	0.500	5.00	
PFHxS	355-46-4	301 D	G1668-FS-D(3)	5.000	11/3/2020	0.560	2.00	25.0	
PFOS	1763-23-1	2990 D	G1668-FS-D(7)	62.500	11/3/2020	27.3	62.5	313	
HFPO-DA	13252-13-6	0.500 U	G1668-FS(0)	1.000	11/3/2020	0.248	0.500	5.00	
Adona	919005-14-4	1.00 U	G1668-FS(0)	1.000	11/3/2020	0.265	1.00	5.00	
9Cl-PF3ONS	756426-58-1	0.500 U	G1668-FS(0)	1.000	11/3/2020	0.268	0.500	5.00	
11Cl-PF3OUdS	763051-92-9	1.00 U	G1668-FS(0)	1.000	11/3/2020	0.231	1.00	5.00	

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Printed: 11/10/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW09-1020
Battelle ID	G1668-FS
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	54	D	G1668-FS-D(3)	11/3/2020
13C4-PFHpA	61	D	G1668-FS-D(3)	11/3/2020
13C8-PFOA	68	D	G1668-FS-D(3)	11/3/2020
13C9-PFNA	55		G1668-FS(0)	11/3/2020
13C6-PFDA	63		G1668-FS(0)	11/3/2020
13C7-PFUnA	79	D	G1668-FS-D(3)	11/3/2020
13C2-PFDoA	40	M	G1668-FS(0)	11/3/2020
13C2-PFTeDA	22	M	G1668-FS(0)	11/3/2020
d3-MeFOSAA	86	D	G1668-FS-D(7)	11/3/2020
d5-EtFOSAA	90	D	G1668-FS-D(7)	11/3/2020
13C3-PFBS	80	D	G1668-FS-D(7)	11/3/2020
13C3-PFHxS	80	D	G1668-FS-D(7)	11/3/2020
13C8-PFOS	85	D	G1668-FS-D(7)	11/3/2020
13C3-HFPO-DA	56	D	G1668-FS-D(3)	11/3/2020

11/10/21

Analyzed by: Schumitz, Denise
Printed: 11/10/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1305
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 10, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-HVG-GW10-1020	G1696-FS	Water
2	CBD-HVG-GW09-1020	G1697-FS	Water
3	CBD-EB01-101420-GW	G1698-FS	Water
4	CBD-AOA-MW10-1020	G1699-FS	Water
5	CBD-BKG-MW03-1020	G1700-FS	Water
6	CBD-SO4-MW01-1020	G1701-FS	Water
7	CBD-SO4-MW01P-1020	G1702-FS	Water

A Stage 2B/4 data validation was performed on the analytical data for six water samples and one aqueous equipment blank sample collected on October 14-15, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for water samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks exhibited the following contamination.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
LD80 IB	NMeFOSAA	0.392	None	All Samples ND

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-EB01-101420-GW	None - ND	-	-	-
CBD-FB04-101620	PFTrDA	0.179	None	All Samples ND

Surrogate Spike Recoveries

- Several samples exhibited surrogate recoveries outside of QC limits. See summary pages behind Form Is for specifics. All associated compounds were qualified estimated (J/UJ).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	CBD-SO4-MW01-1020 ng/g	CBD-SO4-MW01P-1020 ng/g	RPD	Qualifier
PFHxA	291	289	1%	None
PFHpA	51.1	53.7	5%	
PFOA	12.1	12.9	6%	
PFNA	3.51	4.19	18%	
PFBS	168	154	9%	
PFHxS	736	883	18%	
PFOS	1850	1900	3%	

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/19/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-HVG-GW10-1020
Battelle ID	G1696-FS
Sample Type	SA
Collection Date	10/14/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.50 J UJ	G1696-FS(0)	1.000	11/6/2020	0.527	1.50	5.00	SSL
PFHpA	375-85-9	1.00 U UJ	G1696-FS(0)	1.000	11/6/2020	0.263	1.00	5.00	SSL
PFOA	335-67-1	1.47 J	G1696-FS(0)	1.000	11/6/2020	0.511	1.50	5.00	
PFNA	375-95-1	1.00 U	G1696-FS(0)	1.000	11/6/2020	0.309	1.00	5.00	
PFDA	335-76-2	0.500 U	G1696-FS(0)	1.000	11/6/2020	0.142	0.500	5.00	
PFUnA	2058-94-8	0.500 U	G1696-FS(0)	1.000	11/6/2020	0.219	0.500	5.00	
PFDoA	307-55-1	0.500 U	G1696-FS(0)	1.000	11/6/2020	0.192	0.500	5.00	
PFTrDA	72629-94-8	0.500 U	G1696-FS(0)	1.000	11/6/2020	0.154	0.500	5.00	
PFTeDA	376-06-7	2.00 J UJ	G1696-FS(0)	1.000	11/6/2020	0.733	2.00	5.00	SSL
NMeFOSAA	2355-31-9	1.00 U	G1696-FS(0)	1.000	11/6/2020	0.350	1.00	5.00	
NEtFOSAA	2991-50-6	1.00 U	G1696-FS(0)	1.000	11/6/2020	0.500	1.00	5.00	
PFBS	375-73-5	2.82 J	G1696-FS(0)	1.000	11/6/2020	0.144	0.500	5.00	SSL
PFHxS	355-46-4	42.5	G1696-FS(0)	1.000	11/6/2020	0.112	0.400	5.00	
PFOS	1763-23-1	3.27 J	G1696-FS(0)	1.000	11/6/2020	0.437	1.00	5.00	
HFPO-DA	13252-13-6	0.500 U	G1696-FS(0)	1.000	11/6/2020	0.248	0.500	5.00	
Adona	919005-14-4	1.00 U	G1696-FS(0)	1.000	11/6/2020	0.265	1.00	5.00	
9Cl-PF3ONS	756426-58-1	0.500 U	G1696-FS(0)	1.000	11/6/2020	0.268	0.500	5.00	
11Cl-PF3OUdS	763051-92-9	1.00 U	G1696-FS(0)	1.000	11/6/2020	0.231	1.00	5.00	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-HVG-GW10-1020
Battelle ID	G1696-FS
Sample Type	SA
Collection Date	10/14/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	33 N	G1696-FS(0)	11/6/2020
13C4-PFHpA	49 N	G1696-FS(0)	11/6/2020
13C8-PFOA	67	G1696-FS(0)	11/6/2020
13C9-PFNA	73	G1696-FS(0)	11/6/2020
13C6-PFDA	78	G1696-FS(0)	11/6/2020
13C7-PFUnA	65	G1696-FS(0)	11/6/2020
13C2-PFDoA	57	G1696-FS(0)	11/6/2020
13C2-PFTeDA	47 N	G1696-FS(0)	11/6/2020
d3-MeFOSAA	71	G1696-FS(0)	11/6/2020
d5-EtFOSAA	69	G1696-FS(0)	11/6/2020
13C3-PFBS	46 N	G1696-FS(0)	11/6/2020
13C3-PFHxS	65	G1696-FS(0)	11/6/2020
13C8-PFOS	76	G1696-FS(0)	11/6/2020
13C3-HFPO-DA	58	G1696-FS(0)	11/6/2020

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Printed: 11/13/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-HVG-GW09-1020
Battelle ID	G1697-FS
Sample Type	SA
Collection Date	10/14/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.42 J UJ	G1697-FS(0)	1.000	11/5/2020	0.497	1.42	4.72	SSL
PFHpA	375-85-9	0.943 U	G1697-FS(0)	1.000	11/5/2020	0.248	0.943	4.72	
PFOA	335-67-1	1.42 U	G1697-FS(0)	1.000	11/5/2020	0.482	1.42	4.72	
PFNA	375-95-1	0.943 U	G1697-FS(0)	1.000	11/5/2020	0.292	0.943	4.72	
PFDA	335-76-2	0.472 U	G1697-FS(0)	1.000	11/5/2020	0.134	0.472	4.72	
PFUnA	2058-94-8	0.472 U	G1697-FS(0)	1.000	11/5/2020	0.207	0.472	4.72	
PFDoA	307-55-1	0.472 U	G1697-FS(0)	1.000	11/5/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	0.472 U	G1697-FS(0)	1.000	11/5/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89 U	G1697-FS(0)	1.000	11/5/2020	0.692	1.89	4.72	
NMeFOSAA	2355-31-9	0.943 U	G1697-FS(0)	1.000	11/5/2020	0.330	0.943	4.72	
NEtFOSAA	2991-50-6	0.943 U	G1697-FS(0)	1.000	11/5/2020	0.472	0.943	4.72	
PFBS	375-73-5	2.70 J	G1697-FS(0)	1.000	11/5/2020	0.136	0.472	4.72	
PFHxS	355-46-4	13.0	G1697-FS(0)	1.000	11/5/2020	0.106	0.377	4.72	
PFOS	1763-23-1	3.17 J	G1697-FS(0)	1.000	11/5/2020	0.412	0.943	4.72	
HFPO-DA	13252-13-6	0.472 U	G1697-FS(0)	1.000	11/5/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943 U	G1697-FS(0)	1.000	11/5/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472 U	G1697-FS(0)	1.000	11/5/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943 U	G1697-FS(0)	1.000	11/5/2020	0.218	0.943	4.72	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-HVG-GW09-1020
Battelle ID	G1697-FS
Sample Type	SA
Collection Date	10/14/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	40	G1697-FS(0)	11/5/2020
13C4-PFHpA	56	G1697-FS(0)	11/5/2020
13C8-PFOA	69	G1697-FS(0)	11/5/2020
13C9-PFNA	78	G1697-FS(0)	11/5/2020
13C6-PFDA	70	G1697-FS(0)	11/5/2020
13C7-PFUnA	68	G1697-FS(0)	11/5/2020
13C2-PFDoA	70	G1697-FS(0)	11/5/2020
13C2-PFTeDA	65	G1697-FS(0)	11/5/2020
d3-MeFOSAA	104	G1697-FS(0)	11/5/2020
d5-EtFOSAA	98	G1697-FS(0)	11/5/2020
13C3-PFBS	54	G1697-FS(0)	11/5/2020
13C3-PFHxS	82	G1697-FS(0)	11/5/2020
13C8-PFOS	86	G1697-FS(0)	11/5/2020
13C3-HFPO-DA	60	G1697-FS(0)	11/5/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-EB01-101420-GW
Battelle ID	G1698-FS
Sample Type	SA
Collection Date	10/14/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.47 U	G1698-FS(0)	1.000	11/5/2020	0.517	1.47	4.90
PFHpA	375-85-9	0.980 U	G1698-FS(0)	1.000	11/5/2020	0.258	0.980	4.90
PFOA	335-67-1	1.47 U	G1698-FS(0)	1.000	11/5/2020	0.501	1.47	4.90
PFNA	375-95-1	0.980 U	G1698-FS(0)	1.000	11/5/2020	0.303	0.980	4.90
PFDA	335-76-2	0.490 U	G1698-FS(0)	1.000	11/5/2020	0.139	0.490	4.90
PFUnA	2058-94-8	0.490 U	G1698-FS(0)	1.000	11/5/2020	0.215	0.490	4.90
PFDoA	307-55-1	0.490 U	G1698-FS(0)	1.000	11/5/2020	0.188	0.490	4.90
PFTrDA	72629-94-8	0.490 U	G1698-FS(0)	1.000	11/5/2020	0.151	0.490	4.90
PFTeDA	376-06-7	1.96 U	G1698-FS(0)	1.000	11/5/2020	0.719	1.96	4.90
NMeFOSAA	2355-31-9	0.980 U	G1698-FS(0)	1.000	11/5/2020	0.343	0.980	4.90
NEtFOSAA	2991-50-6	0.980 U	G1698-FS(0)	1.000	11/5/2020	0.490	0.980	4.90
PFBS	375-73-5	0.490 U	G1698-FS(0)	1.000	11/5/2020	0.141	0.490	4.90
PFHxS	355-46-4	0.392 U	G1698-FS(0)	1.000	11/5/2020	0.110	0.392	4.90
PFOS	1763-23-1	0.980 U	G1698-FS(0)	1.000	11/5/2020	0.428	0.980	4.90
HFPO-DA	13252-13-6	0.490 U	G1698-FS(0)	1.000	11/5/2020	0.243	0.490	4.90
Adona	919005-14-4	0.980 U	G1698-FS(0)	1.000	11/5/2020	0.260	0.980	4.90
9Cl-PF3ONS	756426-58-1	0.490 U	G1698-FS(0)	1.000	11/5/2020	0.263	0.490	4.90
11Cl-PF3OUdS	763051-92-9	0.980 U	G1698-FS(0)	1.000	11/5/2020	0.226	0.980	4.90

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Printed: 11/13/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW10-1020
Battelle ID	G1699-FS
Sample Type	SA
Collection Date	10/15/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	241	G1699-FS(0)	1.000	11/5/2020	0.527	1.50	5.00
PFHpA	375-85-9	142	G1699-FS(0)	1.000	11/5/2020	0.263	1.00	5.00
PFOA	335-67-1	248	G1699-FS-D(3)	5.000	11/5/2020	2.56	7.50	25.0
PFNA	375-95-1	88.7	G1699-FS(0)	1.000	11/5/2020	0.309	1.00	5.00
PFDA	335-76-2	2.48 J	G1699-FS(0)	1.000	11/5/2020	0.142	0.500	5.00
PFUnA	2058-94-8	0.500 U	G1699-FS(0)	1.000	11/5/2020	0.219	0.500	5.00
PFDoA	307-55-1	0.500 U	G1699-FS(0)	1.000	11/5/2020	0.192	0.500	5.00
PFTrDA	72629-94-8	0.500 U	G1699-FS(0)	1.000	11/5/2020	0.154	0.500	5.00
PFTeDA	376-06-7	2.00 U	G1699-FS(0)	1.000	11/5/2020	0.733	2.00	5.00
NMeFOSAA	2355-31-9	1.00 U	G1699-FS(0)	1.000	11/5/2020	0.350	1.00	5.00
NEtFOSAA	2991-50-6	1.00 U	G1699-FS(0)	1.000	11/5/2020	0.500	1.00	5.00
PFBS	375-73-5	33.3	G1699-FS(0)	1.000	11/5/2020	0.144	0.500	5.00
PFHxS	355-46-4	658	G1699-FS-D(5)	12.500	11/5/2020	1.40	5.00	62.5
PFOS	1763-23-1	325	G1699-FS-D(3)	5.000	11/5/2020	2.19	5.00	25.0
HFPO-DA	13252-13-6	0.500 U	G1699-FS(0)	1.000	11/5/2020	0.248	0.500	5.00
Adona	919005-14-4	1.00 U	G1699-FS(0)	1.000	11/5/2020	0.265	1.00	5.00
9Cl-PF3ONS	756426-58-1	0.500 U	G1699-FS(0)	1.000	11/5/2020	0.268	0.500	5.00
11Cl-PF3OUdS	763051-92-9	1.00 U	G1699-FS(0)	1.000	11/5/2020	0.231	1.00	5.00

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Printed: 11/13/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-BKG-MW03-1020
Battelle ID	G1700-FS
Sample Type	SA
Collection Date	10/15/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.34 J	G1700-FS(0)	1.000	11/5/2020	0.497	1.42	4.72
PFHpA	375-85-9	1.06 J	G1700-FS(0)	1.000	11/5/2020	0.248	0.943	4.72
PFOA	335-67-1	2.89 J	G1700-FS(0)	1.000	11/5/2020	0.482	1.42	4.72
PFNA	375-95-1	1.26 J	G1700-FS(0)	1.000	11/5/2020	0.292	0.943	4.72
PFDA	335-76-2	0.472 U	G1700-FS(0)	1.000	11/5/2020	0.134	0.472	4.72
PFUnA	2058-94-8	0.472 U	G1700-FS(0)	1.000	11/5/2020	0.207	0.472	4.72
PFDoA	307-55-1	0.472 U	G1700-FS(0)	1.000	11/5/2020	0.181	0.472	4.72
PFTrDA	72629-94-8	0.472 U	G1700-FS(0)	1.000	11/5/2020	0.145	0.472	4.72
PFTeDA	376-06-7	1.89 U	G1700-FS(0)	1.000	11/5/2020	0.692	1.89	4.72
NMeFOSAA	2355-31-9	0.943 U	G1700-FS(0)	1.000	11/5/2020	0.330	0.943	4.72
NEtFOSAA	2991-50-6	0.943 U	G1700-FS(0)	1.000	11/5/2020	0.472	0.943	4.72
PFBS	375-73-5	1.11 J	G1700-FS(0)	1.000	11/5/2020	0.136	0.472	4.72
PFHxS	355-46-4	9.72	G1700-FS(0)	1.000	11/5/2020	0.106	0.377	4.72
PFOS	1763-23-1	10.6	G1700-FS(0)	1.000	11/5/2020	0.412	0.943	4.72
HFPO-DA	13252-13-6	0.472 U	G1700-FS(0)	1.000	11/5/2020	0.234	0.472	4.72
Adona	919005-14-4	0.943 U	G1700-FS(0)	1.000	11/5/2020	0.250	0.943	4.72
9Cl-PF3ONS	756426-58-1	0.472 U	G1700-FS(0)	1.000	11/5/2020	0.253	0.472	4.72
11Cl-PF3OUdS	763051-92-9	0.943 U	G1700-FS(0)	1.000	11/5/2020	0.218	0.943	4.72

11/10/21
Analyzed by: Schumitz, Denise
Printed: 11/13/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-SO4-MW01-1020
Battelle ID	G1701-FS
Sample Type	SA
Collection Date	10/15/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	291	G1701-FS-D(3)	12.500	11/5/2020	6.59	18.8	62.5	
PFHpA	375-85-9	51.1 J	G1701-FS(0)	1.000	11/5/2020	0.263	1.00	5.00	SSL
PFOA	335-67-1	12.1	G1701-FS(0)	1.000	11/5/2020	0.511	1.50	5.00	
PFNA	375-95-1	3.51 J	G1701-FS(0)	1.000	11/5/2020	0.309	1.00	5.00	
PFDA	335-76-2	0.500 U	G1701-FS(0)	1.000	11/5/2020	0.142	0.500	5.00	
PFUnA	2058-94-8	0.500 U	G1701-FS(0)	1.000	11/5/2020	0.219	0.500	5.00	
PFDoA	307-55-1	0.500 U	G1701-FS(0)	1.000	11/5/2020	0.192	0.500	5.00	
PFTrDA	72629-94-8	0.500 U	G1701-FS(0)	1.000	11/5/2020	0.154	0.500	5.00	
PFTeDA	376-06-7	2.00 U	G1701-FS(0)	1.000	11/5/2020	0.733	2.00	5.00	
NMeFOSAA	2355-31-9	1.00 U	G1701-FS(0)	1.000	11/5/2020	0.350	1.00	5.00	
NEtFOSAA	2991-50-6	1.00 U	G1701-FS(0)	1.000	11/5/2020	0.500	1.00	5.00	
PFBS	375-73-5	168	G1701-FS(0)	1.000	11/5/2020	0.144	0.500	5.00	
PFHxS	355-46-4	736	G1701-FS-D(3)	12.500	11/5/2020	1.40	5.00	62.5	
PFOS	1763-23-1	1850	G1701-FS-D(5)	31.250	11/5/2020	13.7	31.3	156	
HFPO-DA	13252-13-6	0.500 U	G1701-FS(0)	1.000	11/5/2020	0.248	0.500	5.00	
Adona	919005-14-4	1.00 U	G1701-FS(0)	1.000	11/5/2020	0.265	1.00	5.00	
9Cl-PF3ONS	756426-58-1	0.500 U	G1701-FS(0)	1.000	11/5/2020	0.268	0.500	5.00	
11Cl-PF3OUdS	763051-92-9	1.00 U	G1701-FS(0)	1.000	11/5/2020	0.231	1.00	5.00	

NW 11/10/21

Analyzed by: Schumitz, Denise
Printed: 11/13/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-SO4-MW01-1020
Battelle ID	G1701-FS
Sample Type	SA
Collection Date	10/15/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	105 D	G1701-FS-D(3)	11/5/2020
13C4-PFHpA	41 M	G1701-FS(0)	11/5/2020
13C8-PFOA	71	G1701-FS(0)	11/5/2020
13C9-PFNA	103 D	G1701-FS-D(5)	11/5/2020
13C6-PFDA	90	G1701-FS(0)	11/5/2020
13C7-PFUnA	83	G1701-FS(0)	11/5/2020
13C2-PFDoA	88	G1701-FS(0)	11/5/2020
13C2-PFTeDA	76	G1701-FS(0)	11/5/2020
d3-MeFOSAA	93 D	G1701-FS-D(5)	11/5/2020
d5-EtFOSAA	113 D	G1701-FS-D(5)	11/5/2020
13C3-PFBS	103 D	G1701-FS-D(5)	11/5/2020
13C3-PFHxS	112 D	G1701-FS-D(5)	11/5/2020
13C8-PFOS	99 D	G1701-FS-D(5)	11/5/2020
13C3-HFPO-DA	69	G1701-FS(0)	11/5/2020

NW 11/10/21

Analyzed by: Schumitz, Denise
Printed: 11/13/2020

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7

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-SO4-MW01P-1020
Battelle ID	G1702-FS
Sample Type	SA
Collection Date	10/15/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	289	G1702-FS-D(3)	12.500	11/5/2020	6.21	17.7	59.0
PFHpA	375-85-9	53.7 J	G1702-FS(0)	1.000	11/5/2020	0.248	0.943	4.72
PFOA	335-67-1	12.9	G1702-FS(0)	1.000	11/5/2020	0.482	1.42	4.72
PFNA	375-95-1	4.19 J	G1702-FS(0)	1.000	11/5/2020	0.292	0.943	4.72
PFDA	335-76-2	0.472 U	G1702-FS(0)	1.000	11/5/2020	0.134	0.472	4.72
PFUnA	2058-94-8	0.472 U	G1702-FS(0)	1.000	11/5/2020	0.207	0.472	4.72
PFDoA	307-55-1	0.472 U	G1702-FS(0)	1.000	11/5/2020	0.181	0.472	4.72
PFTrDA	72629-94-8	0.472 U	G1702-FS(0)	1.000	11/5/2020	0.145	0.472	4.72
PFTeDA	376-06-7	1.89 U	G1702-FS(0)	1.000	11/5/2020	0.692	1.89	4.72
NMeFOSAA	2355-31-9	0.943 U	G1702-FS(0)	1.000	11/5/2020	0.330	0.943	4.72
NEtFOSAA	2991-50-6	0.943 U	G1702-FS(0)	1.000	11/5/2020	0.472	0.943	4.72
PFBS	375-73-5	154	G1702-FS-D(3)	12.500	11/5/2020	1.70	5.90	59.0
PFHxS	355-46-4	883	G1702-FS-D(3)	12.500	11/5/2020	1.32	4.72	59.0
PFOS	1763-23-1	1900	G1702-FS-D(5)	31.250	11/5/2020	12.9	29.5	147
HFPO-DA	13252-13-6	0.472 U	G1702-FS(0)	1.000	11/5/2020	0.234	0.472	4.72
Adona	919005-14-4	0.943 U	G1702-FS(0)	1.000	11/5/2020	0.250	0.943	4.72
9Cl-PF3ONS	756426-58-1	0.472 U	G1702-FS(0)	1.000	11/5/2020	0.253	0.472	4.72
11Cl-PF3OUdS	763051-92-9	0.943 U	G1702-FS(0)	1.000	11/5/2020	0.218	0.943	4.72

SSL

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7

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-SO4-MW01P-1020
Battelle ID	G1702-FS
Sample Type	SA
Collection Date	10/15/2020
Extraction Date	10/21/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	83	G1702-FS-D(3)	11/5/2020
13C4-PFHpA	41	G1702-FS(0)	11/5/2020
13C8-PFOA	77	G1702-FS(0)	11/5/2020
13C9-PFNA	108	G1702-FS-D(3)	11/5/2020
13C6-PFDA	77	G1702-FS(0)	11/5/2020
13C7-PFUnA	77	G1702-FS(0)	11/5/2020
13C2-PFDoA	76	G1702-FS(0)	11/5/2020
13C2-PFTeDA	64	G1702-FS(0)	11/5/2020
d3-MeFOSAA	107	G1702-FS-D(5)	11/5/2020
d5-EtFOSAA	103	G1702-FS-D(5)	11/5/2020
13C3-PFBS	102	G1702-FS-D(5)	11/5/2020
13C3-PFHxS	111	G1702-FS-D(5)	11/5/2020
13C8-PFOS	101	G1702-FS-D(5)	11/5/2020
13C3-HFPO-DA	78	G1702-FS(0)	11/5/2020

MW 11/10/21

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1310
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 10, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-MW15-1020	G1707-FS	Water
2	CBD-AOA-MW16-1020	G1708-FS	Water
2MS	CBD-AOA-MW16-1020MS	G1708-FSMS	Water
2MSD	CBD-AOA-MW16-1020MSD	G1708-FSMSD	Water
3	CBD-FB04-101620	G1709-FS	Water

A Stage 2B/4 data validation was performed on the analytical data for two water samples and one aqueous field blank sample collected on October 16, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation

- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for water samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-FB04-101620	PFTrDA	0.179	None	All Samples ND
CBD-EB01-101420-GW	None - ND	-	-	-

Surrogate Spike Recoveries

- Several samples exhibited surrogates outside of QC limits. See summary pages behind Form Is for specifics. All associated compounds were qualified estimated (J/UJ).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples exhibited acceptable percent recoveries (%R) and RPD values except for the following.

MS/MSD Sample ID	Compound	MS %R/MSD %R/ RPD	Qualifier
2	PFTrDA	191%/214%/OK	None - Samples ND
	PFHxS	21%/0%/200	J
	PFOS	21%/0%/200	J

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/19/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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1

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW15-1020
Battelle ID	G1707-FS
Sample Type	SA
Collection Date	10/16/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	149	G1707-FS-D(5)	12.500	11/6/2020	6.33	18.0	60.1	
PFHpA	375-85-9	86.7	G1707-FS-D(3)	5.000	11/6/2020	1.26	4.81	24.0	
PFOA	335-67-1	431	G1707-FS-D(5)	12.500	11/6/2020	6.14	18.0	60.1	
PFNA	375-95-1	46.3	G1707-FS(0)	1.000	11/6/2020	0.297	0.962	4.81	
PFDA	335-76-2	0.481 U	G1707-FS(0)	1.000	11/6/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	0.481 U	G1707-FS(0)	1.000	11/6/2020	0.211	0.481	4.81	
PFDoA	307-55-1	0.481 UJ	G1707-FS(0)	1.000	11/6/2020	0.185	0.481	4.81	SSL
PFTrDA	72629-94-8	0.481 U	G1707-FS(0)	1.000	11/6/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92 UJ	G1707-FS(0)	1.000	11/6/2020	0.705	1.92	4.81	SSL
NMeFOSAA	2355-31-9	0.962 U	G1707-FS(0)	1.000	11/6/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962 UJ	G1707-FS(0)	1.000	11/6/2020	0.481	0.962	4.81	SSL
PFBS	375-73-5	30.2	G1707-FS(0)	1.000	11/6/2020	0.138	0.481	4.81	
PFHxS	355-46-4	901	G1707-FS-D(5)	12.500	11/6/2020	1.35	4.81	60.1	
PFOS	1763-23-1	34.5	G1707-FS(0)	1.000	11/6/2020	0.420	0.962	4.81	
HFPO-DA	13252-13-6	0.481 U	G1707-FS(0)	1.000	11/6/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962 U	G1707-FS(0)	1.000	11/6/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481 U	G1707-FS(0)	1.000	11/6/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962 U	G1707-FS(0)	1.000	11/6/2020	0.222	0.962	4.81	

MW 11/01/21

Analyzed by: Griffith, Lauren
Printed: 11/16/2020

1

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW15-1020
Battelle ID	G1707-FS
Sample Type	SA
Collection Date	10/16/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	99 D	G1707-FS-D(5)	11/6/2020
13C4-PFHpA	96 D	G1707-FS-D(5)	11/6/2020
13C8-PFOA	98 D	G1707-FS-D(5)	11/6/2020
13C9-PFNA	98 D	G1707-FS-D(5)	11/6/2020
13C6-PFDA	86	G1707-FS(0)	11/6/2020
13C7-PFUnA	69	G1707-FS(0)	11/6/2020
13C2-PFDoA	43 M	G1707-FS(0)	11/6/2020
13C2-PFTeDA	14 M	G1707-FS(0)	11/6/2020
d3-MeFOSAA	50	G1707-FS(0)	11/6/2020
d5-EtFOSAA	47 M	G1707-FS(0)	11/6/2020
13C3-PFBS	90	G1707-FS(0)	11/6/2020
13C3-PFHxS	92 D	G1707-FS-D(5)	11/6/2020
13C8-PFOS	86	G1707-FS(0)	11/6/2020
13C3-HFPO-DA	96 D	G1707-FS-D(5)	11/6/2020

11/10/21

Analyzed by: Griffith, Lauren
Printed: 11/16/2020

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW16-1020
Battelle ID	G1708-FS
Sample Type	SA
Collection Date	10/16/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	27.6	G1708-FS(0)	1.000	11/6/2020	0.507	1.44	4.81	
PFHpA	375-85-9	9.99	G1708-FS(0)	1.000	11/6/2020	0.253	0.962	4.81	
PFOA	335-67-1	22.0	G1708-FS(0)	1.000	11/6/2020	0.491	1.44	4.81	
PFNA	375-95-1	6.91	G1708-FS(0)	1.000	11/6/2020	0.297	0.962	4.81	
PFDA	335-76-2	0.481 U	G1708-FS(0)	1.000	11/6/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	0.481 U	G1708-FS(0)	1.000	11/6/2020	0.211	0.481	4.81	
PFDoA	307-55-1	0.481 U UJ	G1708-FS(0)	1.000	11/6/2020	0.185	0.481	4.81	SSL
PFTrDA	72629-94-8	0.481 U	G1708-FS(0)	1.000	11/6/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92 U UJ	G1708-FS(0)	1.000	11/6/2020	0.705	1.92	4.81	SSL
NMeFOSAA	2355-31-9	0.962 U	G1708-FS(0)	1.000	11/6/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962 U	G1708-FS(0)	1.000	11/6/2020	0.481	0.962	4.81	
PFBS	375-73-5	9.89	G1708-FS(0)	1.000	11/6/2020	0.138	0.481	4.81	
PFHxS	355-46-4	118 J	G1708-FS(0)	1.000	11/6/2020	0.108	0.385	4.81	MSL
PFOS	1763-23-1	92.0 J	G1708-FS(0)	1.000	11/6/2020	0.420	0.962	4.81	MSL
HFPO-DA	13252-13-6	0.481 U	G1708-FS(0)	1.000	11/6/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962 U	G1708-FS(0)	1.000	11/6/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481 U	G1708-FS(0)	1.000	11/6/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962 U	G1708-FS(0)	1.000	11/6/2020	0.222	0.962	4.81	

NW 1/10/21

Analyzed by: Griffith, Lauren
Printed: 11/16/2020

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW16-1020
Battelle ID	G1708-FS
Sample Type	SA
Collection Date	10/16/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	81	G1708-FS(0)	11/6/2020
13C4-PFHpA	82	G1708-FS(0)	11/6/2020
13C8-PFOA	78	G1708-FS(0)	11/6/2020
13C9-PFNA	75	G1708-FS(0)	11/6/2020
13C6-PFDA	74	G1708-FS(0)	11/6/2020
13C7-PFUnA	68	G1708-FS(0)	11/6/2020
13C2-PFDoA	42 N	G1708-FS(0)	11/6/2020
13C2-PFTeDA	11 N	G1708-FS(0)	11/6/2020
d3-MeFOSAA	52	G1708-FS(0)	11/6/2020
d5-EtFOSAA	56	G1708-FS(0)	11/6/2020
13C3-PFBS	94	G1708-FS(0)	11/6/2020
13C3-PFHxS	91	G1708-FS(0)	11/6/2020
13C8-PFOS	85	G1708-FS(0)	11/6/2020
13C3-HFPO-DA	77	G1708-FS(0)	11/6/2020

MW 11/10/21

Analyzed by: Griffith, Lauren
Printed: 11/16/2020

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3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-FB04-101620
Battelle ID	G1709-FS
Sample Type	SA
Collection Date	10/16/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.47 U	G1709-FS(0)	1.000	11/6/2020	0.517	1.47	4.90
PFHpA	375-85-9	0.980 U	G1709-FS(0)	1.000	11/6/2020	0.258	0.980	4.90
PFOA	335-67-1	1.47 U	G1709-FS(0)	1.000	11/6/2020	0.501	1.47	4.90
PFNA	375-95-1	0.980 U	G1709-FS(0)	1.000	11/6/2020	0.303	0.980	4.90
PFDA	335-76-2	0.490 U	G1709-FS(0)	1.000	11/6/2020	0.139	0.490	4.90
PFUnA	2058-94-8	0.490 U	G1709-FS(0)	1.000	11/6/2020	0.215	0.490	4.90
PFDoA	307-55-1	0.490 U	G1709-FS(0)	1.000	11/6/2020	0.188	0.490	4.90
PFTrDA	72629-94-8	0.179 J	G1709-FS(0)	1.000	11/6/2020	0.151	0.490	4.90
PFTeDA	376-06-7	1.96 U	G1709-FS(0)	1.000	11/6/2020	0.719	1.96	4.90
NMeFOSAA	2355-31-9	0.980 U	G1709-FS(0)	1.000	11/6/2020	0.343	0.980	4.90
NEtFOSAA	2991-50-6	0.980 U	G1709-FS(0)	1.000	11/6/2020	0.490	0.980	4.90
PFBS	375-73-5	0.490 U	G1709-FS(0)	1.000	11/6/2020	0.141	0.490	4.90
PFHxS	355-46-4	0.392 U	G1709-FS(0)	1.000	11/6/2020	0.110	0.392	4.90
PFOS	1763-23-1	0.980 U	G1709-FS(0)	1.000	11/6/2020	0.428	0.980	4.90
HFPO-DA	13252-13-6	0.490 U	G1709-FS(0)	1.000	11/6/2020	0.243	0.490	4.90
Adona	919005-14-4	0.980 U	G1709-FS(0)	1.000	11/6/2020	0.260	0.980	4.90
9Cl-PF3ONS	756426-58-1	0.490 U	G1709-FS(0)	1.000	11/6/2020	0.263	0.490	4.90
11Cl-PF3OUdS	763051-92-9	0.980 U	G1709-FS(0)	1.000	11/6/2020	0.226	0.980	4.90

NW 1/10/21

Analyzed by: Griffith, Lauren
Printed: 11/16/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1321
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 10, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-MW04-1020	G1765-FS	Water
2	CBD-AOA-MW01-1020	G1766-FS	Water
3	CBD-AOA-MW01P-1020	G1767-FS	Water
4	CBD-AOA-MW03-1020	G1768-FS	Water
5	CBD-AOA-MW08-1020	G1769-FS	Water
5MS	CBD-AOA-MW08-1020MS	G1770-FSMS	Water
5MSD	CBD-AOA-MW08-1020MSD	G1771-FSMSD	Water
6	CBD-AOA-MW02-1020	G1772-FS	Water
7	CBD-AOA-MW18-1020	G1773-FS	Water
8	CBD-AOA-EB01-101920-GW	G1774-FS	Water
9	CBD-SO3-MW01-1020	G1775-FS	Water

A Stage 2B/4 data validation was performed on the analytical data for eight water samples and one aqueous equipment blank sample collected on October 19, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for water samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks exhibited the following contamination.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
LE58 IB	NMeFOSAA	0.387	U	2, 3, 4, 7

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-101920-GW	PFOS	0.449	None	Associated Samples >10X
CBD-FB05-102020	None - ND	-	-	-

Surrogate Spike Recoveries

- Several samples exhibited surrogates outside of QC limits. See summary pages behind Form Is for specifics. All associated compounds were qualified estimated (J/UJ).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples exhibited acceptable percent recoveries (%R) and RPD values except for the following.

MS/MSD Sample ID	Compound	MS %R/MSD %R/ RPD	Qualifier
5	7 Compounds	High/High/High	None - 4X Rule Applies
	HFPO-DA	73%/64%/OK	UJ

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	CBD-AOA-MW01-1020 ng/L	CBD-AOA-MW01P-1020 ng/L	RPD	Qualifier
PFHxA	2880	2970	3%	None
PFHpA	1600	1740	8%	
PFOA	1970	2330	17%	
PFNA	2150	2130	1%	
PFDA	210	225	7%	
PFUnA	776	942	19%	
PFDoA	2.39	2.68	11%	
PFTrDA	5.02	5.57	10%	
NEtFOSAA	1.70	1.99	16%	
PFBS	167	171	2%	
PFHxS	6180	7140	14%	
PFOS	23700	21600	9%	

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW04-1020
Battelle ID	G1765-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1360 D	G1765-FS-D(7)	31.250	11/10/2020	16.1	46.0	153
PFHpA	375-85-9	471	G1765-FS(0)	1.000	11/10/2020	0.258	0.980	4.90
PFOA	335-67-1	1090 D	G1765-FS-D(5)	12.500	11/10/2020	6.26	18.4	61.3
PFNA	375-95-1	1130 D	G1765-FS-D(3)	5.000	11/10/2020	1.51	4.90	24.5
PFDA	335-76-2	360 D	G1765-FS-D(3)	5.000	11/10/2020	0.696	2.45	24.5
PFUnA	2058-94-8	3390 D	G1765-FS-D(9)	156.250	11/11/2020	33.5	76.6	766
PFDoA	307-55-1	175	G1765-FS(0)	1.000	11/10/2020	0.188	0.490	4.90
PFTrDA	72629-94-8	488 D	G1765-FS-D(3)	5.000	11/10/2020	0.755	2.45	24.5
PFTeDA	376-06-7	1.96 U	G1765-FS(0)	1.000	11/10/2020	0.719	1.96	4.90
NMeFOSAA	2355-31-9	7.27	G1765-FS(0)	1.000	11/10/2020	0.343	0.980	4.90
NEtFOSAA	2991-50-6	18.5	G1765-FS(0)	1.000	11/10/2020	0.490	0.980	4.90
PFBS	375-73-5	88.8	G1765-FS(0)	1.000	11/10/2020	0.141	0.490	4.90
PFHxS	355-46-4	3170 D	G1765-FS-D(9)	156.250	11/11/2020	17.2	61.3	766
PFOS	1763-23-1	10800 D	G1765-FS-D(9)	156.250	11/11/2020	66.9	153	766
HFPO-DA	13252-13-6	0.490 U	G1765-FS(0)	1.000	11/10/2020	0.243	0.490	4.90
Adona	919005-14-4	0.980 U	G1765-FS(0)	1.000	11/10/2020	0.260	0.980	4.90
9Cl-PF3ONS	756426-58-1	0.490 U	G1765-FS(0)	1.000	11/10/2020	0.263	0.490	4.90
11Cl-PF3OUdS	763051-92-9	0.980 U	G1765-FS(0)	1.000	11/10/2020	0.226	0.980	4.90

11/10/21

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW01-1020
Battelle ID	G1766-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2880 D	G1766-FS-D(7)	62.500	11/11/2020	31.7	90.1	300
PFHpA	375-85-9	1600 D	G1766-FS-D(7)	62.500	11/11/2020	15.8	60.1	300
PFOA	335-67-1	1970 D	G1766-FS-D(5)	25.000	11/11/2020	12.3	36.1	120
PFNA	375-95-1	2150 D	G1766-FS-D(5)	25.000	11/11/2020	7.43	24.0	120
PFDA	335-76-2	210 D	G1766-FS-D(3)	5.000	11/11/2020	0.683	2.40	24.0
PFUnA	2058-94-8	776 D	G1766-FS-D(5)	25.000	11/11/2020	5.26	12.0	120
PFDoA	307-55-1	2.39 J	G1766-FS(0)	1.000	11/11/2020	0.185	0.481	4.81
PFTrDA	72629-94-8	5.02	G1766-FS(0)	1.000	11/11/2020	0.148	0.481	4.81
PFTeDA	376-06-7	1.92 U	G1766-FS(0)	1.000	11/11/2020	0.705	1.92	4.81
NMeFOSAA	2355-31-9	0.962 ~~0.784 J~~ U	G1766-FS(0)	1.000	11/11/2020	0.337	0.962	4.81
NEtFOSAA	2991-50-6	1.70 J	G1766-FS(0)	1.000	11/11/2020	0.481	0.962	4.81
PFBS	375-73-5	167	G1766-FS(0)	1.000	11/11/2020	0.138	0.481	4.81
PFHxS	355-46-4	6180 D	G1766-FS-D(9)	312.500	11/11/2020	33.7	120	1500
PFOS	1763-23-1	23700 D	G1766-FS-D(9)	312.500	11/11/2020	131	300	1500
HFPO-DA	13252-13-6	0.481 U	G1766-FS(0)	1.000	11/11/2020	0.238	0.481	4.81
Adona	919005-14-4	0.962 U	G1766-FS(0)	1.000	11/11/2020	0.255	0.962	4.81
9Cl-PF3ONS	756426-58-1	0.481 U	G1766-FS(0)	1.000	11/11/2020	0.258	0.481	4.81
11Cl-PF3OUdS	763051-92-9	0.962 U	G1766-FS(0)	1.000	11/11/2020	0.222	0.962	4.81

MBL

MW 11/10/21

Analyzed by: Schumitz, Denise
Printed: 11/17/2020

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3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW01P-1020
Battelle ID	G1767-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2970 D	G1767-FS-D(9)	312.500	11/11/2020	155	442	1470
PFHpA	375-85-9	1740 D	G1767-FS-D(7)	62.500	11/11/2020	15.5	59.0	295
PFOA	335-67-1	2330 D	G1767-FS-D(7)	62.500	11/11/2020	30.1	88.4	295
PFNA	375-95-1	2130 D	G1767-FS-D(7)	62.500	11/11/2020	18.2	59.0	295
PFDA	335-76-2	225 D	G1767-FS-D(3)	5.000	11/11/2020	0.670	2.36	23.6
PFUnA	2058-94-8	942 D	G1767-FS-D(7)	62.500	11/11/2020	12.9	29.5	295
PFDoA	307-55-1	2.68 J	G1767-FS(0)	1.000	11/11/2020	0.181	0.472	4.72
PFTrDA	72629-94-8	5.57	G1767-FS(0)	1.000	11/11/2020	0.145	0.472	4.72
PFTeDA	376-06-7	1.89 U	G1767-FS(0)	1.000	11/11/2020	0.692	1.89	4.72
NMeFOSAA	2355-31-9	0.943 ~~0.843 J~~ U	G1767-FS(0)	1.000	11/11/2020	0.330	0.943	4.72 MBL
NEtFOSAA	2991-50-6	1.99 J	G1767-FS(0)	1.000	11/11/2020	0.472	0.943	4.72
PFBS	375-73-5	171	G1767-FS(0)	1.000	11/11/2020	0.136	0.472	4.72
PFHxS	355-46-4	7140 D	G1767-FS-D(9)	312.500	11/11/2020	33.0	118	1470
PFOS	1763-23-1	21600 D	G1767-FS-D(9)	312.500	11/11/2020	129	295	1470
HFPO-DA	13252-13-6	0.472 U	G1767-FS(0)	1.000	11/11/2020	0.234	0.472	4.72
Adona	919005-14-4	0.943 U	G1767-FS(0)	1.000	11/11/2020	0.250	0.943	4.72
9Cl-PF3ONS	756426-58-1	0.472 U	G1767-FS(0)	1.000	11/11/2020	0.253	0.472	4.72
11Cl-PF3OUdS	763051-92-9	0.943 U	G1767-FS(0)	1.000	11/11/2020	0.218	0.943	4.72

11/10/21

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Printed: 11/17/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

4

Client ID	CBD-AOA-MW03-1020
Battelle ID	G1768-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	6210 D	G1768-FS-D(7)	156.250	11/11/2020	77.7	221	737	
PFHpA	375-85-9	5820 D	G1768-FS-D(5)	62.500	11/11/2020	15.5	59.0	295	
PFOA	335-67-1	6800 D	G1768-FS-D(7)	156.250	11/11/2020	75.3	221	737	
PFNA	375-95-1	8720 D	G1768-FS-D(5)	62.500	11/11/2020	18.2	59.0	295	
PFDA	335-76-2	306 D	G1768-FS-D(3)	5.000	11/11/2020	0.670	2.36	23.6	
PFUnA	2058-94-8	763 D	G1768-FS-D(5)	62.500	11/11/2020	12.9	29.5	295	
PFDoA	307-55-1	4.01 J	G1768-FS(0)	1.000	11/11/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	25.0	G1768-FS(0)	1.000	11/11/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89 U	G1768-FS(0)	1.000	11/11/2020	0.692	1.89	4.72	
NMeFOSAA	2355-31-9	1.05 J U	G1768-FS(0)	1.000	11/11/2020	0.330	0.943	4.72	MBL
NEtFOSAA	2991-50-6	2.03 J	G1768-FS(0)	1.000	11/11/2020	0.472	0.943	4.72	
PFBS	375-73-5	574 D	G1768-FS-D(3)	5.000	11/11/2020	0.679	2.36	23.6	
PFHxS	355-46-4	25600 D	G1768-FS-D(9)	390.625	11/11/2020	41.3	147	1840	
PFOS	1763-23-1	112000 D	G1768-FS-D(13)	2441.406	11/12/2020	1010	2300	11500	
HFPO-DA	13252-13-6	0.472 U	G1768-FS(0)	1.000	11/11/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943 U	G1768-FS(0)	1.000	11/11/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472 U	G1768-FS(0)	1.000	11/11/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943 U	G1768-FS(0)	1.000	11/11/2020	0.218	0.943	4.72	

MW 11/10/21

Analyzed by: Schumitz, Denise
Printed: 11/17/2020

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4

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW03-1020
Battelle ID	G1768-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	90	D	G1768-FS-D(7)	11/11/2020
13C4-PFHpA	76	D	G1768-FS-D(7)	11/11/2020
13C8-PFOA	90	D	G1768-FS-D(7)	11/11/2020
13C9-PFNA	53	D	G1768-FS-D(7)	11/11/2020
13C6-PFDA	101	D	G1768-FS-D(3)	11/11/2020
13C7-PFUnA	109	D	G1768-FS-D(5)	11/11/2020
13C2-PFDoA	144	D	G1768-FS-D(3)	11/11/2020
13C2-PFTeDA	160	SD	G1768-FS-D(3)	11/11/2020
d3-MeFOSAA	88	D	G1768-FS-D(13)	11/12/2020
d5-EtFOSAA	91	D	G1768-FS-D(13)	11/12/2020
13C3-PFBS	82	D	G1768-FS-D(13)	11/12/2020
13C3-PFHxS	79	D	G1768-FS-D(13)	11/12/2020
13C8-PFOS	82	D	G1768-FS-D(13)	11/12/2020
13C3-HFPO-DA	68	D	G1768-FS-D(7)	11/11/2020

mw 1/10/21

Analyzed by: Schumitz, Denise
Printed: 11/17/2020

BATTELLE
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5

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW08-1020
Battelle ID	G1769-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2280 D	G1769-FS-D(7)	31.250	11/11/2020	15.8	45.1	150
PFHpA	375-85-9	881 D	G1769-FS-D(3)	5.000	11/11/2020	1.28	4.81	24.0
PFOA	335-67-1	4630 D	G1769-FS-D(9)	78.125	11/11/2020	38.4	113	376
PFNA	375-95-1	2430 D	G1769-FS-D(7)	31.250	11/11/2020	9.28	30.0	150
PFDA	335-76-2	33.6	G1769-FS(0)	1.000	11/11/2020	0.137	0.481	4.81
PFUnA	2058-94-8	3.49 J	G1769-FS(0)	1.000	11/11/2020	0.211	0.481	4.81
PFDoA	307-55-1	0.481 U	G1769-FS(0)	1.000	11/11/2020	0.185	0.481	4.81
PFTrDA	72629-94-8	0.481 U	G1769-FS(0)	1.000	11/11/2020	0.148	0.481	4.81
PFTeDA	376-06-7	1.92 U	G1769-FS(0)	1.000	11/11/2020	0.705	1.92	4.81
NMeFOSAA	2355-31-9	0.962 U	G1769-FS(0)	1.000	11/11/2020	0.337	0.962	4.81
NEtFOSAA	2991-50-6	0.962 U	G1769-FS(0)	1.000	11/11/2020	0.481	0.962	4.81
PFBS	375-73-5	501 D	G1769-FS-D(3)	5.000	11/11/2020	0.692	2.40	24.0
PFHxS	355-46-4	7690 D	G1769-FS-D(11)	195.313	11/11/2020	21.0	75.1	939
PFOS	1763-23-1	13300 D	G1769-FS-D(11)	195.313	11/11/2020	82.1	188	939
HFPO-DA	13252-13-6	0.481 UJ	G1769-FS(0)	1.000	11/11/2020	0.238	0.481	4.81
Adona	919005-14-4	0.962 U	G1769-FS(0)	1.000	11/11/2020	0.255	0.962	4.81
9Cl-PF3ONS	756426-58-1	0.481 U	G1769-FS(0)	1.000	11/11/2020	0.258	0.481	4.81
11Cl-PF3OUdS	763051-92-9	0.962 U	G1769-FS(0)	1.000	11/11/2020	0.222	0.962	4.81

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Analyzed by: Schumitz, Denise
Printed: 11/17/2020

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6

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW02-1020
Battelle ID	G1772-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.275
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	3860 D	G1772-FS-D(7)	78.125	11/11/2020	37.4	107	355
PFHpA	375-85-9	1850 D	G1772-FS-D(3)	12.500	11/11/2020	2.99	11.4	56.8
PFOA	335-67-1	3870 D	G1772-FS-D(7)	78.125	11/11/2020	36.3	107	355
PFNA	375-95-1	31000 D	G1772-FS-D(11)	488.281	11/11/2020	137	444	2220
PFDA	335-76-2	849 D	G1772-FS-D(3)	12.500	11/11/2020	1.61	5.68	56.8
PFUnA	2058-94-8	868 D	G1772-FS-D(3)	12.500	11/11/2020	2.49	5.68	56.8
PFDoA	307-55-1	5.16	G1772-FS(0)	1.000	11/11/2020	0.175	0.455	4.55
PFTrDA	72629-94-8	86.9	G1772-FS(0)	1.000	11/11/2020	0.140	0.455	4.55
PFTeDA	376-06-7	1.82 U	G1772-FS(0)	1.000	11/11/2020	0.666	1.82	4.55
NMeFOSAA	2355-31-9	0.909 U	G1772-FS(0)	1.000	11/11/2020	0.318	0.909	4.55
NEtFOSAA	2991-50-6	0.909 U	G1772-FS(0)	1.000	11/11/2020	0.455	0.909	4.55
PFBS	375-73-5	261	G1772-FS(0)	1.000	11/11/2020	0.131	0.455	4.55
PFHxS	355-46-4	12300 D	G1772-FS-D(9)	195.313	11/11/2020	19.9	71.0	888
PFOS	1763-23-1	171000 D	G1772-FS-D(13)	2441.406	11/11/2020	970	2220	11100
HFPO-DA	13252-13-6	0.455 U	G1772-FS(0)	1.000	11/11/2020	0.225	0.455	4.55
Adona	919005-14-4	0.909 U	G1772-FS(0)	1.000	11/11/2020	0.241	0.909	4.55
9Cl-PF3ONS	756426-58-1	0.455 U	G1772-FS(0)	1.000	11/11/2020	0.244	0.455	4.55
11Cl-PF3OUdS	763051-92-9	0.909 U	G1772-FS(0)	1.000	11/11/2020	0.210	0.909	4.55

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Analyzed by: Schumitz, Denise
Printed: 11/17/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW18-1020
Battelle ID	G1773-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	636 D	G1773-FS-D(3)	5.000	11/11/2020	2.58	7.35	24.5
PFHpA	375-85-9	412 D	G1773-FS-D(3)	5.000	11/11/2020	1.29	4.90	24.5
PFOA	335-67-1	1030 D	G1773-FS-D(5)	12.500	11/11/2020	6.26	18.4	61.3
PFNA	375-95-1	631 D	G1773-FS-D(3)	5.000	11/11/2020	1.51	4.90	24.5
PFDA	335-76-2	8.21	G1773-FS(0)	1.000	11/11/2020	0.139	0.490	4.90
PFUnA	2058-94-8	30.8	G1773-FS(0)	1.000	11/11/2020	0.215	0.490	4.90
PFDoA	307-55-1	0.490 U	G1773-FS(0)	1.000	11/11/2020	0.188	0.490	4.90
PFTrDA	72629-94-8	0.490 U	G1773-FS(0)	1.000	11/11/2020	0.151	0.490	4.90
PFTeDA	376-06-7	1.96 J UJ	G1773-FS(0)	1.000	11/11/2020	0.719	1.96	4.90
NMeFOSAA	2355-31-9	0.441 J U	G1773-FS(0)	1.000	11/11/2020	0.343	0.980	4.90
NEtFOSAA	2991-50-6	0.980 U	G1773-FS(0)	1.000	11/11/2020	0.490	0.980	4.90
PFBS	375-73-5	62.0	G1773-FS(0)	1.000	11/11/2020	0.141	0.490	4.90
PFHxS	355-46-4	12800 D	G1773-FS-D(9)	156.250	11/12/2020	17.2	61.3	766
PFOS	1763-23-1	12700 D	G1773-FS-D(9)	156.250	11/12/2020	66.9	153	766
HFPO-DA	13252-13-6	0.490 U	G1773-FS(0)	1.000	11/11/2020	0.243	0.490	4.90
Adona	919005-14-4	0.980 U	G1773-FS(0)	1.000	11/11/2020	0.260	0.980	4.90
9Cl-PF3ONS	756426-58-1	0.490 U	G1773-FS(0)	1.000	11/11/2020	0.263	0.490	4.90
11Cl-PF3OUdS	763051-92-9	0.980 U	G1773-FS(0)	1.000	11/11/2020	0.226	0.980	4.90

0.980

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

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Client ID	CBD-AOA-MW18-1020
Battelle ID	G1773-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	87	D	G1773-FS-D(5)	11/11/2020
13C4-PFHpA	81	D	G1773-FS-D(5)	11/11/2020
13C8-PFOA	92	D	G1773-FS-D(5)	11/11/2020
13C9-PFNA	79	D	G1773-FS-D(5)	11/11/2020
13C6-PFDA	78		G1773-FS(0)	11/11/2020
13C7-PFUnA	76		G1773-FS(0)	11/11/2020
13C2-PFDoA	66		G1773-FS(0)	11/11/2020
13C2-PFTeDA	31	M	G1773-FS(0)	11/11/2020
d3-MeFOSAA	126	D	G1773-FS-D(9)	11/12/2020
d5-EtFOSAA	136	D	G1773-FS-D(9)	11/12/2020
13C3-PFBS	102	D	G1773-FS-D(9)	11/12/2020
13C3-PFHxS	94	D	G1773-FS-D(9)	11/12/2020
13C8-PFOS	96	D	G1773-FS-D(9)	11/12/2020
13C3-HFPO-DA	71	D	G1773-FS-D(5)	11/11/2020

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Analyzed by: Schumitz, Denise
Printed: 11/17/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

8

Client ID	CBD-AOA-EB01-101920-GW
Battelle ID	G1774-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.47 U	G1774-FS(0)	1.000	11/11/2020	0.517	1.47	4.90
PFHpA	375-85-9	0.980 U	G1774-FS(0)	1.000	11/11/2020	0.258	0.980	4.90
PFOA	335-67-1	1.47 U	G1774-FS(0)	1.000	11/11/2020	0.501	1.47	4.90
PFNA	375-95-1	0.980 U	G1774-FS(0)	1.000	11/11/2020	0.303	0.980	4.90
PFDA	335-76-2	0.490 U	G1774-FS(0)	1.000	11/11/2020	0.139	0.490	4.90
PFUnA	2058-94-8	0.490 U	G1774-FS(0)	1.000	11/11/2020	0.215	0.490	4.90
PFDoA	307-55-1	0.490 U	G1774-FS(0)	1.000	11/11/2020	0.188	0.490	4.90
PFTrDA	72629-94-8	0.490 U	G1774-FS(0)	1.000	11/11/2020	0.151	0.490	4.90
PFTeDA	376-06-7	1.96 U	G1774-FS(0)	1.000	11/11/2020	0.719	1.96	4.90
NMeFOSAA	2355-31-9	0.980 U	G1774-FS(0)	1.000	11/11/2020	0.343	0.980	4.90
NEtFOSAA	2991-50-6	0.980 U	G1774-FS(0)	1.000	11/11/2020	0.490	0.980	4.90
PFBS	375-73-5	0.490 U	G1774-FS(0)	1.000	11/11/2020	0.141	0.490	4.90
PFHxS	355-46-4	0.392 U	G1774-FS(0)	1.000	11/11/2020	0.110	0.392	4.90
PFOS	1763-23-1	0.449 J	G1774-FS(0)	1.000	11/11/2020	0.428	0.980	4.90
HFPO-DA	13252-13-6	0.490 U	G1774-FS(0)	1.000	11/11/2020	0.243	0.490	4.90
Adona	919005-14-4	0.980 U	G1774-FS(0)	1.000	11/11/2020	0.260	0.980	4.90
9Cl-PF3ONS	756426-58-1	0.490 U	G1774-FS(0)	1.000	11/11/2020	0.263	0.490	4.90
11Cl-PF3OUdS	763051-92-9	0.980 U	G1774-FS(0)	1.000	11/11/2020	0.226	0.980	4.90

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

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Client ID	CBD-SO3-MW01-1020
Battelle ID	G1775-FS
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	10/22/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.275
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	39.2	G1775-FS(0)	1.000	11/11/2020	0.479	1.36	4.55
PFHpA	375-85-9	14.5	G1775-FS(0)	1.000	11/11/2020	0.239	0.909	4.55
PFOA	335-67-1	59.6	G1775-FS(0)	1.000	11/11/2020	0.465	1.36	4.55
PFNA	375-95-1	67.7	G1775-FS(0)	1.000	11/11/2020	0.281	0.909	4.55
PFDA	335-76-2	0.708 J	G1775-FS(0)	1.000	11/11/2020	0.129	0.455	4.55
PFUnA	2058-94-8	2.96 J	G1775-FS(0)	1.000	11/11/2020	0.199	0.455	4.55
PFDoA	307-55-1	0.455 U	G1775-FS(0)	1.000	11/11/2020	0.175	0.455	4.55
PFTrDA	72629-94-8	0.455 U	G1775-FS(0)	1.000	11/11/2020	0.140	0.455	4.55
PFTeDA	376-06-7	1.82 U	G1775-FS(0)	1.000	11/11/2020	0.666	1.82	4.55
NMeFOSAA	2355-31-9	0.909 U	G1775-FS(0)	1.000	11/11/2020	0.318	0.909	4.55
NEtFOSAA	2991-50-6	0.909 U	G1775-FS(0)	1.000	11/11/2020	0.455	0.909	4.55
PFBS	375-73-5	7.50	G1775-FS(0)	1.000	11/11/2020	0.131	0.455	4.55
PFHxS	355-46-4	393	G1775-FS-D(3)	5.000	11/11/2020	0.509	1.82	22.7
PFOS	1763-23-1	1090	G1775-FS-D(7)	31.250	11/12/2020	12.4	28.4	142
HFPO-DA	13252-13-6	0.455 U	G1775-FS(0)	1.000	11/11/2020	0.225	0.455	4.55
Adona	919005-14-4	0.909 U	G1775-FS(0)	1.000	11/11/2020	0.241	0.909	4.55
9Cl-PF3ONS	756426-58-1	0.455 U	G1775-FS(0)	1.000	11/11/2020	0.244	0.455	4.55
11Cl-PF3OUdS	763051-92-9	0.909 U	G1775-FS(0)	1.000	11/11/2020	0.210	0.909	4.55

11/10/21

Analyzed by: Schumitz, Denise
Printed: 11/17/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1329
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 10, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-MW07-1020	G1794-FS	Water
2	CBD-AOA-MW17-1020	G1795-FS	Water
3	CBD-AOA-MW19-1020	G1796-FS	Water
4	CBD-AOA-FB05-102020	G1797-FS	Water
5	CBD-AOA-EB01-102020-GW	G1798-FS	Water
6	CBD-BKG-MW01-1020	G1799-FS	Water
7	CBD-BKG-MW02-1020	G1800-FS	Water
8	CBD-SO3-MW02-1020	G1801-FS	Water
9	CBD-AOA-MW09-1020	G1802-FS	Water
10	CBD-AOA-MW05-1020	G1803-FS	Water
11	CBD-AOA-EB01-102120-GW	G1804-FS	Water

A Stage 2B/4 data validation was performed on the analytical data for eight water samples, two aqueous equipment blank samples, and one aqueous field blank sample collected on October 20-21, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for water samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
DB009PB-FS	PFBS	0.166	U	4, 5, 6, 7, 10, 11
	PFHxS	0.115	U	4, 5, 11
	PFOS	0.661	U	1, 5, 7, 10, 11

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-FB05-102020	None - ND	-	-	-
CBD-AOA-EB01-102020-GW	PFUnA	0.266	U	1, 2, 6, 7, 8
CBD-AOA-EB01-102120-GW	PFUnA	0.284	U	9

Surrogate Spike Recoveries

- Several samples exhibited surrogates outside of QC limits. See summary pages behind Form Is for specifics. All associated compounds were qualified estimated (J/UJ).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW07-1020
Battelle ID	G1794-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.275
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	2.85 J	G1794-FS(0)	1.000	11/16/2020	0.479	1.36	4.55	
PFHpA	375-85-9	0.530 J	G1794-FS(0)	1.000	11/16/2020	0.236	0.909	4.55	
PFOA	335-67-1	1.36 U	G1794-FS(0)	1.000	11/16/2020	0.465	1.36	4.55	
PFNA	375-95-1	0.909 U	G1794-FS(0)	1.000	11/16/2020	0.281	0.909	4.55	
PFDA	335-76-2	0.455 U	G1794-FS(0)	1.000	11/16/2020	0.129	0.455	4.55	
PFUnA	2058-94-8	0.455 ~~0.283 J~~ U	G1794-FS(0)	1.000	11/16/2020	0.199	0.455	4.55	EBL
PFDoA	307-55-1	0.455 U	G1794-FS(0)	1.000	11/16/2020	0.175	0.455	4.55	
PFTrDA	72629-94-8	0.455 U	G1794-FS(0)	1.000	11/16/2020	0.140	0.455	4.55	
PFTeDA	376-06-7	1.82 U	G1794-FS(0)	1.000	11/16/2020	0.666	1.82	4.55	
NMeFOSAA	2355-31-9	0.909 U	G1794-FS(0)	1.000	11/16/2020	0.318	0.909	4.55	
NEtFOSAA	2991-50-6	0.909 U	G1794-FS(0)	1.000	11/16/2020	0.455	0.909	4.55	
PFBS	375-73-5	2.45 J	G1794-FS(0)	1.000	11/16/2020	0.131	0.455	4.55	
PFHxS	355-46-4	7.28	G1794-FS(0)	1.000	11/16/2020	0.102	0.364	4.55	
PFOS	1763-23-1	~~3.94~~ U	G1794-FS(0)	1.000	11/16/2020	0.397	0.909	4.55	MBL
HFPO-DA	13252-13-6	0.455 U	G1794-FS(0)	1.000	11/16/2020	0.225	0.455	4.55	
Adona	919005-14-4	0.909 U	G1794-FS(0)	1.000	11/16/2020	0.241	0.909	4.55	
9Cl-PF3ONS	756426-58-1	0.455 U	G1794-FS(0)	1.000	11/16/2020	0.244	0.455	4.55	
11Cl-PF3OUdS	763051-92-9	0.909 U	G1794-FS(0)	1.000	11/16/2020	0.210	0.909	4.55	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW17-1020
Battelle ID	G1795-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	5.49	G1795-FS(0)	1.000	11/16/2020	0.488	1.39	4.63	
PFHpA	375-85-9	1.43 J	G1795-FS(0)	1.000	11/16/2020	0.244	0.926	4.63	
PFOA	335-67-1	2.56 J	G1795-FS(0)	1.000	11/16/2020	0.473	1.39	4.63	
PFNA	375-95-1	1.50 J	G1795-FS(0)	1.000	11/16/2020	0.286	0.926	4.63	
PFDA	335-76-2	0.463 U	G1795-FS(0)	1.000	11/16/2020	0.131	0.463	4.63	
PFUnA	2058-94-8	0.463 ~~0.402~~ U	G1795-FS(0)	1.000	11/16/2020	0.203	0.463	4.63	EBL
PFDoA	307-55-1	0.463 U	G1795-FS(0)	1.000	11/16/2020	0.178	0.463	4.63	
PFTrDA	72629-94-8	0.463 U	G1795-FS(0)	1.000	11/16/2020	0.143	0.463	4.63	
PFTeDA	376-06-7	1.85 UJ	G1795-FS(0)	1.000	11/16/2020	0.679	1.85	4.63	SSL
NMeFOSAA	2355-31-9	0.926 U	G1795-FS(0)	1.000	11/16/2020	0.324	0.926	4.63	
NEtFOSAA	2991-50-6	0.926 U	G1795-FS(0)	1.000	11/16/2020	0.463	0.926	4.63	
PFBS	375-73-5	1.72 J	G1795-FS(0)	1.000	11/16/2020	0.133	0.463	4.63	
PFHxS	355-46-4	28.0	G1795-FS(0)	1.000	11/16/2020	0.104	0.370	4.63	
PFOS	1763-23-1	9.67	G1795-FS(0)	1.000	11/16/2020	0.405	0.926	4.63	
HFPO-DA	13252-13-6	0.463 U	G1795-FS(0)	1.000	11/16/2020	0.230	0.463	4.63	
Adona	919005-14-4	0.926 U	G1795-FS(0)	1.000	11/16/2020	0.245	0.926	4.63	
9Cl-PF3ONS	756426-58-1	0.463 U	G1795-FS(0)	1.000	11/16/2020	0.248	0.463	4.63	
11Cl-PF3OUdS	763051-92-9	0.926 U	G1795-FS(0)	1.000	11/16/2020	0.214	0.926	4.63	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW17-1020
Battelle ID	G1795-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	99	G1795-FS(0)	11/16/2020
13C4-PFHpA	91	G1795-FS(0)	11/16/2020
13C8-PFOA	94	G1795-FS(0)	11/16/2020
13C9-PFNA	95	G1795-FS(0)	11/16/2020
13C6-PFDA	86	G1795-FS(0)	11/16/2020
13C7-PFUnA	75	G1795-FS(0)	11/16/2020
13C2-PFDoA	57	G1795-FS(0)	11/16/2020
13C2-PFTeDA	23	G1795-FS(0)	11/16/2020
d3-MeFOSAA	77	G1795-FS(0)	11/16/2020
d5-EtFOSAA	69	G1795-FS(0)	11/16/2020
13C3-PFBS	100	G1795-FS(0)	11/16/2020
13C3-PFHxS	104	G1795-FS(0)	11/16/2020
13C8-PFOS	100	G1795-FS(0)	11/16/2020
13C3-HFPO-DA	89	G1795-FS(0)	11/16/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW19-1020
Battelle ID	G1796-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.275
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	12.1	G1796-FS(0)	1.000	11/16/2020	0.479	1.36	4.55
PFHpA	375-85-9	5.49	G1796-FS(0)	1.000	11/16/2020	0.239	0.909	4.55
PFOA	335-67-1	23.7	G1796-FS(0)	1.000	11/16/2020	0.465	1.36	4.55
PFNA	375-95-1	1.20 J	G1796-FS(0)	1.000	11/16/2020	0.281	0.909	4.55
PFDA	335-76-2	0.455 U	G1796-FS(0)	1.000	11/16/2020	0.129	0.455	4.55
PFUnA	2058-94-8	0.455 U	G1796-FS(0)	1.000	11/16/2020	0.199	0.455	4.55
PFDoA	307-55-1	0.455 U	G1796-FS(0)	1.000	11/16/2020	0.175	0.455	4.55
PFTrDA	72629-94-8	0.455 U	G1796-FS(0)	1.000	11/16/2020	0.140	0.455	4.55
PFTeDA	376-06-7	1.82 U	G1796-FS(0)	1.000	11/16/2020	0.666	1.82	4.55
NMeFOSAA	2355-31-9	0.909 U	G1796-FS(0)	1.000	11/16/2020	0.318	0.909	4.55
NEtFOSAA	2991-50-6	0.909 U	G1796-FS(0)	1.000	11/16/2020	0.455	0.909	4.55
PFBS	375-73-5	1.81 J	G1796-FS(0)	1.000	11/16/2020	0.131	0.455	4.55
PFHxS	355-46-4	59.0	G1796-FS(0)	1.000	11/16/2020	0.102	0.364	4.55
PFOS	1763-23-1	21.1	G1796-FS(0)	1.000	11/16/2020	0.397	0.909	4.55
HFPO-DA	13252-13-6	0.455 U	G1796-FS(0)	1.000	11/16/2020	0.225	0.455	4.55
Adona	919005-14-4	0.909 U	G1796-FS(0)	1.000	11/16/2020	0.241	0.909	4.55
9Cl-PF3ONS	756426-58-1	0.455 U	G1796-FS(0)	1.000	11/16/2020	0.244	0.455	4.55
11Cl-PF3OUdS	763051-92-9	0.909 U	G1796-FS(0)	1.000	11/16/2020	0.210	0.909	4.55

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-FB05-102020
Battelle ID	G1797-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.42 U	G1797-FS(0)	1.000	11/16/2020	0.497	1.42	4.72	
PFHpA	375-85-9	0.943 U	G1797-FS(0)	1.000	11/16/2020	0.248	0.943	4.72	
PFOA	335-67-1	1.42 U	G1797-FS(0)	1.000	11/16/2020	0.482	1.42	4.72	
PFNA	375-95-1	0.943 U	G1797-FS(0)	1.000	11/16/2020	0.292	0.943	4.72	
PFDA	335-76-2	0.472 U	G1797-FS(0)	1.000	11/16/2020	0.134	0.472	4.72	
PFUnA	2058-94-8	0.472 U	G1797-FS(0)	1.000	11/16/2020	0.207	0.472	4.72	
PFDoA	307-55-1	0.472 U	G1797-FS(0)	1.000	11/16/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	0.472 U	G1797-FS(0)	1.000	11/16/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89 U	G1797-FS(0)	1.000	11/16/2020	0.692	1.89	4.72	
NMeFOSAA	2355-31-9	0.943 U	G1797-FS(0)	1.000	11/16/2020	0.330	0.943	4.72	
NEtFOSAA	2991-50-6	0.943 U	G1797-FS(0)	1.000	11/16/2020	0.472	0.943	4.72	
PFBS	375-73-5	0.472 ~~0.149 J~~ U	G1797-FS(0)	1.000	11/16/2020	0.136	0.472	4.72	MBL
PFHxS	355-46-4	0.377 ~~0.111 J~~ U	G1797-FS(0)	1.000	11/16/2020	0.106	0.377	4.72	MBL
PFOS	1763-23-1	0.943 U	G1797-FS(0)	1.000	11/16/2020	0.412	0.943	4.72	
HFPO-DA	13252-13-6	0.472 U	G1797-FS(0)	1.000	11/16/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943 U	G1797-FS(0)	1.000	11/16/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472 U	G1797-FS(0)	1.000	11/16/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943 U	G1797-FS(0)	1.000	11/16/2020	0.218	0.943	4.72	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB01-102020-GW
Battelle ID	G1798-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.42 U	G1798-FS(0)	1.000	11/16/2020	0.497	1.42	4.72
PFHpA	375-85-9	0.943 U	G1798-FS(0)	1.000	11/16/2020	0.248	0.943	4.72
PFOA	335-67-1	1.42 U	G1798-FS(0)	1.000	11/16/2020	0.482	1.42	4.72
PFNA	375-95-1	0.943 U	G1798-FS(0)	1.000	11/16/2020	0.292	0.943	4.72
PFDA	335-76-2	0.472 U	G1798-FS(0)	1.000	11/16/2020	0.134	0.472	4.72
PFUnA	2058-94-8	0.266 J	G1798-FS(0)	1.000	11/16/2020	0.207	0.472	4.72
PFDoA	307-55-1	0.472 U	G1798-FS(0)	1.000	11/16/2020	0.181	0.472	4.72
PFTrDA	72629-94-8	0.472 U	G1798-FS(0)	1.000	11/16/2020	0.145	0.472	4.72
PFTeDA	376-06-7	1.89 U	G1798-FS(0)	1.000	11/16/2020	0.692	1.89	4.72
NMeFOSAA	2355-31-9	0.943 U	G1798-FS(0)	1.000	11/16/2020	0.330	0.943	4.72
NEtFOSAA	2991-50-6	0.943 U	G1798-FS(0)	1.000	11/16/2020	0.472	0.943	4.72
PFBS	375-73-5	0.153 U	G1798-FS(0)	1.000	11/16/2020	0.136	0.472	4.72
PFHxS	355-46-4	0.107 U	G1798-FS(0)	1.000	11/16/2020	0.106	0.377	4.72
PFOS	1763-23-1	2.39	G1798-FS(0)	1.000	11/16/2020	0.412	0.943	4.72
HFPO-DA	13252-13-6	0.472 U	G1798-FS(0)	1.000	11/16/2020	0.234	0.472	4.72
Adona	919005-14-4	0.943 U	G1798-FS(0)	1.000	11/16/2020	0.250	0.943	4.72
9Cl-PF3ONS	756426-58-1	0.472 U	G1798-FS(0)	1.000	11/16/2020	0.253	0.472	4.72
11Cl-PF3OUdS	763051-92-9	0.943 U	G1798-FS(0)	1.000	11/16/2020	0.218	0.943	4.72

0.472 0.153 U
0.377 0.107 U

MBL

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-BKG-MW01-1020
Battelle ID	G1799-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.74 J	G1799-FS(0)	1.000	11/16/2020	0.488	1.39	4.63	
PFHpA	375-85-9	0.506 J	G1799-FS(0)	1.000	11/16/2020	0.244	0.926	4.63	
PFOA	335-67-1	1.40 J	G1799-FS(0)	1.000	11/16/2020	0.473	1.39	4.63	
PFNA	375-95-1	0.926 U	G1799-FS(0)	1.000	11/16/2020	0.286	0.926	4.63	
PFDA	335-76-2	0.463 U	G1799-FS(0)	1.000	11/16/2020	0.131	0.463	4.63	
PFUnA	2058-94-8	0.463 0.243 U	G1799-FS(0)	1.000	11/16/2020	0.203	0.463	4.63	EBL
PFDoA	307-55-1	0.463 U	G1799-FS(0)	1.000	11/16/2020	0.178	0.463	4.63	
PFTrDA	72629-94-8	0.463 U	G1799-FS(0)	1.000	11/16/2020	0.143	0.463	4.63	
PFTeDA	376-06-7	1.85 U	G1799-FS(0)	1.000	11/16/2020	0.679	1.85	4.63	
NMeFOSAA	2355-31-9	0.926 U	G1799-FS(0)	1.000	11/16/2020	0.324	0.926	4.63	
NEtFOSAA	2991-50-6	0.926 U	G1799-FS(0)	1.000	11/16/2020	0.463	0.926	4.63	
PFBS	375-73-5	1.19 / U	G1799-FS(0)	1.000	11/16/2020	0.133	0.463	4.63	MBL
PFHxS	355-46-4	13.5	G1799-FS(0)	1.000	11/16/2020	0.104	0.370	4.63	
PFOS	1763-23-1	10.8	G1799-FS(0)	1.000	11/16/2020	0.405	0.926	4.63	
HFPO-DA	13252-13-6	0.463 U	G1799-FS(0)	1.000	11/16/2020	0.230	0.463	4.63	
Adona	919005-14-4	0.926 U	G1799-FS(0)	1.000	11/16/2020	0.245	0.926	4.63	
9Cl-PF3ONS	756426-58-1	0.463 U	G1799-FS(0)	1.000	11/16/2020	0.248	0.463	4.63	
11Cl-PF3OUdS	763051-92-9	0.926 U	G1799-FS(0)	1.000	11/16/2020	0.214	0.926	4.63	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-BKG-MW02-1020
Battelle ID	G1800-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.39 U	G1800-FS(0)	1.000	11/16/2020	0.488	1.39	4.63	
PFHpA	375-85-9	0.926 U	G1800-FS(0)	1.000	11/16/2020	0.244	0.926	4.63	
PFOA	335-67-1	0.988 J	G1800-FS(0)	1.000	11/16/2020	0.473	1.39	4.63	
PFNA	375-95-1	0.926 U	G1800-FS(0)	1.000	11/16/2020	0.286	0.926	4.63	
PFDA	335-76-2	0.463 U	G1800-FS(0)	1.000	11/16/2020	0.131	0.463	4.63	
PFUnA	2058-94-8	0.463 ~~0.234~~ U	G1800-FS(0)	1.000	11/16/2020	0.203	0.463	4.63	EBL
PFDoA	307-55-1	0.463 U	G1800-FS(0)	1.000	11/16/2020	0.178	0.463	4.63	
PFTrDA	72629-94-8	0.463 U	G1800-FS(0)	1.000	11/16/2020	0.143	0.463	4.63	
PFTeDA	376-06-7	1.85 U	G1800-FS(0)	1.000	11/16/2020	0.679	1.85	4.63	
NMeFOSAA	2355-31-9	0.926 U	G1800-FS(0)	1.000	11/16/2020	0.324	0.926	4.63	
NEtFOSAA	2991-50-6	0.926 U	G1800-FS(0)	1.000	11/16/2020	0.463	0.926	4.63	
PFBS	375-73-5	0.999 ~~1~~ U	G1800-FS(0)	1.000	11/16/2020	0.133	0.463	4.63	MBL
PFHxS	355-46-4	17.5	G1800-FS(0)	1.000	11/16/2020	0.104	0.370	4.63	
PFOS	1763-23-1	2.25 ~~1~~ U	G1800-FS(0)	1.000	11/16/2020	0.405	0.926	4.63	MBL
HFPO-DA	13252-13-6	0.463 U	G1800-FS(0)	1.000	11/16/2020	0.230	0.463	4.63	
Adona	919005-14-4	0.926 U	G1800-FS(0)	1.000	11/16/2020	0.245	0.926	4.63	
9Cl-PF3ONS	756426-58-1	0.463 U	G1800-FS(0)	1.000	11/16/2020	0.248	0.463	4.63	
11Cl-PF3OUdS	763051-92-9	0.926 U	G1800-FS(0)	1.000	11/16/2020	0.214	0.926	4.63	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-SO3-MW02-1020
Battelle ID	G1801-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	69.7	G1801-FS(0)	1.000	11/16/2020	0.527	1.50	5.00	
PFHpA	375-85-9	40.6	G1801-FS(0)	1.000	11/16/2020	0.263	1.00	5.00	
PFOA	335-67-1	94.2	G1801-FS(0)	1.000	11/16/2020	0.511	1.50	5.00	
PFNA	375-95-1	60.7	G1801-FS(0)	1.000	11/16/2020	0.309	1.00	5.00	
PFDA	335-76-2	0.500 U	G1801-FS(0)	1.000	11/16/2020	0.142	0.500	5.00	
PFUnA	2058-94-8	0.500 ~~0.484~~ J U	G1801-FS(0)	1.000	11/16/2020	0.219	0.500	5.00	EBL
PFDoA	307-55-1	0.500 U	G1801-FS(0)	1.000	11/16/2020	0.192	0.500	5.00	
PFTrDA	72629-94-8	0.500 U	G1801-FS(0)	1.000	11/16/2020	0.154	0.500	5.00	
PFTeDA	376-06-7	2.00 J UJ	G1801-FS(0)	1.000	11/16/2020	0.733	2.00	5.00	SSL
NMeFOSAA	2355-31-9	1.00 U	G1801-FS(0)	1.000	11/16/2020	0.350	1.00	5.00	
NEtFOSAA	2991-50-6	1.00 U	G1801-FS(0)	1.000	11/16/2020	0.500	1.00	5.00	
PFBS	375-73-5	10.1	G1801-FS(0)	1.000	11/16/2020	0.144	0.500	5.00	
PFHxS	355-46-4	252 D	G1801-FS-D(3)	12.500	11/17/2020	1.40	5.00	62.5	
PFOS	1763-23-1	323 D	G1801-FS-D(3)	12.500	11/17/2020	5.46	12.5	62.5	
HFPO-DA	13252-13-6	0.500 U	G1801-FS(0)	1.000	11/16/2020	0.248	0.500	5.00	
Adona	919005-14-4	1.00 U	G1801-FS(0)	1.000	11/16/2020	0.265	1.00	5.00	
9Cl-PF3ONS	756426-58-1	0.500 U	G1801-FS(0)	1.000	11/16/2020	0.268	0.500	5.00	
11Cl-PF3OUdS	763051-92-9	1.00 U	G1801-FS(0)	1.000	11/16/2020	0.231	1.00	5.00	

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Printed: 11/18/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-SO3-MW02-1020
Battelle ID	G1801-FS
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	87	G1801-FS(0)	11/16/2020
13C4-PFHpA	87	G1801-FS(0)	11/16/2020
13C8-PFOA	85	G1801-FS(0)	11/16/2020
13C9-PFNA	82	G1801-FS(0)	11/16/2020
13C6-PFDA	79	G1801-FS(0)	11/16/2020
13C7-PFUnA	79	G1801-FS(0)	11/16/2020
13C2-PFDoA	72	G1801-FS(0)	11/16/2020
13C2-PFTeDA	46 M	G1801-FS(0)	11/16/2020
d3-MeFOSAA	89	G1801-FS-D(3)	11/17/2020
d5-EtFOSAA	98	G1801-FS-D(3)	11/17/2020
13C3-PFBS	96	G1801-FS-D(3)	11/17/2020
13C3-PFHxS	97	G1801-FS-D(3)	11/17/2020
13C8-PFOS	96	G1801-FS-D(3)	11/17/2020
13C3-HFPO-DA	83	G1801-FS(0)	11/16/2020

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Printed: 11/18/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW09-1020
Battelle ID	G1802-FS
Sample Type	SA
Collection Date	10/21/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	8.96	G1802-FS(0)	1.000	11/16/2020	0.488	1.39	4.63	
PFHpA	375-85-9	2.01 J	G1802-FS(0)	1.000	11/16/2020	0.244	0.926	4.63	
PFOA	335-67-1	9.05	G1802-FS(0)	1.000	11/16/2020	0.473	1.39	4.63	
PFNA	375-95-1	0.440 J	G1802-FS(0)	1.000	11/16/2020	0.286	0.926	4.63	
PFDA	335-76-2	0.463 U	G1802-FS(0)	1.000	11/16/2020	0.131	0.463	4.63	
PFUnA	2058-94-8	0.463 ~~0.286 J~~ U	G1802-FS(0)	1.000	11/16/2020	0.203	0.463	4.63	EBL
PFDoA	307-55-1	0.463 U	G1802-FS(0)	1.000	11/16/2020	0.178	0.463	4.63	
PFTrDA	72629-94-8	0.463 U	G1802-FS(0)	1.000	11/16/2020	0.143	0.463	4.63	
PFTeDA	376-06-7	1.85 ~~J~~ UJ	G1802-FS(0)	1.000	11/16/2020	0.679	1.85	4.63	SSL
NMeFOSAA	2355-31-9	0.926 U	G1802-FS(0)	1.000	11/16/2020	0.324	0.926	4.63	
NEtFOSAA	2991-50-6	0.926 U	G1802-FS(0)	1.000	11/16/2020	0.463	0.926	4.63	
PFBS	375-73-5	1.88 J	G1802-FS(0)	1.000	11/16/2020	0.133	0.463	4.63	
PFHxS	355-46-4	75.1	G1802-FS(0)	1.000	11/16/2020	0.104	0.370	4.63	
PFOS	1763-23-1	15.6	G1802-FS(0)	1.000	11/16/2020	0.405	0.926	4.63	
HFPO-DA	13252-13-6	0.463 U	G1802-FS(0)	1.000	11/16/2020	0.230	0.463	4.63	
Adona	919005-14-4	0.926 U	G1802-FS(0)	1.000	11/16/2020	0.245	0.926	4.63	
9Cl-PF3ONS	756426-58-1	0.463 U	G1802-FS(0)	1.000	11/16/2020	0.248	0.463	4.63	
11Cl-PF3OUdS	763051-92-9	0.926 U	G1802-FS(0)	1.000	11/16/2020	0.214	0.926	4.63	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW09-1020
Battelle ID	G1802-FS
Sample Type	SA
Collection Date	10/21/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	86	G1802-FS(0)	11/16/2020
13C4-PFHpA	85	G1802-FS(0)	11/16/2020
13C8-PFOA	87	G1802-FS(0)	11/16/2020
13C9-PFNA	78	G1802-FS(0)	11/16/2020
13C6-PFDA	78	G1802-FS(0)	11/16/2020
13C7-PFUnA	65	G1802-FS(0)	11/16/2020
13C2-PFDoA	58	G1802-FS(0)	11/16/2020
13C2-PFTeDA	13 ✓	G1802-FS(0)	11/16/2020
d3-MeFOSAA	63	G1802-FS(0)	11/16/2020
d5-EtFOSAA	67	G1802-FS(0)	11/16/2020
13C3-PFBS	88	G1802-FS(0)	11/16/2020
13C3-PFHxS	92	G1802-FS(0)	11/16/2020
13C8-PFOS	87	G1802-FS(0)	11/16/2020
13C3-HFPO-DA	80	G1802-FS(0)	11/16/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW05-1020
Battelle ID	G1803-FS
Sample Type	SA
Collection Date	10/21/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.265
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	0.828 J	G1803-FS(0)	1.000	11/17/2020	0.497	1.42	4.72	
PFHpA	375-85-9	0.943 U	G1803-FS(0)	1.000	11/17/2020	0.248	0.943	4.72	
PFOA	335-67-1	1.42 U	G1803-FS(0)	1.000	11/17/2020	0.482	1.42	4.72	
PFNA	375-95-1	0.943 U	G1803-FS(0)	1.000	11/17/2020	0.292	0.943	4.72	
PFDA	335-76-2	0.472 U	G1803-FS(0)	1.000	11/17/2020	0.134	0.472	4.72	
PFUnA	2058-94-8	0.472 U	G1803-FS(0)	1.000	11/17/2020	0.207	0.472	4.72	
PFDoA	307-55-1	0.472 U	G1803-FS(0)	1.000	11/17/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	0.472 U	G1803-FS(0)	1.000	11/17/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89 U	G1803-FS(0)	1.000	11/17/2020	0.692	1.89	4.72	
NMeFOSAA	2355-31-9	0.943 U	G1803-FS(0)	1.000	11/17/2020	0.330	0.943	4.72	
NEtFOSAA	2991-50-6	0.943 U	G1803-FS(0)	1.000	11/17/2020	0.472	0.943	4.72	
PFBS	375-73-5	0.933 J U	G1803-FS(0)	1.000	11/17/2020	0.136	0.472	4.72	MBL
PFHxS	355-46-4	3.51 J	G1803-FS(0)	1.000	11/17/2020	0.106	0.377	4.72	
PFOS	1763-23-1	0.943 0.710 J U	G1803-FS(0)	1.000	11/17/2020	0.412	0.943	4.72	MBL
HFPO-DA	13252-13-6	0.472 U	G1803-FS(0)	1.000	11/17/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943 U	G1803-FS(0)	1.000	11/17/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472 U	G1803-FS(0)	1.000	11/17/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943 U	G1803-FS(0)	1.000	11/17/2020	0.218	0.943	4.72	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB01-102120-GW
Battelle ID	G1804-FS
Sample Type	SA
Collection Date	10/21/2020
Extraction Date	10/23/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.245
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.53 U	G1804-FS(0)	1.000	11/16/2020	0.538	1.53	5.10	
PFHpA	375-85-9	1.02 U	G1804-FS(0)	1.000	11/16/2020	0.268	1.02	5.10	
PFOA	335-67-1	1.53 U	G1804-FS(0)	1.000	11/16/2020	0.521	1.53	5.10	
PFNA	375-95-1	1.02 U	G1804-FS(0)	1.000	11/16/2020	0.315	1.02	5.10	
PFDA	335-76-2	0.510 U	G1804-FS(0)	1.000	11/16/2020	0.145	0.510	5.10	
PFUnA	2058-94-8	0.284 J	G1804-FS(0)	1.000	11/16/2020	0.223	0.510	5.10	
PFDoA	307-55-1	0.510 U	G1804-FS(0)	1.000	11/16/2020	0.196	0.510	5.10	
PFTrDA	72629-94-8	0.510 U	G1804-FS(0)	1.000	11/16/2020	0.157	0.510	5.10	
PFTeDA	376-06-7	2.04 U	G1804-FS(0)	1.000	11/16/2020	0.748	2.04	5.10	
NMeFOSAA	2355-31-9	1.02 U	G1804-FS(0)	1.000	11/16/2020	0.357	1.02	5.10	
NEtFOSAA	2991-50-6	1.02 U	G1804-FS(0)	1.000	11/16/2020	0.510	1.02	5.10	
PFBS	375-73-5	0.178 J	G1804-FS(0)	1.000	11/16/2020	0.147	0.510	5.10	MBL
PFHxS	355-46-4	0.175 J	G1804-FS(0)	1.000	11/16/2020	0.114	0.408	5.10	
PFOS	1763-23-1	4.76	G1804-FS(0)	1.000	11/16/2020	0.446	1.02	5.10	
HFPO-DA	13252-13-6	0.510 U	G1804-FS(0)	1.000	11/16/2020	0.253	0.510	5.10	
Adona	919005-14-4	1.02 U	G1804-FS(0)	1.000	11/16/2020	0.270	1.02	5.10	
9Cl-PF3ONS	756426-58-1	0.510 U	G1804-FS(0)	1.000	11/16/2020	0.273	0.510	5.10	
11Cl-PF3OUdS	763051-92-9	1.02 U	G1804-FS(0)	1.000	11/16/2020	0.236	1.02	5.10	

0.510 U
0.408 U

11/16/21

Analyzed by: Griffith, Lauren
Printed: 11/18/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1375
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 11, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-MW06-1020	G2203-FS	Water
2	CBD-AOA-EB01-102720-GW	G2204-FS	Water
3	CBD-AOA-MW12-1020	G2205-FS	Water
4	CBD-AOA-MW11-1020	G2206-FS	Water
5	CBD-AOA-MW11P-1020	G2207-FS	Water
6	CBD-AOA-FB01-102820	G2208-FS	Water
7	CBD-AOA-EB01-102820-GW	G2209-FS	Water
8	CBD-AOA-MW14-1020	G2210-FS	Water
9	CBD-AOA-MW13-1020	G2211-FS	Water

A Stage 2B/4 data validation was performed on the analytical data for six water samples, one aqueous field blank sample, and two aqueous equipment blank samples collected on October 27-28, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for water samples and analyzed within 28 days.

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks exhibited the following contamination.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
DB124PB-FS	PFHxA	1.02	U	1, 7, 8

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-102720-GW	None - ND	-	-	-
CBD-AOA-FB01-102820	None - ND	-	-	-
CBD-AOA-EB01-102820-GW	PFTrDA	0.291	None	Associated Samples ND
	PFOS	1.20	U	8

Surrogate Spike Recoveries

- Several samples exhibited surrogates outside of QC limits. See summary pages behind Form Is for specifics. All associated compounds were qualified estimated (J/UJ).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	CBD-AOA-MW11-1020 ng/L	CBD-AOA-MW11P-1020 ng/L	RPD	Qualifier
PFOA	0.681	0.765	12%	None

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW06-1020
Battelle ID	G2203-FS
Sample Type	SA
Collection Date	10/27/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.46 J U	G2203-FS(0)	1.000	11/19/2020	0.507	1.44	4.81	MBL
PFHpA	375-85-9	1.54 J	G2203-FS(0)	1.000	11/19/2020	0.253	0.962	4.81	
PFOA	335-67-1	55.0	G2203-FS(0)	1.000	11/19/2020	0.491	1.44	4.81	
PFNA	375-95-1	0.426 J	G2203-FS(0)	1.000	11/19/2020	0.297	0.962	4.81	
PFDA	335-76-2	0.481 U	G2203-FS(0)	1.000	11/19/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	0.481 U	G2203-FS(0)	1.000	11/19/2020	0.211	0.481	4.81	
PFDoA	307-55-1	0.481 U	G2203-FS(0)	1.000	11/19/2020	0.185	0.481	4.81	
PFTrDA	72629-94-8	0.481 U	G2203-FS(0)	1.000	11/19/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92 J U J	G2203-FS(0)	1.000	11/19/2020	0.705	1.92	4.81	SSL
NMeFOSAA	2355-31-9	0.962 U	G2203-FS(0)	1.000	11/19/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962 U	G2203-FS(0)	1.000	11/19/2020	0.481	0.962	4.81	
PFBS	375-73-5	1.04 J	G2203-FS(0)	1.000	11/19/2020	0.138	0.481	4.81	
PFHxS	355-46-4	15.1	G2203-FS(0)	1.000	11/19/2020	0.108	0.385	4.81	
PFOS	1763-23-1	5.96	G2203-FS(0)	1.000	11/19/2020	0.420	0.962	4.81	
HFPO-DA	13252-13-6	0.481 U	G2203-FS(0)	1.000	11/19/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962 U	G2203-FS(0)	1.000	11/19/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481 U	G2203-FS(0)	1.000	11/19/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962 U	G2203-FS(0)	1.000	11/19/2020	0.222	0.962	4.81	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW06-1020
Battelle ID	G2203-FS
Sample Type	SA
Collection Date	10/27/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	51	G2203-FS(0)	11/19/2020
13C4-PFHpA	67	G2203-FS(0)	11/19/2020
13C8-PFOA	70	G2203-FS(0)	11/19/2020
13C9-PFNA	73	G2203-FS(0)	11/19/2020
13C6-PFDA	77	G2203-FS(0)	11/19/2020
13C7-PFUnA	67	G2203-FS(0)	11/19/2020
13C2-PFDoA	60	G2203-FS(0)	11/19/2020
13C2-PFTeDA	23	G2203-FS(0)	11/19/2020
d3-MeFOSAA	72	G2203-FS(0)	11/19/2020
d5-EtFOSAA	89	G2203-FS(0)	11/19/2020
13C3-PFBS	86	G2203-FS(0)	11/19/2020
13C3-PFHxS	92	G2203-FS(0)	11/19/2020
13C8-PFOS	83	G2203-FS(0)	11/19/2020
13C3-HFPO-DA	77	G2203-FS(0)	11/19/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB01-102720-GW
Battelle ID	G2204-FS
Sample Type	SA
Collection Date	10/27/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.50 U	G2204-FS(0)	1.000	11/19/2020	0.527	1.50	5.00
PFHpA	375-85-9	1.00 U	G2204-FS(0)	1.000	11/19/2020	0.263	1.00	5.00
PFOA	335-67-1	1.50 U	G2204-FS(0)	1.000	11/19/2020	0.511	1.50	5.00
PFNA	375-95-1	1.00 U	G2204-FS(0)	1.000	11/19/2020	0.309	1.00	5.00
PFDA	335-76-2	0.500 U	G2204-FS(0)	1.000	11/19/2020	0.142	0.500	5.00
PFUnA	2058-94-8	0.500 U	G2204-FS(0)	1.000	11/19/2020	0.219	0.500	5.00
PFDoA	307-55-1	0.500 U	G2204-FS(0)	1.000	11/19/2020	0.192	0.500	5.00
PFTrDA	72629-94-8	0.500 U	G2204-FS(0)	1.000	11/19/2020	0.154	0.500	5.00
PFTeDA	376-06-7	2.00 U	G2204-FS(0)	1.000	11/19/2020	0.733	2.00	5.00
NMeFOSAA	2355-31-9	1.00 U	G2204-FS(0)	1.000	11/19/2020	0.350	1.00	5.00
NEtFOSAA	2991-50-6	1.00 U	G2204-FS(0)	1.000	11/19/2020	0.500	1.00	5.00
PFBS	375-73-5	0.500 U	G2204-FS(0)	1.000	11/19/2020	0.144	0.500	5.00
PFHxS	355-46-4	0.400 U	G2204-FS(0)	1.000	11/19/2020	0.112	0.400	5.00
PFOS	1763-23-1	1.00 U	G2204-FS(0)	1.000	11/19/2020	0.437	1.00	5.00
HFPO-DA	13252-13-6	0.500 U	G2204-FS(0)	1.000	11/19/2020	0.248	0.500	5.00
Adona	919005-14-4	1.00 U	G2204-FS(0)	1.000	11/19/2020	0.265	1.00	5.00
9Cl-PF3ONS	756426-58-1	0.500 U	G2204-FS(0)	1.000	11/19/2020	0.268	0.500	5.00
11Cl-PF3OUdS	763051-92-9	1.00 U	G2204-FS(0)	1.000	11/19/2020	0.231	1.00	5.00

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW12-1020
Battelle ID	G2205-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.275
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.36 ~~J~~ UJ	G2205-FS(0)	1.000	11/19/2020	0.479	1.36	4.55	SSL
~~PFHpA~~	~~375-85-9~~	~~0.909 U~~ UJ	~~G2205-FS(0)~~	~~1.000~~	~~11/19/2020~~	~~0.239~~	~~0.909~~	~~4.55~~	SSL
PFOA	335-67-1	0.681 J	G2205-FS(0)	1.000	11/19/2020	0.465	1.36	4.55	
~~PFNA~~	~~375-95-1~~	~~0.909 U~~	~~G2205-FS(0)~~	~~1.000~~	~~11/19/2020~~	~~0.281~~	~~0.909~~	~~4.55~~	
PFDA	335-76-2	0.455 U	G2205-FS(0)	1.000	11/19/2020	0.129	0.455	4.55	
~~PFUnA~~	~~2058-94-8~~	~~0.455 U~~	~~G2205-FS(0)~~	~~1.000~~	~~11/19/2020~~	~~0.199~~	~~0.455~~	~~4.55~~	
PFDoA	307-55-1	0.455 U	G2205-FS(0)	1.000	11/19/2020	0.175	0.455	4.55	
~~PFTrDA~~	~~72629-94-8~~	~~0.455 U~~	~~G2205-FS(0)~~	~~1.000~~	~~11/19/2020~~	~~0.140~~	~~0.455~~	~~4.55~~	
PFTeDA	376-06-7	1.82 U	G2205-FS(0)	1.000	11/19/2020	0.666	1.82	4.55	
~~NMeFOSAA~~	~~2355-31-9~~	~~0.909 U~~	~~G2205-FS(0)~~	~~1.000~~	~~11/19/2020~~	~~0.318~~	~~0.909~~	~~4.55~~	
NEtFOSAA	2991-50-6	0.909 U	G2205-FS(0)	1.000	11/19/2020	0.455	0.909	4.55	
~~PFBS~~	~~375-73-5~~	~~0.455 U~~	~~G2205-FS(0)~~	~~1.000~~	~~11/19/2020~~	~~0.131~~	~~0.455~~	~~4.55~~	
PFHxS	355-46-4	0.152 J	G2205-FS(0)	1.000	11/19/2020	0.102	0.364	4.55	
~~PFOS~~	~~1763-23-1~~	~~0.909 U~~	~~G2205-FS(0)~~	~~1.000~~	~~11/19/2020~~	~~0.397~~	~~0.909~~	~~4.55~~	
HFPO-DA	13252-13-6	0.455 U	G2205-FS(0)	1.000	11/19/2020	0.225	0.455	4.55	
~~Adona~~	~~919005-14-4~~	~~0.909 U~~	~~G2205-FS(0)~~	~~1.000~~	~~11/19/2020~~	~~0.241~~	~~0.909~~	~~4.55~~	
9Cl-PF3ONS	756426-58-1	0.455 U	G2205-FS(0)	1.000	11/19/2020	0.244	0.455	4.55	
~~11Cl-PF3OUdS~~	~~763051-92-9~~	~~0.909 U~~	~~G2205-FS(0)~~	~~1.000~~	~~11/19/2020~~	~~0.210~~	~~0.909~~	~~4.55~~	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW12-1020
Battelle ID	G2205-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	42	G2205-FS(0)	11/19/2020
13C4-PFHpA	44	G2205-FS(0)	11/19/2020
13C8-PFOA	58	G2205-FS(0)	11/19/2020
13C9-PFNA	73	G2205-FS(0)	11/19/2020
13C6-PFDA	78	G2205-FS(0)	11/19/2020
13C7-PFUnA	84	G2205-FS(0)	11/19/2020
13C2-PFDoA	84	G2205-FS(0)	11/19/2020
13C2-PFTeDA	89	G2205-FS(0)	11/19/2020
d3-MeFOSAA	94	G2205-FS(0)	11/19/2020
d5-EtFOSAA	141	G2205-FS(0)	11/19/2020
13C3-PFBS	76	G2205-FS(0)	11/19/2020
13C3-PFHxS	80	G2205-FS(0)	11/19/2020
13C8-PFOS	91	G2205-FS(0)	11/19/2020
13C3-HFPO-DA	89	G2205-FS(0)	11/19/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW11-1020
Battelle ID	G2206-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.39 U UJ	G2206-FS(0)	1.000	11/19/2020	0.488	1.39	4.63	SSL
PFHpA	375-85-9	0.926 U UJ	G2206-FS(0)	1.000	11/19/2020	0.244	0.926	4.63	SSL
PFOA	335-67-1	0.681 J	G2206-FS(0)	1.000	11/19/2020	0.473	1.39	4.63	
PFNA	375-95-1	0.926 U	G2206-FS(0)	1.000	11/19/2020	0.286	0.926	4.63	
PFDA	335-76-2	0.463 U	G2206-FS(0)	1.000	11/19/2020	0.131	0.463	4.63	
PFUnA	2058-94-8	0.463 U	G2206-FS(0)	1.000	11/19/2020	0.203	0.463	4.63	
PFDoA	307-55-1	0.463 U	G2206-FS(0)	1.000	11/19/2020	0.178	0.463	4.63	
PFTrDA	72629-94-8	0.463 U	G2206-FS(0)	1.000	11/19/2020	0.143	0.463	4.63	
PFTeDA	376-06-7	1.85 U	G2206-FS(0)	1.000	11/19/2020	0.679	1.85	4.63	
NMeFOSAA	2355-31-9	0.926 U	G2206-FS(0)	1.000	11/19/2020	0.324	0.926	4.63	
NEtFOSAA	2991-50-6	0.926 U	G2206-FS(0)	1.000	11/19/2020	0.463	0.926	4.63	
PFBS	375-73-5	0.463 U	G2206-FS(0)	1.000	11/19/2020	0.133	0.463	4.63	
PFHxS	355-46-4	0.370 U	G2206-FS(0)	1.000	11/19/2020	0.104	0.370	4.63	
PFOS	1763-23-1	0.926 U	G2206-FS(0)	1.000	11/19/2020	0.405	0.926	4.63	
HFPO-DA	13252-13-6	0.463 U UJ	G2206-FS(0)	1.000	11/19/2020	0.230	0.463	4.63	SSL
Adona	919005-14-4	0.926 U	G2206-FS(0)	1.000	11/19/2020	0.245	0.926	4.63	
9Cl-PF3ONS	756426-58-1	0.463 U	G2206-FS(0)	1.000	11/19/2020	0.248	0.463	4.63	
11Cl-PF3OUdS	763051-92-9	0.926 U	G2206-FS(0)	1.000	11/19/2020	0.214	0.926	4.63	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW11-1020
Battelle ID	G2206-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	27 N	G2206-FS(0)	11/19/2020
13C4-PFHpA	20 N	G2206-FS(0)	11/19/2020
13C8-PFOA	55	G2206-FS(0)	11/19/2020
13C9-PFNA	81	G2206-FS(0)	11/19/2020
13C6-PFDA	69	G2206-FS(0)	11/19/2020
13C7-PFUnA	97	G2206-FS(0)	11/19/2020
13C2-PFDoA	85	G2206-FS(0)	11/19/2020
13C2-PFTeDA	92	G2206-FS(0)	11/19/2020
d3-MeFOSAA	96	G2206-FS(0)	11/19/2020
d5-EtFOSAA	148	G2206-FS(0)	11/19/2020
13C3-PFBS	61	G2206-FS(0)	11/19/2020
13C3-PFHxS	63	G2206-FS(0)	11/19/2020
13C8-PFOS	85	G2206-FS(0)	11/19/2020
13C3-HFPO-DA	39 N	G2206-FS(0)	11/19/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW11P-1020
Battelle ID	G2207-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.47 U UJ	G2207-FS(0)	1.000	11/19/2020	0.517	1.47	4.90	SSL
PFHpA	375-85-9	0.980 U UJ	G2207-FS(0)	1.000	11/19/2020	0.258	0.980	4.90	SSL
PFOA	335-67-1	0.765 J	G2207-FS(0)	1.000	11/19/2020	0.501	1.47	4.90	
PFNA	375-95-1	0.980 U	G2207-FS(0)	1.000	11/19/2020	0.303	0.980	4.90	
PFDA	335-76-2	0.490 U	G2207-FS(0)	1.000	11/19/2020	0.139	0.490	4.90	
PFUnA	2058-94-8	0.490 U	G2207-FS(0)	1.000	11/19/2020	0.215	0.490	4.90	
PFDoA	307-55-1	0.490 U	G2207-FS(0)	1.000	11/19/2020	0.188	0.490	4.90	
PFTrDA	72629-94-8	0.490 U	G2207-FS(0)	1.000	11/19/2020	0.151	0.490	4.90	
PFTeDA	376-06-7	1.96 U	G2207-FS(0)	1.000	11/19/2020	0.719	1.96	4.90	
NMeFOSAA	2355-31-9	0.980 U	G2207-FS(0)	1.000	11/19/2020	0.343	0.980	4.90	
NEtFOSAA	2991-50-6	0.980 U	G2207-FS(0)	1.000	11/19/2020	0.490	0.980	4.90	
PFBS	375-73-5	0.490 U	G2207-FS(0)	1.000	11/19/2020	0.141	0.490	4.90	
PFHxS	355-46-4	0.392 U	G2207-FS(0)	1.000	11/19/2020	0.110	0.392	4.90	
PFOS	1763-23-1	0.980 U	G2207-FS(0)	1.000	11/19/2020	0.428	0.980	4.90	
HFPO-DA	13252-13-6	0.490 U UJ	G2207-FS(0)	1.000	11/19/2020	0.243	0.490	4.90	SSL
Adona	919005-14-4	0.980 U	G2207-FS(0)	1.000	11/19/2020	0.260	0.980	4.90	
9Cl-PF3ONS	756426-58-1	0.490 U	G2207-FS(0)	1.000	11/19/2020	0.263	0.490	4.90	
11Cl-PF3OUdS	763051-92-9	0.980 U	G2207-FS(0)	1.000	11/19/2020	0.226	0.980	4.90	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW11P-1020
Battelle ID	G2207-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	27 N	G2207-FS(0)	11/19/2020
13C4-PFHpA	23 N	G2207-FS(0)	11/19/2020
13C8-PFOA	62	G2207-FS(0)	11/19/2020
13C9-PFNA	94	G2207-FS(0)	11/19/2020
13C6-PFDA	70	G2207-FS(0)	11/19/2020
13C7-PFUnA	91	G2207-FS(0)	11/19/2020
13C2-PFDoA	81	G2207-FS(0)	11/19/2020
13C2-PFTeDA	92	G2207-FS(0)	11/19/2020
d3-MeFOSAA	97	G2207-FS(0)	11/19/2020
d5-EtFOSAA	161 N	G2207-FS(0)	11/19/2020
13C3-PFBS	55	G2207-FS(0)	11/19/2020
13C3-PFHxS	61	G2207-FS(0)	11/19/2020
13C8-PFOS	78	G2207-FS(0)	11/19/2020
13C3-HFPO-DA	40 N	G2207-FS(0)	11/19/2020

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Printed: 11/25/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-FB01-102820
Battelle ID	G2208-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.47 U	G2208-FS(0)	1.000	11/19/2020	0.517	1.47	4.90
PFHpA	375-85-9	0.980 U	G2208-FS(0)	1.000	11/19/2020	0.258	0.980	4.90
PFOA	335-67-1	1.47 U	G2208-FS(0)	1.000	11/19/2020	0.501	1.47	4.90
PFNA	375-95-1	0.980 U	G2208-FS(0)	1.000	11/19/2020	0.303	0.980	4.90
PFDA	335-76-2	0.490 U	G2208-FS(0)	1.000	11/19/2020	0.139	0.490	4.90
PFUnA	2058-94-8	0.490 U	G2208-FS(0)	1.000	11/19/2020	0.215	0.490	4.90
PFDoA	307-55-1	0.490 U	G2208-FS(0)	1.000	11/19/2020	0.188	0.490	4.90
PFTrDA	72629-94-8	0.490 U	G2208-FS(0)	1.000	11/19/2020	0.151	0.490	4.90
PFTeDA	376-06-7	1.96 U	G2208-FS(0)	1.000	11/19/2020	0.719	1.96	4.90
NMeFOSAA	2355-31-9	0.980 U	G2208-FS(0)	1.000	11/19/2020	0.343	0.980	4.90
NEtFOSAA	2991-50-6	0.980 U	G2208-FS(0)	1.000	11/19/2020	0.490	0.980	4.90
PFBS	375-73-5	0.490 U	G2208-FS(0)	1.000	11/19/2020	0.141	0.490	4.90
PFHxS	355-46-4	0.392 U	G2208-FS(0)	1.000	11/19/2020	0.110	0.392	4.90
PFOS	1763-23-1	0.980 U	G2208-FS(0)	1.000	11/19/2020	0.428	0.980	4.90
HFPO-DA	13252-13-6	0.490 U	G2208-FS(0)	1.000	11/19/2020	0.243	0.490	4.90
Adona	919005-14-4	0.980 U	G2208-FS(0)	1.000	11/19/2020	0.260	0.980	4.90
9Cl-PF3ONS	756426-58-1	0.490 U	G2208-FS(0)	1.000	11/19/2020	0.263	0.490	4.90
11Cl-PF3OUdS	763051-92-9	0.980 U	G2208-FS(0)	1.000	11/19/2020	0.226	0.980	4.90

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB01-102820-GW
Battelle ID	G2209-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	AQ
Sample Size	0.280
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.34 ~~0.682~~ U	G2209-FS(0)	1.000	11/18/2020	0.471	1.34	4.46	MBL
PFHpA	375-85-9	0.893 U	G2209-FS(0)	1.000	11/18/2020	0.235	0.893	4.46	
PFOA	335-67-1	1.34 U	G2209-FS(0)	1.000	11/18/2020	0.456	1.34	4.46	
PFNA	375-95-1	0.893 U	G2209-FS(0)	1.000	11/18/2020	0.276	0.893	4.46	
PFDA	335-76-2	0.446 U	G2209-FS(0)	1.000	11/18/2020	0.127	0.446	4.46	
PFUnA	2058-94-8	0.446 UJ	G2209-FS(0)	1.000	11/18/2020	0.196	0.446	4.46	SSL
PFDoA	307-55-1	0.446 UJ	G2209-FS(0)	1.000	11/18/2020	0.171	0.446	4.46	SSL
PFTrDA	72629-94-8	0.291 J	G2209-FS(0)	1.000	11/18/2020	0.138	0.446	4.46	
PFTeDA	376-06-7	1.79 UJ	G2209-FS(0)	1.000	11/18/2020	0.654	1.79	4.46	SSL
NMeFOSAA	2355-31-9	0.893 U	G2209-FS(0)	1.000	11/18/2020	0.313	0.893	4.46	
NEtFOSAA	2991-50-6	0.893 U	G2209-FS(0)	1.000	11/18/2020	0.446	0.893	4.46	
PFBS	375-73-5	0.446 U	G2209-FS(0)	1.000	11/18/2020	0.129	0.446	4.46	
PFHxS	355-46-4	0.357 U	G2209-FS(0)	1.000	11/18/2020	0.100	0.357	4.46	
PFOS	1763-23-1	1.20 J	G2209-FS(0)	1.000	11/18/2020	0.390	0.893	4.46	
HFPO-DA	13252-13-6	0.446 U	G2209-FS(0)	1.000	11/18/2020	0.221	0.446	4.46	
Adona	919005-14-4	0.893 U	G2209-FS(0)	1.000	11/18/2020	0.237	0.893	4.46	
9Cl-PF3ONS	756426-58-1	0.446 U	G2209-FS(0)	1.000	11/18/2020	0.239	0.446	4.46	
11Cl-PF3OUdS	763051-92-9	0.893 U	G2209-FS(0)	1.000	11/18/2020	0.206	0.893	4.46	

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Printed: 11/25/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-EB01-102820-GW
Battelle ID	G2209-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	55	G2209-FS(0)	11/18/2020
13C4-PFHpA	63	G2209-FS(0)	11/18/2020
13C8-PFOA	61	G2209-FS(0)	11/18/2020
13C9-PFNA	70	G2209-FS(0)	11/18/2020
13C6-PFDA	72	G2209-FS(0)	11/18/2020
13C7-PFUnA	30	G2209-FS(0)	11/18/2020
13C2-PFDoA	33	G2209-FS(0)	11/18/2020
13C2-PFTeDA	30	G2209-FS(0)	11/18/2020
d3-MeFOSAA	11	G2209-FS(0)	11/18/2020
d5-EtFOSAA	27	G2209-FS(0)	11/18/2020
13C3-PFBS	88	G2209-FS(0)	11/18/2020
13C3-PFHxS	83	G2209-FS(0)	11/18/2020
13C8-PFOS	84	G2209-FS(0)	11/18/2020
13C3-HFPO-DA	91	G2209-FS(0)	11/18/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW14-1020
Battelle ID	G2210-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	4.36 J UJ	G2210-FS(0)	1.000	11/19/2020	0.527	1.50	5.00	MBL SSL
PFHpA	375-85-9	1.97 J	G2210-FS(0)	1.000	11/19/2020	0.263	1.00	5.00	
PFOA	335-67-1	5.99	G2210-FS(0)	1.000	11/19/2020	0.511	1.50	5.00	
PFNA	375-95-1	1.32 J	G2210-FS(0)	1.000	11/19/2020	0.309	1.00	5.00	
PFDA	335-76-2	0.500 U	G2210-FS(0)	1.000	11/19/2020	0.142	0.500	5.00	
PFUnA	2058-94-8	0.500 U	G2210-FS(0)	1.000	11/19/2020	0.219	0.500	5.00	
PFDoA	307-55-1	0.500 U	G2210-FS(0)	1.000	11/19/2020	0.192	0.500	5.00	
PFTrDA	72629-94-8	0.500 U	G2210-FS(0)	1.000	11/19/2020	0.154	0.500	5.00	
PFTeDA	376-06-7	2.00 U	G2210-FS(0)	1.000	11/19/2020	0.733	2.00	5.00	
NMeFOSAA	2355-31-9	1.00 U	G2210-FS(0)	1.000	11/19/2020	0.350	1.00	5.00	
NEtFOSAA	2991-50-6	1.00 U	G2210-FS(0)	1.000	11/19/2020	0.500	1.00	5.00	
PFBS	375-73-5	0.751 J	G2210-FS(0)	1.000	11/19/2020	0.144	0.500	5.00	
PFHxS	355-46-4	9.20	G2210-FS(0)	1.000	11/19/2020	0.112	0.400	5.00	
PFOS	1763-23-1	4.25 J U	G2210-FS(0)	1.000	11/19/2020	0.437	1.00	5.00	EBL
HFPO-DA	13252-13-6	0.500 U	G2210-FS(0)	1.000	11/19/2020	0.248	0.500	5.00	
Adona	919005-14-4	1.00 U	G2210-FS(0)	1.000	11/19/2020	0.265	1.00	5.00	
9Cl-PF3ONS	756426-58-1	0.500 U	G2210-FS(0)	1.000	11/19/2020	0.268	0.500	5.00	
11Cl-PF3OUdS	763051-92-9	1.00 U	G2210-FS(0)	1.000	11/19/2020	0.231	1.00	5.00	

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Analyzed by: Schumitz, Denise
Printed: 11/25/2020

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8

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW14-1020
Battelle ID	G2210-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	40	G2210-FS(0)	11/19/2020
13C4-PFHpA	51	G2210-FS(0)	11/19/2020
13C8-PFOA	55	G2210-FS(0)	11/19/2020
13C9-PFNA	81	G2210-FS(0)	11/19/2020
13C6-PFDA	73	G2210-FS(0)	11/19/2020
13C7-PFUnA	80	G2210-FS(0)	11/19/2020
13C2-PFDoA	78	G2210-FS(0)	11/19/2020
13C2-PFTeDA	83	G2210-FS(0)	11/19/2020
d3-MeFOSAA	80	G2210-FS(0)	11/19/2020
d5-EtFOSAA	114	G2210-FS(0)	11/19/2020
13C3-PFBS	75	G2210-FS(0)	11/19/2020
13C3-PFHxS	79	G2210-FS(0)	11/19/2020
13C8-PFOS	97	G2210-FS(0)	11/19/2020
13C3-HFPO-DA	84	G2210-FS(0)	11/19/2020

11/11/21

Analyzed by: Schumitz, Denise
Printed: 11/25/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW13-1020
Battelle ID	G2211-FS
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	16.6	G2211-FS(0)	1.000	11/19/2020	0.527	1.50	5.00
PFHpA	375-85-9	7.02	G2211-FS(0)	1.000	11/19/2020	0.263	1.00	5.00
PFOA	335-67-1	10.0	G2211-FS(0)	1.000	11/19/2020	0.511	1.50	5.00
PFNA	375-95-1	3.09 J	G2211-FS(0)	1.000	11/19/2020	0.309	1.00	5.00
PFDA	335-76-2	0.898 J	G2211-FS(0)	1.000	11/19/2020	0.142	0.500	5.00
PFUnA	2058-94-8	1.09 J	G2211-FS(0)	1.000	11/19/2020	0.219	0.500	5.00
PFDoA	307-55-1	0.500 U	G2211-FS(0)	1.000	11/19/2020	0.192	0.500	5.00
PFTrDA	72629-94-8	0.500 U	G2211-FS(0)	1.000	11/19/2020	0.154	0.500	5.00
PFTeDA	376-06-7	2.00 U	G2211-FS(0)	1.000	11/19/2020	0.733	2.00	5.00
NMeFOSAA	2355-31-9	1.00 U	G2211-FS(0)	1.000	11/19/2020	0.350	1.00	5.00
NEtFOSAA	2991-50-6	1.00 U	G2211-FS(0)	1.000	11/19/2020	0.500	1.00	5.00
PFBS	375-73-5	0.500 U	G2211-FS(0)	1.000	11/19/2020	0.144	0.500	5.00
PFHxS	355-46-4	42.9	G2211-FS(0)	1.000	11/19/2020	0.112	0.400	5.00
PFOS	1763-23-1	17.9	G2211-FS(0)	1.000	11/19/2020	0.437	1.00	5.00
HFPO-DA	13252-13-6	0.500 U	G2211-FS(0)	1.000	11/19/2020	0.248	0.500	5.00
Adona	919005-14-4	1.00 U	G2211-FS(0)	1.000	11/19/2020	0.265	1.00	5.00
9Cl-PF3ONS	756426-58-1	0.500 U	G2211-FS(0)	1.000	11/19/2020	0.268	0.500	5.00
11Cl-PF3OUdS	763051-92-9	1.00 U	G2211-FS(0)	1.000	11/19/2020	0.231	1.00	5.00

MW 1/11/21

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1419
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 11, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-SW07-1020	G1644-FS1	Water
2	CBD-AOA-SW05-1020	G1645-FS1	Water
3	CBD-AOA-SW03-1020	G1646-FS1	Water
4	CBD-AOA-SW04-1020	G1647-FS1	Water
5	CBD-AOA-SW02-1020	G1651-FS1	Water
6	CBD-AOA-SW01-1020	G1654-FS1	Water
7	CBD-AOA-SW06-1020	G1661-FS1	Water
8	CBD-AOA-SW09-1020	G1668-FS1	Water

A Stage 2B/4 data validation was performed on the analytical data for eight water samples collected on October 13, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted at 22 days which is outside the 14-day holding time for water samples. All samples were qualified estimated (J/UJ).

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks exhibited the following contamination.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
LD80 IB	NMeFOSAA	0.398	U	7, 8

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-101320-SW	None - ND	-	-	-
CBD-AOA-FB03-101320	None - ND	-	-	-

Surrogate Spike Recoveries

- Several samples exhibited surrogate percent recoveries outside of QC limits, however the results were already previously qualified (J/UJ) due to holding time deficiencies.

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.
- All samples were re-extracted outside of holding times from SDG 20-1298 to verify surrogate recovery deficiencies. Use the original analysis results in SDG 20-1298 for reporting purposes.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW07-1020
Battelle ID	G1644-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	131 T	J	G1644-FS1(0)	1.000	11/6/2020	0.527	1.50	5.00
PFHpA	375-85-9	57.7 T		G1644-FS1(0)	1.000	11/6/2020	0.263	1.00	5.00
PFOA	335-67-1	102 T		G1644-FS1(0)	1.000	11/6/2020	0.511	1.50	5.00
PFNA	375-95-1	197 TD		G1644-FS1-D(3)	5.000	11/9/2020	1.55	5.00	25.0
PFDA	335-76-2	5.80 T		G1644-FS1(0)	1.000	11/6/2020	0.142	0.500	5.00
PFUnA	2058-94-8	20.7 T		G1644-FS1(0)	1.000	11/6/2020	0.219	0.500	5.00
PFDoA	307-55-1	0.500 UT	UJ	G1644-FS1(0)	1.000	11/6/2020	0.192	0.500	5.00
PFTrDA	72629-94-8	0.500 UT		G1644-FS1(0)	1.000	11/6/2020	0.154	0.500	5.00
PFTeDA	376-06-7	2.00 UT		G1644-FS1(0)	1.000	11/6/2020	0.733	2.00	5.00
NMeFOSAA	2355-31-9	1.00 UT		G1644-FS1(0)	1.000	11/6/2020	0.350	1.00	5.00
NEtFOSAA	2991-50-6	1.00 UT		G1644-FS1(0)	1.000	11/6/2020	0.500	1.00	5.00
PFBS	375-73-5	22.0 T	J	G1644-FS1(0)	1.000	11/6/2020	0.144	0.500	5.00
PFHxS	355-46-4	342 TD	J	G1644-FS1-D(3)	5.000	11/9/2020	0.560	2.00	25.0
PFOS	1763-23-1	1610 TD	J	G1644-FS1-D(7)	31.250	11/9/2020	13.7	31.3	156
HFPO-DA	13252-13-6	0.500 UT	UJ	G1644-FS1(0)	1.000	11/6/2020	0.248	0.500	5.00
Adona	919005-14-4	1.00 UT		G1644-FS1(0)	1.000	11/6/2020	0.265	1.00	5.00
9Cl-PF3ONS	756426-58-1	0.500 UT		G1644-FS1(0)	1.000	11/6/2020	0.268	0.500	5.00
11Cl-PF3OUdS	763051-92-9	1.00 UT		G1644-FS1(0)	1.000	11/6/2020	0.231	1.00	5.00

1

Use original results in L20-1298

HT

11/11/21

Analyzed by: Schumitz, Denise
Printed: 11/11/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW07-1020
Battelle ID	G1644-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

use original

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	38	N	G1644-FS1(0)	11/6/2020
13C4-PFHpA	45	N	G1644-FS1(0)	11/6/2020
13C8-PFOA	78		G1644-FS1(0)	11/6/2020
13C9-PFNA	104	D	G1644-FS1-D(7)	11/9/2020
13C6-PFDA	86		G1644-FS1(0)	11/6/2020
13C7-PFUnA	103		G1644-FS1(0)	11/6/2020
13C2-PFDoA	96		G1644-FS1(0)	11/6/2020
13C2-PFTeDA	80		G1644-FS1(0)	11/6/2020
d3-MeFOSAA	93	D	G1644-FS1-D(7)	11/9/2020
d5-EtFOSAA	97	D	G1644-FS1-D(7)	11/9/2020
13C3-PFBS	103	D	G1644-FS1-D(7)	11/9/2020
13C3-PFHxS	98	D	G1644-FS1-D(7)	11/9/2020
13C8-PFOS	94	D	G1644-FS1-D(7)	11/9/2020
13C3-HFPO-DA	65		G1644-FS1(0)	11/6/2020

MW 1/11/21

Analyzed by: Schumitz, Denise
Printed: 11/11/2020

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It can be done

2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW05-1020
Battelle ID	G1645-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.260
Size Unit-Basis	L

use original results in 20-1298

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	150	T J	G1645-FS1(0)	1.000	11/6/2020	0.507	1.44	4.81	HT
PFHpA	375-85-9	55.0	T	G1645-FS1(0)	1.000	11/6/2020	0.253	0.962	4.81	
PFOA	335-67-1	113	T	G1645-FS1(0)	1.000	11/6/2020	0.491	1.44	4.81	
PFNA	375-95-1	218	TD	G1645-FS1-D(3)	5.000	11/9/2020	1.49	4.81	24.0	
PFDA	335-76-2	4.58	JT	G1645-FS1(0)	1.000	11/6/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	17.1	T	G1645-FS1(0)	1.000	11/6/2020	0.211	0.481	4.81	
PFDoA	307-55-1	0.481	UT UJ	G1645-FS1(0)	1.000	11/6/2020	0.185	0.481	4.81	
PFTrDA	72629-94-8	0.481	UT	G1645-FS1(0)	1.000	11/6/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92	UT	G1645-FS1(0)	1.000	11/6/2020	0.705	1.92	4.81	
NMeFOSAA	2355-31-9	0.962	UT	G1645-FS1(0)	1.000	11/6/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962	UT	G1645-FS1(0)	1.000	11/6/2020	0.481	0.962	4.81	
PFBS	375-73-5	19.5	T J	G1645-FS1(0)	1.000	11/6/2020	0.138	0.481	4.81	
PFHxS	355-46-4	309	TD	G1645-FS1-D(3)	5.000	11/9/2020	0.538	1.92	24.0	
PFOS	1763-23-1	1420	TD	G1645-FS1-D(7)	31.250	11/9/2020	13.1	30.0	150	
HFPO-DA	13252-13-6	0.481	UT UJ	G1645-FS1(0)	1.000	11/6/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962	UT	G1645-FS1(0)	1.000	11/6/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481	UT	G1645-FS1(0)	1.000	11/6/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962	UT	G1645-FS1(0)	1.000	11/6/2020	0.222	0.962	4.81	

11/11/21

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2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW05-1020
Battelle ID	G1645-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	36 N	G1645-FS1(0)	11/6/2020
13C4-PFHpA	52	G1645-FS1(0)	11/6/2020
13C8-PFOA	81	G1645-FS1(0)	11/6/2020
13C9-PFNA	110 D	G1645-FS1-D(7)	11/9/2020
13C6-PFDA	92	G1645-FS1(0)	11/6/2020
13C7-PFUnA	98	G1645-FS1(0)	11/6/2020
13C2-PFDoA	89	G1645-FS1(0)	11/6/2020
13C2-PFTeDA	75	G1645-FS1(0)	11/6/2020
d3-MeFOSAA	105 D	G1645-FS1-D(7)	11/9/2020
d5-EtFOSAA	112 D	G1645-FS1-D(7)	11/9/2020
13C3-PFBS	97 D	G1645-FS1-D(7)	11/9/2020
13C3-PFHxS	105 D	G1645-FS1-D(7)	11/9/2020
13C8-PFOS	105 D	G1645-FS1-D(7)	11/9/2020
13C3-HFPO-DA	69	G1645-FS1(0)	11/6/2020

use original

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Analyzed by: Schumitz, Denise
Printed: 11/11/2020

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3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW03-1020
Battelle ID	G1646-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.260
Size Unit-Basis	L

use original in 20.1298

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	34.8 T	J	G1646-FS1(0)	1.000	11/6/2020	0.507	1.44	4.81	HT
PFHpA	375-85-9	17.0 T		G1646-FS1(0)	1.000	11/6/2020	0.253	0.962	4.81	
PFOA	335-67-1	71.6 T		G1646-FS1(0)	1.000	11/6/2020	0.491	1.44	4.81	
PFNA	375-95-1	23.2 T		G1646-FS1(0)	1.000	11/6/2020	0.297	0.962	4.81	
PFDA	335-76-2	0.374 JT		G1646-FS1(0)	1.000	11/6/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	0.590 JT		G1646-FS1(0)	1.000	11/6/2020	0.211	0.481	4.81	
PFDoA	307-55-1	0.481 UT	UJ	G1646-FS1(0)	1.000	11/6/2020	0.185	0.481	4.81	
PFTrDA	72629-94-8	0.481 UT		G1646-FS1(0)	1.000	11/6/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92 UT		G1646-FS1(0)	1.000	11/6/2020	0.705	1.92	4.81	
NMeFOSAA	2355-31-9	0.962 UT		G1646-FS1(0)	1.000	11/6/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962 UT		G1646-FS1(0)	1.000	11/6/2020	0.481	0.962	4.81	
PFBS	375-73-5	6.74 T	J	G1646-FS1(0)	1.000	11/6/2020	0.138	0.481	4.81	
PFHxS	355-46-4	139 TD		G1646-FS1-D(3)	5.000	11/9/2020	0.538	1.92	24.0	
PFOS	1763-23-1	167 TD		G1646-FS1-D(3)	5.000	11/9/2020	2.10	4.81	24.0	
HFPO-DA	13252-13-6	0.481 UT	UJ	G1646-FS1(0)	1.000	11/6/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962 UT		G1646-FS1(0)	1.000	11/6/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481 UT		G1646-FS1(0)	1.000	11/6/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962 UT		G1646-FS1(0)	1.000	11/6/2020	0.222	0.962	4.81	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW03-1020
Battelle ID	G1646-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

use original

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	36	N	G1646-FS1(0)	11/6/2020
13C4-PFHpA	46	N	G1646-FS1(0)	11/6/2020
13C8-PFOA	70		G1646-FS1(0)	11/6/2020
13C9-PFNA	103	D	G1646-FS1-D(3)	11/9/2020
13C6-PFDA	90		G1646-FS1(0)	11/6/2020
13C7-PFUnA	106		G1646-FS1(0)	11/6/2020
13C2-PFDoA	91		G1646-FS1(0)	11/6/2020
13C2-PFTeDA	67		G1646-FS1(0)	11/6/2020
d3-MeFOSAA	103	D	G1646-FS1-D(3)	11/9/2020
d5-EtFOSAA	108	D	G1646-FS1-D(3)	11/9/2020
13C3-PFBS	77	D	G1646-FS1-D(3)	11/9/2020
13C3-PFHxS	99	D	G1646-FS1-D(3)	11/9/2020
13C8-PFOS	95	D	G1646-FS1-D(3)	11/9/2020
13C3-HFPO-DA	57		G1646-FS1(0)	11/6/2020

NW 11/11/21

BATTELLE
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4

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW04-1020
Battelle ID	G1647-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.260
Size Unit-Basis	L

use original in 20-1298

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	25.5	T J	G1647-FS1(0)	1.000	11/6/2020	0.507	1.44	4.81	HT
PFHpA	375-85-9	9.50	T	G1647-FS1(0)	1.000	11/6/2020	0.253	0.962	4.81	
PFOA	335-67-1	23.6	T	G1647-FS1(0)	1.000	11/6/2020	0.491	1.44	4.81	
PFNA	375-95-1	16.4	T	G1647-FS1(0)	1.000	11/6/2020	0.297	0.962	4.81	
PFDA	335-76-2	0.481	UT UJ	G1647-FS1(0)	1.000	11/6/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	0.523	JT J	G1647-FS1(0)	1.000	11/6/2020	0.211	0.481	4.81	
PFDoA	307-55-1	0.481	UT UJ	G1647-FS1(0)	1.000	11/6/2020	0.185	0.481	4.81	
PFTrDA	72629-94-8	0.481	UT	G1647-FS1(0)	1.000	11/6/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92	UT	G1647-FS1(0)	1.000	11/6/2020	0.705	1.92	4.81	
NMeFOSAA	2355-31-9	0.962	UT	G1647-FS1(0)	1.000	11/6/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962	UT	G1647-FS1(0)	1.000	11/6/2020	0.481	0.962	4.81	
PFBS	375-73-5	5.24	T J	G1647-FS1(0)	1.000	11/6/2020	0.138	0.481	4.81	
PFHxS	355-46-4	101	T J	G1647-FS1(0)	1.000	11/6/2020	0.108	0.385	4.81	
PFOS	1763-23-1	154	TD J	G1647-FS1-D(3)	5.000	11/9/2020	2.10	4.81	24.0	
HFPO-DA	13252-13-6	0.481	UT UJ	G1647-FS1(0)	1.000	11/6/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962	UT	G1647-FS1(0)	1.000	11/6/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481	UT	G1647-FS1(0)	1.000	11/6/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962	UT	G1647-FS1(0)	1.000	11/6/2020	0.222	0.962	4.81	

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Printed: 11/11/2020

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4

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW04-1020
Battelle ID	G1647-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	36	N	G1647-FS1(0)	11/6/2020
13C4-PFHpA	47	N	G1647-FS1(0)	11/6/2020
13C8-PFOA	67		G1647-FS1(0)	11/6/2020
13C9-PFNA	104	D	G1647-FS1-D(3)	11/9/2020
13C6-PFDA	84		G1647-FS1(0)	11/6/2020
13C7-PFUnA	99		G1647-FS1(0)	11/6/2020
13C2-PFDoA	86		G1647-FS1(0)	11/6/2020
13C2-PFTeDA	61		G1647-FS1(0)	11/6/2020
d3-MeFOSAA	98	D	G1647-FS1-D(3)	11/9/2020
d5-EtFOSAA	115	D	G1647-FS1-D(3)	11/9/2020
13C3-PFBS	82	D	G1647-FS1-D(3)	11/9/2020
13C3-PFHxS	92	D	G1647-FS1-D(3)	11/9/2020
13C8-PFOS	99	D	G1647-FS1-D(3)	11/9/2020
13C3-HFPO-DA	56		G1647-FS1(0)	11/6/2020

use original

MW 11/12/21

Analyzed by: Schumitz, Denise
Printed: 11/11/2020

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It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW02-1020
Battelle ID	G1651-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	11.0	J	G1651-FS1(0)	1.000	11/6/2020	0.517	1.47	4.90
PFHpA	375-85-9	4.37	JT	G1651-FS1(0)	1.000	11/6/2020	0.258	0.980	4.90
PFOA	335-67-1	10.9	T	G1651-FS1(0)	1.000	11/6/2020	0.501	1.47	4.90
PFNA	375-95-1	4.72	JT	G1651-FS1(0)	1.000	11/6/2020	0.303	0.980	4.90
PFDA	335-76-2	0.490	UT	G1651-FS1(0)	1.000	11/6/2020	0.139	0.490	4.90
PFUnA	2058-94-8	1.17	JT	G1651-FS1(0)	1.000	11/6/2020	0.215	0.490	4.90
PFDoA	307-55-1	0.490	UT	G1651-FS1(0)	1.000	11/6/2020	0.188	0.490	4.90
PFTrDA	72629-94-8	0.490	UT	G1651-FS1(0)	1.000	11/6/2020	0.151	0.490	4.90
PFTeDA	376-06-7	1.96	UT	G1651-FS1(0)	1.000	11/6/2020	0.719	1.96	4.90
NMeFOSAA	2355-31-9	0.980	UT	G1651-FS1(0)	1.000	11/6/2020	0.343	0.980	4.90
NEtFOSAA	2991-50-6	0.980	UT	G1651-FS1(0)	1.000	11/6/2020	0.490	0.980	4.90
PFBS	375-73-5	3.05	JT	G1651-FS1(0)	1.000	11/6/2020	0.141	0.490	4.90
PFHxS	355-46-4	51.3	T	G1651-FS1(0)	1.000	11/6/2020	0.110	0.392	4.90
PFOS	1763-23-1	48.7	T	G1651-FS1(0)	1.000	11/6/2020	0.428	0.980	4.90
HFPO-DA	13252-13-6	0.490	UT	G1651-FS1(0)	1.000	11/6/2020	0.243	0.490	4.90
Adona	919005-14-4	0.980	UT	G1651-FS1(0)	1.000	11/6/2020	0.260	0.980	4.90
9Cl-PF3ONS	756426-58-1	0.490	UT	G1651-FS1(0)	1.000	11/6/2020	0.263	0.490	4.90
11Cl-PF3OUdS	763051-92-9	0.980	UT	G1651-FS1(0)	1.000	11/6/2020	0.226	0.980	4.90

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use original in 20-1298

HT

MW 11/11/21

Analyzed by: Schumitz, Denise
Printed: 11/11/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

use original

Client ID	CBD-AOA-SW02-1020
Battelle ID	G1651-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	36	N	G1651-FS1(0)	11/6/2020
13C4-PFHpA	47	N	G1651-FS1(0)	11/6/2020
13C8-PFOA	68		G1651-FS1(0)	11/6/2020
13C9-PFNA	79		G1651-FS1(0)	11/6/2020
13C6-PFDA	83		G1651-FS1(0)	11/6/2020
13C7-PFUnA	84		G1651-FS1(0)	11/6/2020
13C2-PFDoA	76		G1651-FS1(0)	11/6/2020
13C2-PFTeDA	60		G1651-FS1(0)	11/6/2020
d3-MeFOSAA	93		G1651-FS1(0)	11/6/2020
d5-EtFOSAA	128		G1651-FS1(0)	11/6/2020
13C3-PFBS	54		G1651-FS1(0)	11/6/2020
13C3-PFHxS	80		G1651-FS1(0)	11/6/2020
13C8-PFOS	86		G1651-FS1(0)	11/6/2020
13C3-HFPO-DA	55		G1651-FS1(0)	11/6/2020

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BATTELLE
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6

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW01-1020
Battelle ID	G1654-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.265
Size Unit-Basis	L

use original in 20-1298

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	3.11 JT	J	G1654-FS1(0)	1.000	11/6/2020	0.497	1.42	4.72	HT
PFHpA	375-85-9	1.57 JT		G1654-FS1(0)	1.000	11/6/2020	0.248	0.943	4.72	
PFOA	335-67-1	2.88 JT		G1654-FS1(0)	1.000	11/6/2020	0.482	1.42	4.72	
PFNA	375-95-1	1.64 JT		G1654-FS1(0)	1.000	11/6/2020	0.292	0.943	4.72	
PFDA	335-76-2	0.472 UT	UJ	G1654-FS1(0)	1.000	11/6/2020	0.134	0.472	4.72	
PFUnA	2058-94-8	0.268 JT	J	G1654-FS1(0)	1.000	11/6/2020	0.207	0.472	4.72	
PFDoA	307-55-1	0.472 UT	UJ	G1654-FS1(0)	1.000	11/6/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	0.472 UT		G1654-FS1(0)	1.000	11/6/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89 UT		G1654-FS1(0)	1.000	11/6/2020	0.692	1.89	4.72	
NMeFOSAA	2355-31-9	0.943 UT		G1654-FS1(0)	1.000	11/6/2020	0.330	0.943	4.72	
NEtFOSAA	2991-50-6	0.943 UT		G1654-FS1(0)	1.000	11/6/2020	0.472	0.943	4.72	
PFBS	375-73-5	2.02 JT	J	G1654-FS1(0)	1.000	11/6/2020	0.136	0.472	4.72	
PFHxS	355-46-4	21.4 T		G1654-FS1(0)	1.000	11/6/2020	0.106	0.377	4.72	
PFOS	1763-23-1	11.1 T		G1654-FS1(0)	1.000	11/6/2020	0.412	0.943	4.72	
HFPO-DA	13252-13-6	0.472 UT	UJ	G1654-FS1(0)	1.000	11/6/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943 UT		G1654-FS1(0)	1.000	11/6/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472 UT		G1654-FS1(0)	1.000	11/6/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943 UT		G1654-FS1(0)	1.000	11/6/2020	0.218	0.943	4.72	

nw 11/11/21

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW01-1020
Battelle ID	G1654-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

use original

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	30 N	G1654-FS1(0)	11/6/2020
13C4-PFHpA	**42 N**	G1654-FS1(0)	**11/6/2020**
13C8-PFOA	66	G1654-FS1(0)	11/6/2020
13C9-PFNA	**85**	G1654-FS1(0)	**11/6/2020**
13C6-PFDA	76	G1654-FS1(0)	11/6/2020
13C7-PFUnA	**68**	G1654-FS1(0)	**11/6/2020**
13C2-PFDoA	43 N	G1654-FS1(0)	11/6/2020
13C2-PFTeDA	**24 N**	G1654-FS1(0)	**11/6/2020**
d3-MeFOSAA	72	G1654-FS1(0)	11/6/2020
d5-EtFOSAA	**86**	G1654-FS1(0)	**11/6/2020**
13C3-PFBS	50	G1654-FS1(0)	11/6/2020
13C3-PFHxS	**78**	G1654-FS1(0)	**11/6/2020**
13C8-PFOS	86	G1654-FS1(0)	11/6/2020
13C3-HFPO-DA	**51**	G1654-FS1(0)	**11/6/2020**

MW 11/11/21

Analyzed by: Schumitz, Denise
Printed: 11/11/2020

BATTELLE
It can be done

7

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW06-1020
Battelle ID	G1661-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.260
Size Unit-Basis	L

use original in 20-1298

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	462 TD J	G1661-FS1-D(3)	5.000	11/9/2020	2.53	7.21	24.0	HT
PFHpA	**375-85-9**	**290 T**	**G1661-FS1(0)**	**1.000**	**11/7/2020**	**0.253**	**0.962**	**4.81**	
PFOA	335-67-1	380 TD	G1661-FS1-D(5)	25.000	11/9/2020	12.3	36.1	120	
PFNA	**375-95-1**	**374 TD**	**G1661-FS1-D(3)**	**5.000**	**11/9/2020**	**1.49**	**4.81**	**24.0**	
PFDA	335-76-2	40.6 T	G1661-FS1(0)	1.000	11/7/2020	0.137	0.481	4.81	
PFUnA	**2058-94-8**	**137 TD**	**G1661-FS1-D(3)**	**5.000**	**11/9/2020**	**1.05**	**2.40**	**24.0**	
PFDoA	307-55-1	1.59 JT	G1661-FS1(0)	1.000	11/7/2020	0.185	0.481	4.81	
PFTrDA	**72629-94-8**	**13.5 T**	**G1661-FS1(0)**	**1.000**	**11/7/2020**	**0.148**	**0.481**	**4.81**	
PFTeDA	376-06-7	1.92 JT UJ	G1661-FS1(0)	1.000	11/7/2020	0.705	1.92	4.81	
NMeFOSAA	**2355-31-9**	**2.39 JT UJ**	**G1661-FS1(0)**	**1.000**	**11/7/2020**	**0.337**	**0.962**	**4.81**	NBL HT HT
NEtFOSAA	2991-50-6	0.962 UT UJ	G1661-FS1(0)	1.000	11/7/2020	0.481	0.962	4.81	
PFBS	**375-73-5**	**46.0 T**	**G1661-FS1(0)**	**1.000**	**11/7/2020**	**0.138**	**0.481**	**4.81**	
PFHxS	355-46-4	1200 TD	G1661-FS1-D(5)	25.000	11/9/2020	2.69	9.62	120	
PFOS	**1763-23-1**	**6210 TD**	**G1661-FS1-D(9)**	**156.250**	**11/9/2020**	**65.7**	**150**	**751**	
HFPO-DA	13252-13-6	0.481 UT UJ	G1661-FS1(0)	1.000	11/7/2020	0.238	0.481	4.81	
Adona	**919005-14-4**	**0.962 UT**	**G1661-FS1(0)**	**1.000**	**11/7/2020**	**0.255**	**0.962**	**4.81**	
9Cl-PF3ONS	756426-58-1	0.481 UT	G1661-FS1(0)	1.000	11/7/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	**763051-92-9**	**0.962 UT**	**G1661-FS1(0)**	**1.000**	**11/7/2020**	**0.222**	**0.962**	**4.81**	

11/11/21

Analyzed by: Schumitz, Denise
Printed: 11/11/2020

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW09-1020
Battelle ID	G1668-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	SW
Sample Size	0.250
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	198 T	J	G1668-FS1(0)	1.000	11/7/2020	0.527	1.50	5.00
PFHpA	**375-85-9**	**232 T**		**G1668-FS1(0)**	**1.000**	**11/7/2020**	**0.263**	**1.00**	**5.00**
PFOA	335-67-1	141 TD		G1668-FS1-D(3)	5.000	11/9/2020	2.56	7.50	25.0
PFNA	**375-95-1**	**80.2 T**		**G1668-FS1(0)**	**1.000**	**11/7/2020**	**0.309**	**1.00**	**5.00**
PFDA	335-76-2	9.48 T		G1668-FS1(0)	1.000	11/7/2020	0.142	0.500	5.00
PFUnA	**2058-94-8**	**125 TD**		**G1668-FS1-D(3)**	**5.000**	**11/9/2020**	**1.10**	**2.50**	**25.0**
PFDoA	307-55-1	2.40 JT		G1668-FS1(0)	1.000	11/7/2020	0.192	0.500	5.00
PFTrDA	**72629-94-8**	**20.4 T**		**G1668-FS1(0)**	**1.000**	**11/7/2020**	**0.154**	**0.500**	**5.00**
PFTeDA	376-06-7	2.00 UT	UJ	G1668-FS1(0)	1.000	11/7/2020	0.733	2.00	5.00
NMeFOSAA	**2355-31-9**	~~0.755 JT~~ 1.00	UJ	**G1668-FS1(0)**	**1.000**	**11/7/2020**	**0.350**	**1.00**	**5.00**
NEtFOSAA	2991-50-6	1.00 UT	UJ	G1668-FS1(0)	1.000	11/7/2020	0.500	1.00	5.00
PFBS	**375-73-5**	**17.3 T**	J	**G1668-FS1(0)**	**1.000**	**11/7/2020**	**0.144**	**0.500**	**5.00**
PFHxS	355-46-4	323 TD		G1668-FS1-D(3)	5.000	11/9/2020	0.560	2.00	25.0
PFOS	**1763-23-1**	**1380 TD**		**G1668-FS1-D(5)**	**25.000**	**11/9/2020**	**10.9**	**25.0**	**125**
HFPO-DA	13252-13-6	0.500 UT	UJ	G1668-FS1(0)	1.000	11/7/2020	0.248	0.500	5.00
Adona	**919005-14-4**	**1.00 UT**		**G1668-FS1(0)**	**1.000**	**11/7/2020**	**0.265**	**1.00**	**5.00**
9Cl-PF3ONS	756426-58-1	0.500 UT		G1668-FS1(0)	1.000	11/7/2020	0.268	0.500	5.00
11Cl-PF3OUdS	**763051-92-9**	**1.00 UT**		**G1668-FS1(0)**	**1.000**	**11/7/2020**	**0.231**	**1.00**	**5.00**

Analyzed by: Schumitz, Denise
Printed: 11/11/2020

BATTELLE
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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-SW09-1020
Battelle ID	G1668-FS1
Sample Type	SA
Collection Date	10/13/2020
Extraction Date	11/04/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

use original

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	66	D	G1668-FS1-D(3)	11/9/2020
13C4-PFHpA	**78**	**D**	**G1668-FS1-D(3)**	**11/9/2020**
13C8-PFOA	90	D	G1668-FS1-D(3)	11/9/2020
13C9-PFNA	**98**	**D**	**G1668-FS1-D(5)**	**11/9/2020**
13C6-PFDA	73		G1668-FS1(0)	11/7/2020
13C7-PFUnA	**96**	**D**	**G1668-FS1-D(3)**	**11/9/2020**
13C2-PFDoA	36	N	G1668-FS1(0)	11/7/2020
13C2-PFTeDA	**12**	**N**	**G1668-FS1(0)**	**11/7/2020**
d3-MeFOSAA	98	D	G1668-FS1-D(5)	11/9/2020
d5-EtFOSAA	**112**	**D**	**G1668-FS1-D(5)**	**11/9/2020**
13C3-PFBS	94	D	G1668-FS1-D(5)	11/9/2020
13C3-PFHxS	**100**	**D**	**G1668-FS1-D(5)**	**11/9/2020**
13C8-PFOS	94	D	G1668-FS1-D(5)	11/9/2020
13C3-HFPO-DA	**71**	**D**	**G1668-FS1-D(3)**	**11/9/2020**

11/11/21

Analyzed by: Schumitz, Denise
Printed: 11/11/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1441
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 11, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-HVG-GW10-1020	G1696-FS1	Water
2	CBD-HVG-GW09-1020	G1697-FS1	Water

A Stage 2B/4 data validation was performed on the analytical data for two water samples collected on October 14, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination

- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted outside of the 14-day holding time for water samples at 26 days. All samples were qualified estimated (J/UJ).

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-101420-GW	None - ND	-	-	-
CBD-AOA-FB04-101620	PFTrDA	0.179	None	All Samples ND

Surrogate Spike Recoveries

- One sample exhibited surrogate recoveries outside of QC limits, however the sample was re-extracted outside of holding times and no further qualifications were required. See summary forms behind Form Is for specifics.

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- These samples were re-extracted outside of holding times from SDG 20-1305 to verify surrogate recovery deficiencies. Use the original analysis results in SDG 20-1305 for reporting purposes.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-HVG-GW10-1020
Battelle ID	G1696-FS1
Sample Type	SA
Collection Date	10/14/2020
Extraction Date	11/09/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.44 UT	UJ	G1696-FS1(0)	1.000	11/10/2020	0.507	1.44	4.81	HT
PFHpA	375-85-9	0.962 UT		G1696-FS1(0)	1.000	11/10/2020	0.253	0.962	4.81	
PFOA	335-67-1	1.44 UT		G1696-FS1(0)	1.000	11/10/2020	0.491	1.44	4.81	
PFNA	375-95-1	0.962 UT		G1696-FS1(0)	1.000	11/10/2020	0.297	0.962	4.81	
PFDA	335-76-2	0.481 UT		G1696-FS1(0)	1.000	11/10/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	0.481 UT		G1696-FS1(0)	1.000	11/10/2020	0.211	0.481	4.81	
PFDoA	307-55-1	0.481 UT		G1696-FS1(0)	1.000	11/10/2020	0.185	0.481	4.81	
PFTrDA	72629-94-8	0.481 UT		G1696-FS1(0)	1.000	11/10/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92 UT		G1696-FS1(0)	1.000	11/10/2020	0.705	1.92	4.81	
NMeFOSAA	2355-31-9	0.962 UT		G1696-FS1(0)	1.000	11/10/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962 UT		G1696-FS1(0)	1.000	11/10/2020	0.481	0.962	4.81	
PFBS	375-73-5	1.87 JT	J	G1696-FS1(0)	1.000	11/10/2020	0.138	0.481	4.81	
PFHxS	355-46-4	11.2 T	J	G1696-FS1(0)	1.000	11/10/2020	0.108	0.385	4.81	
PFOS	1763-23-1	2.71 JT	J	G1696-FS1(0)	1.000	11/10/2020	0.420	0.962	4.81	
HFPO-DA	13252-13-6	0.481 UT	UJ	G1696-FS1(0)	1.000	11/10/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962 UT		G1696-FS1(0)	1.000	11/10/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481 UT		G1696-FS1(0)	1.000	11/10/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962 UT		G1696-FS1(0)	1.000	11/10/2020	0.222	0.962	4.81	

1

Use original results in SDG 20-1305

MW 1/11/21

Analyzed by: Schumitz, Denise
Printed: 11/12/2020

BATTELLE
It can be done

2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Use original in 20-1305

Client ID	CBD-HVG-GW09-1020
Battelle ID	G1697-FS1
Sample Type	SA
Collection Date	10/14/2020
Extraction Date	11/09/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	0.706 JT	J	G1697-FS1(0)	1.000	11/10/2020	0.517	1.47	4.90	HT
PFHpA	375-85-9	0.980 UT	UJ	G1697-FS1(0)	1.000	11/10/2020	0.258	0.980	4.90	
PFOA	335-67-1	1.30 JT	J	G1697-FS1(0)	1.000	11/10/2020	0.501	1.47	4.90	
PFNA	375-95-1	0.980 UT	UJ	G1697-FS1(0)	1.000	11/10/2020	0.303	0.980	4.90	
PFDA	335-76-2	0.490 UT		G1697-FS1(0)	1.000	11/10/2020	0.139	0.490	4.90	
PFUnA	2058-94-8	0.490 UT		G1697-FS1(0)	1.000	11/10/2020	0.215	0.490	4.90	
PFDoA	307-55-1	0.490 UT		G1697-FS1(0)	1.000	11/10/2020	0.188	0.490	4.90	
PFTrDA	72629-94-8	0.490 UT		G1697-FS1(0)	1.000	11/10/2020	0.151	0.490	4.90	
PFTeDA	376-06-7	1.96 UT		G1697-FS1(0)	1.000	11/10/2020	0.719	1.96	4.90	
NMeFOSAA	2355-31-9	0.980 UT		G1697-FS1(0)	1.000	11/10/2020	0.343	0.980	4.90	
NEtFOSAA	2991-50-6	0.980 UT		G1697-FS1(0)	1.000	11/10/2020	0.490	0.980	4.90	
PFBS	375-73-5	4.08 JT	J	G1697-FS1(0)	1.000	11/10/2020	0.141	0.490	4.90	
PFHxS	355-46-4	37.7 T	J	G1697-FS1(0)	1.000	11/10/2020	0.110	0.392	4.90	
PFOS	1763-23-1	2.81 JT	J	G1697-FS1(0)	1.000	11/10/2020	0.428	0.980	4.90	
HFPO-DA	13252-13-6	0.490 UT	UJ	G1697-FS1(0)	1.000	11/10/2020	0.243	0.490	4.90	
Adona	919005-14-4	0.980 UT		G1697-FS1(0)	1.000	11/10/2020	0.260	0.980	4.90	
9Cl-PF3ONS	756426-58-1	0.490 UT		G1697-FS1(0)	1.000	11/10/2020	0.263	0.490	4.90	
11Cl-PF3OUdS	763051-92-9	0.980 UT		G1697-FS1(0)	1.000	11/10/2020	0.226	0.980	4.90	

MW 1/11/21

Analyzed by: Schumitz, Denise
Printed: 11/12/2020

BATTELLE
It can be done

2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-HVG-GW09-1020
Battelle ID	G1697-FS1
Sample Type	SA
Collection Date	10/14/2020
Extraction Date	11/09/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Use original results

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	42 N	G1697-FS1(0)	11/10/2020
13C4-PFHpA	58	G1697-FS1(0)	11/10/2020
13C8-PFOA	82	G1697-FS1(0)	11/10/2020
13C9-PFNA	99	G1697-FS1(0)	11/10/2020
13C6-PFDA	85	G1697-FS1(0)	11/10/2020
13C7-PFUnA	85	G1697-FS1(0)	11/10/2020
13C2-PFDoA	72	G1697-FS1(0)	11/10/2020
13C2-PFTeDA	63	G1697-FS1(0)	11/10/2020
d3-MeFOSAA	84	G1697-FS1(0)	11/10/2020
d5-EtFOSAA	95	G1697-FS1(0)	11/10/2020
13C3-PFBS	51	G1697-FS1(0)	11/10/2020
13C3-PFHxS	78	G1697-FS1(0)	11/10/2020
13C8-PFOS	87	G1697-FS1(0)	11/10/2020
13C3-HFPO-DA	74	G1697-FS1(0)	11/10/2020

12/11/20

Analyzed by: Schumitz, Denise
Printed: 11/12/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1455
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 11, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-MW15-1020	G1707-FS1	Water
2	CBD-AOA-MW16-1020	G1708-FS1	Water

A Stage 2B/4 data validation was performed on the analytical data for two water samples collected on October 16, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination

- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted outside of the 14-day holding time at 25 days for water samples and analyzed within 28 days. All results were qualified (J/UJ).

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-FB04-101620	PFTrDA	0.179	None	All Samples ND
CBD-EB01-101420-GW	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R) except for the following. One compound exhibited low percent recoveries in EDS Sample 1. However, this result was already qualified due to holding time exceedances.

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All samples were re-extracted outside of holding times from SDG 20-1310 to verify surrogate recovery deficiencies. Use the original results in SDG 20-1310 for reporting purposes.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW15-1020
Battelle ID	G1707-FS1
Sample Type	SA
Collection Date	10/16/2020
Extraction Date	11/10/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)	Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	186 TD J	G1707-FS1-D(5)	12.500	11/12/2020	6.33	18.0	60.1
PFHpA	**375-85-9**	**110 TD**	**G1707-FS1-D(3)**	**5.000**	**11/12/2020**	**1.26**	**4.81**	**24.0**
PFOA	335-67-1	508 TD	G1707-FS1-D(5)	12.500	11/12/2020	6.14	18.0	60.1
PFNA	**375-95-1**	**50.3 T**	**G1707-FS1(0)**	**1.000**	**11/12/2020**	**0.297**	**0.962**	**4.81**
PFDA	335-76-2	0.481 UT UJ	G1707-FS1(0)	1.000	11/12/2020	0.137	0.481	4.81
PFUnA	**2058-94-8**	**0.481 UT**	**G1707-FS1(0)**	**1.000**	**11/12/2020**	**0.211**	**0.481**	**4.81**
PFDoA	307-55-1	0.481 UT	G1707-FS1(0)	1.000	11/12/2020	0.185	0.481	4.81
PFTrDA	**72629-94-8**	**0.481 UT**	**G1707-FS1(0)**	**1.000**	**11/12/2020**	**0.148**	**0.481**	**4.81**
PFTeDA	376-06-7	1.92 UT	G1707-FS1(0)	1.000	11/12/2020	0.705	1.92	4.81
NMeFOSAA	**2355-31-9**	**0.962 UT**	**G1707-FS1(0)**	**1.000**	**11/12/2020**	**0.337**	**0.962**	**4.81**
NEtFOSAA	2991-50-6	0.962 UT	G1707-FS1(0)	1.000	11/12/2020	0.481	0.962	4.81
PFBS	**375-73-5**	**33.4 T** J	**G1707-FS1(0)**	**1.000**	**11/12/2020**	**0.138**	**0.481**	**4.81**
PFHxS	355-46-4	1060 TD	G1707-FS1-D(5)	12.500	11/12/2020	1.35	4.81	60.1
PFOS	**1763-23-1**	**41.1 T**	**G1707-FS1(0)**	**1.000**	**11/12/2020**	**0.420**	**0.962**	**4.81**
HFPO-DA	13252-13-6	0.481 UT UJ	G1707-FS1(0)	1.000	11/12/2020	0.238	0.481	4.81
Adona	**919005-14-4**	**0.962 UT**	**G1707-FS1(0)**	**1.000**	**11/12/2020**	**0.255**	**0.962**	**4.81**
9Cl-PF3ONS	756426-58-1	0.481 UT	G1707-FS1(0)	1.000	11/12/2020	0.258	0.481	4.81
11Cl-PF3OUdS	**763051-92-9**	**0.962 UT**	**G1707-FS1(0)**	**1.000**	**11/12/2020**	**0.222**	**0.962**	**4.81**

Use original results in 20-1310

UT

MW 1/11/21

Analyzed by: Griffith, Lauren
Printed: 11/16/2020

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW15-1020
Battelle ID	G1707-FS1
Sample Type	SA
Collection Date	10/16/2020
Extraction Date	11/10/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	97 D	G1707-FS1-D(5)	11/12/2020
13C4-PFHpA	**88 D**	**G1707-FS1-D(5)**	**11/12/2020**
13C8-PFOA	97 D	G1707-FS1-D(5)	11/12/2020
13C9-PFNA	**93 D**	**G1707-FS1-D(5)**	**11/12/2020**
13C6-PFDA	72	G1707-FS1(0)	11/12/2020
13C7-PFUnA	**61**	**G1707-FS1(0)**	**11/12/2020**
13C2-PFDoA	50	G1707-FS1(0)	11/12/2020
13C2-PFTeDA	**34 N**	**G1707-FS1(0)**	**11/12/2020**
d3-MeFOSAA	61	G1707-FS1(0)	11/12/2020
d5-EtFOSAA	**63**	**G1707-FS1(0)**	**11/12/2020**
13C3-PFBS	66	G1707-FS1(0)	11/12/2020
13C3-PFHxS	**81 D**	**G1707-FS1-D(5)**	**11/12/2020**
13C8-PFOS	68	G1707-FS1(0)	11/12/2020
13C3-HFPO-DA	**91 D**	**G1707-FS1-D(5)**	**11/12/2020**

use original

11/11/21

BATTELLE
It can be done

2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW16-1020
Battelle ID	G1708-FS1
Sample Type	SA
Collection Date	10/16/2020
Extraction Date	11/10/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.265
Size Unit-Basis	L

use original results in 20-1310

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	29.1 T	J	G1708-FS1(0)	1.000	11/12/2020	0.497	1.42	4.72	HT
PFHpA	375-85-9	8.32 T		G1708-FS1(0)	1.000	11/12/2020	0.248	0.943	4.72	
PFOA	335-67-1	19.5 T		G1708-FS1(0)	1.000	11/12/2020	0.482	1.42	4.72	
PFNA	375-95-1	6.48 T		G1708-FS1(0)	1.000	11/12/2020	0.292	0.943	4.72	
PFDA	335-76-2	0.472 UT	UJ	G1708-FS1(0)	1.000	11/12/2020	0.134	0.472	4.72	
PFUnA	2058-94-8	0.472 UT		G1708-FS1(0)	1.000	11/12/2020	0.207	0.472	4.72	
PFDoA	307-55-1	0.472 UT		G1708-FS1(0)	1.000	11/12/2020	0.181	0.472	4.72	
PFTrDA	72629-94-8	0.472 UT		G1708-FS1(0)	1.000	11/12/2020	0.145	0.472	4.72	
PFTeDA	376-06-7	1.89 UT		G1708-FS1(0)	1.000	11/12/2020	0.692	1.89	4.72	
NMeFOSAA	2355-31-9	0.943 UT		G1708-FS1(0)	1.000	11/12/2020	0.330	0.943	4.72	
NEtFOSAA	2991-50-6	0.943 UT		G1708-FS1(0)	1.000	11/12/2020	0.472	0.943	4.72	
PFBS	375-73-5	9.72 T	J	G1708-FS1(0)	1.000	11/12/2020	0.136	0.472	4.72	
PFHxS	355-46-4	103 T		G1708-FS1(0)	1.000	11/12/2020	0.106	0.377	4.72	
PFOS	1763-23-1	84.1 T		G1708-FS1(0)	1.000	11/12/2020	0.412	0.943	4.72	
HFPO-DA	13252-13-6	0.472 UT	UJ	G1708-FS1(0)	1.000	11/12/2020	0.234	0.472	4.72	
Adona	919005-14-4	0.943 UT		G1708-FS1(0)	1.000	11/12/2020	0.250	0.943	4.72	
9Cl-PF3ONS	756426-58-1	0.472 UT		G1708-FS1(0)	1.000	11/12/2020	0.253	0.472	4.72	
11Cl-PF3OUdS	763051-92-9	0.943 UT		G1708-FS1(0)	1.000	11/12/2020	0.218	0.943	4.72	

nw 1/11/21

Analyzed by: Griffith, Lauren
Printed: 11/16/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1481
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 11, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-MW18-1020	G1773-FS1	Water

A Stage 2B/4 data validation was performed on the analytical data for one water sample collected on October 19, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries

- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no rejections of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- The sample was extracted outside the 14-day holding time at 28 days. The sample was qualified as estimated (J/UJ).

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-101920-GW	PFOS	0.449	None	Sample >10X
CBD-AOA-FB05-102020	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- The sample was re-extracted outside of holding times from SDG 20-1321 to verify surrogate recovery deficiencies. Use the original analysis results in SDG 20-1321 for reporting purposes.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 2/12/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW18-1020
Battelle ID	G1773-FS1
Sample Type	SA
Collection Date	10/19/2020
Extraction Date	11/16/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.240
Size Unit-Basis	L

Use original results in 20-1321

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	717	TD J	G1773-FS1-D(5)	12.500	11/17/2020	6.86	19.5	65.1	HT
PFHpA	375-85-9	435	TD	G1773-FS1-D(3)	5.000	11/17/2020	1.37	5.21	26.0	
PFOA	335-67-1	1130	TD	G1773-FS1-D(7)	31.250	11/17/2020	16.6	48.8	163	
PFNA	375-95-1	622	TD	G1773-FS1-D(3)	5.000	11/17/2020	1.61	5.21	26.0	
PFDA	335-76-2	8.34	T	G1773-FS1(0)	1.000	11/17/2020	0.148	0.521	5.21	
PFUnA	2058-94-8	26.2	T	G1773-FS1(0)	1.000	11/17/2020	0.228	0.521	5.21	
PFDoA	307-55-1	0.521	UT UJ	G1773-FS1(0)	1.000	11/17/2020	0.200	0.521	5.21	
PFTrDA	72629-94-8	0.521	UT	G1773-FS1(0)	1.000	11/17/2020	0.160	0.521	5.21	
PFTeDA	376-06-7	2.08	UT	G1773-FS1(0)	1.000	11/17/2020	0.764	2.08	5.21	
NMeFOSAA	2355-31-9	0.369	JT J	G1773-FS1(0)	1.000	11/17/2020	0.365	1.04	5.21	
NEtFOSAA	2991-50-6	1.04	UT UJ	G1773-FS1(0)	1.000	11/17/2020	0.521	1.04	5.21	
PFBS	375-73-5	65.7	T J	G1773-FS1(0)	1.000	11/17/2020	0.150	0.521	5.21	
PFHxS	355-46-4	2600	TD J	G1773-FS1-D(9)	156.250	11/17/2020	18.2	65.1	814	
PFOS	1763-23-1	4250	TD J	G1773-FS1-D(9)	156.250	11/17/2020	71.1	163	814	
HFPO-DA	13252-13-6	0.521	UT UJ	G1773-FS1(0)	1.000	11/17/2020	0.258	0.521	5.21	
Adona	919005-14-4	1.04	UT	G1773-FS1(0)	1.000	11/17/2020	0.276	1.04	5.21	
9Cl-PF3ONS	756426-58-1	0.521	UT	G1773-FS1(0)	1.000	11/17/2020	0.279	0.521	5.21	
11Cl-PF3OUdS	763051-92-9	1.04	UT	G1773-FS1(0)	1.000	11/17/2020	0.241	1.04	5.21	

NW 1/11/21

Analyzed by: Schumitz, Denise
Printed: 11/17/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1511
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 11, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-MW17-1020	G1795-FS1	Water
2	CBD-SO3-MW02-1020	G1801-FS1	Water
3	CBD-AOA-MW09-1020	G1802-FS1	Water

A Stage 2B/4 data validation was performed on the analytical data for three water samples collected on October 20-21, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning

- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were serious deficiencies of data. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

- Several compounds were qualified (X) in two samples due to grossly exceeded holding times.

The remaining data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- EDS Samples 1 and 2 were extracted outside of the 14-day holding time at 29 days. The results were qualified (J/X) since they were analyzed at 29 days and grossly exceeded holding times.
- EDS Sample 3 was extracted outside of the 14-day holding time at 28 days. The results were qualified as estimated (J/UJ).

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks exhibited the following contamination.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
DB450PB-FS	PFUnA	0.252	U	1, 2, 3
	PFBS	0.173	None	Associated Samples >10X

Field QC Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-102020-GW	PFUnA	0.266	None	Associated Samples ND
CBD-AOA-EB01-102120-GW	PFUnA	0.284	None	Associated Samples ND
CBD-AOA-FB05-102020	None - ND	-	-	-

Surrogate Spike Recoveries

- Several samples exhibited surrogate percent recoveries outside of QC limits. However, the samples were previously qualified due to being re-extracted outside of holding times. See summary forms behind Form Is for specifics.

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- Several compounds were analyzed at a dilution due to high concentrations of target compounds. The reporting limits were adjusted accordingly. No action was required.
- These samples were re-extracted outside of holding times from SDG 20-1329 to verify surrogate recovery deficiencies. Use the original analysis results in SDG 20-1329 for reporting purposes.

Field Duplicate Sample Precision

- Field duplicate samples were not collected.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW17-1020
Battelle ID	G1795-FS1
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	11/18/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.235
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	9.16	J	G1795-FS1(0)	1.000	11/19/2020	0.561	1.60	5.32
PFHpA	375-85-9	3.10	JT	G1795-FS1(0)	1.000	11/19/2020	0.280	1.06	5.32
PFOA	335-67-1	4.40	JT	G1795-FS1(0)	1.000	11/19/2020	0.544	1.60	5.32
PFNA	375-95-1	2.30	JT	G1795-FS1(0)	1.000	11/19/2020	0.329	1.06	5.32
PFDA	335-76-2	0.532	UT	G1795-FS1(0)	1.000	11/19/2020	0.151	0.532	5.32
PFUnA	2058-94-8	0.484	JT	G1795-FS1(0)	1.000	11/19/2020	0.233	0.532	5.32
PFDoA	307-55-1	0.532	UT	G1795-FS1(0)	1.000	11/19/2020	0.204	0.532	5.32
PFTrDA	72629-94-8	0.532	UT	G1795-FS1(0)	1.000	11/19/2020	0.164	0.532	5.32
PFTeDA	376-06-7	2.13	UT	G1795-FS1(0)	1.000	11/19/2020	0.780	2.13	5.32
NMeFOSAA	2355-31-9	1.06	UT	G1795-FS1(0)	1.000	11/19/2020	0.372	1.06	5.32
NEtFOSAA	2991-50-6	1.06	UT	G1795-FS1(0)	1.000	11/19/2020	0.532	1.06	5.32
PFBS	375-73-5	1.79	JT	G1795-FS1(0)	1.000	11/19/2020	0.153	0.532	5.32
PFHxS	355-46-4	38.1	T	G1795-FS1(0)	1.000	11/19/2020	0.119	0.426	5.32
PFOS	1763-23-1	10.1	T	G1795-FS1(0)	1.000	11/19/2020	0.465	1.06	5.32
HFPO-DA	13252-13-6	0.532	UT	G1795-FS1(0)	1.000	11/19/2020	0.264	0.532	5.32
Adona	919005-14-4	1.06	UT	G1795-FS1(0)	1.000	11/19/2020	0.282	1.06	5.32
9Cl-PF3ONS	756426-58-1	0.532	UT	G1795-FS1(0)	1.000	11/19/2020	0.285	0.532	5.32
11Cl-PF3OUdS	763051-92-9	1.06	UT	G1795-FS1(0)	1.000	11/19/2020	0.246	1.06	5.32

NW 1/11/21

Analyzed by: Griffith, Lauren
Printed: 11/20/2020

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW17-1020
Battelle ID	G1795-FS1
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	11/18/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	83	G1795-FS1(0)	11/19/2020
13C4-PFHpA	85	G1795-FS1(0)	11/19/2020
13C8-PFOA	91	G1795-FS1(0)	11/19/2020
13C9-PFNA	90	G1795-FS1(0)	11/19/2020
13C6-PFDA	93	G1795-FS1(0)	11/19/2020
13C7-PFUnA	72	G1795-FS1(0)	11/19/2020
13C2-PFDoA	52	G1795-FS1(0)	11/19/2020
13C2-PFTeDA	28 N	G1795-FS1(0)	11/19/2020
d3-MeFOSAA	71	G1795-FS1(0)	11/19/2020
d5-EtFOSAA	75	G1795-FS1(0)	11/19/2020
13C3-PFBS	94	G1795-FS1(0)	11/19/2020
13C3-PFHxS	86	G1795-FS1(0)	11/19/2020
13C8-PFOS	90	G1795-FS1(0)	11/19/2020
13C3-HFPO-DA	76	G1795-FS1(0)	11/19/2020

use original

MW 11/11/21

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2

use original in 20-1329

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-SO3-MW02-1020
Battelle ID	G1801-FS1
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	11/18/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.260
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	85.3 T	J	G1801-FS1(0)	1.000	11/19/2020	0.507	1.44	4.81	HT
PFHpA	375-85-9	46.6 T		G1801-FS1(0)	1.000	11/19/2020	0.253	0.962	4.81	
PFOA	335-67-1	102 T		G1801-FS1(0)	1.000	11/19/2020	0.491	1.44	4.81	
PFNA	375-95-1	70.1 T		G1801-FS1(0)	1.000	11/19/2020	0.297	0.962	4.81	
PFDA	335-76-2	0.481 UT	X	G1801-FS1(0)	1.000	11/19/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	0.500 JT		G1801-FS1(0)	1.000	11/19/2020	0.211	0.481	4.81	~~MBL~~ HT
PFDoA	307-55-1	0.481 UT		G1801-FS1(0)	1.000	11/19/2020	0.185	0.481	4.81	HT
PFTrDA	72629-94-8	0.481 UT		G1801-FS1(0)	1.000	11/19/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92 UT		G1801-FS1(0)	1.000	11/19/2020	0.705	1.92	4.81	
NMeFOSAA	2355-31-9	0.962 UT		G1801-FS1(0)	1.000	11/19/2020	0.337	0.962	4.81	
NEtFOSAA	2991-50-6	0.962 UT		G1801-FS1(0)	1.000	11/19/2020	0.481	0.962	4.81	
PFBS	375-73-5	10.4 T	J	G1801-FS1(0)	1.000	11/19/2020	0.138	0.481	4.81	
PFHxS	355-46-4	340 TD		G1801-FS1-D(3)	12.500	11/19/2020	1.35	4.81	60.1	
PFOS	1763-23-1	452 TD		G1801-FS1-D(3)	12.500	11/19/2020	5.25	12.0	60.1	
HFPO-DA	13252-13-6	0.481 UT	X	G1801-FS1(0)	1.000	11/19/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962 UT		G1801-FS1(0)	1.000	11/19/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481 UT		G1801-FS1(0)	1.000	11/19/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962 UT		G1801-FS1(0)	1.000	11/19/2020	0.222	0.962	4.81	

NW 1/11/21

BATTELLE
It can be done

2

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-SO3-MW02-1020
Battelle ID	G1801-FS1
Sample Type	SA
Collection Date	10/20/2020
Extraction Date	11/18/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

use original

Surrogate Recoveries (%)	Recovery		Extract ID	Analysis Date
13C5-PFHxA	72		G1801-FS1(0)	11/19/2020
13C4-PFHpA	75		G1801-FS1(0)	11/19/2020
13C8-PFOA	74		G1801-FS1(0)	11/19/2020
13C9-PFNA	67		G1801-FS1(0)	11/19/2020
13C6-PFDA	70		G1801-FS1(0)	11/19/2020
13C7-PFUnA	61		G1801-FS1(0)	11/19/2020
13C2-PFDoA	43	N	G1801-FS1(0)	11/19/2020
13C2-PFTeDA	17	N	G1801-FS1(0)	11/19/2020
d3-MeFOSAA	99	D	G1801-FS1-D(3)	11/19/2020
d5-EtFOSAA	98	D	G1801-FS1-D(3)	11/19/2020
13C3-PFBS	100	D	G1801-FS1-D(3)	11/19/2020
13C3-PFHxS	94	D	G1801-FS1-D(3)	11/19/2020
13C8-PFOS	95	D	G1801-FS1-D(3)	11/19/2020
13C3-HFPO-DA	70		G1801-FS1(0)	11/19/2020

nw 1/11/21

Analyzed by: Griffith, Lauren
Printed: 11/20/2020

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It can be done

3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW09-1020
Battelle ID	G1802-FS1
Sample Type	SA
Collection Date	10/21/2020
Extraction Date	11/18/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.275
Size Unit-Basis	L

Use original in 20-1329

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	10.5	T J	G1802-FS1(0)	1.000	11/19/2020	0.479	1.36	4.55	HT
PFHpA	375-85-9	2.68	JT	G1802-FS1(0)	1.000	11/19/2020	0.239	0.909	4.55	
PFOA	335-67-1	8.08	T	G1802-FS1(0)	1.000	11/19/2020	0.465	1.36	4.55	
PFNA	375-95-1	0.383	JT	G1802-FS1(0)	1.000	11/19/2020	0.281	0.909	4.55	
PFDA	335-76-2	0.455	UT UJ	G1802-FS1(0)	1.000	11/19/2020	0.129	0.455	4.55	
PFUnA	2058-94-8	0.455 ~~0.294~~	~~JT~~ UJ	G1802-FS1(0)	1.000	11/19/2020	0.199	0.455	4.55	~~MBL~~ HT
PFDoA	307-55-1	0.455	UT	G1802-FS1(0)	1.000	11/19/2020	0.175	0.455	4.55	HT
PFTrDA	72629-94-8	0.455	UT	G1802-FS1(0)	1.000	11/19/2020	0.140	0.455	4.55	
PFTeDA	376-06-7	1.82	UT	G1802-FS1(0)	1.000	11/19/2020	0.666	1.82	4.55	
NMeFOSAA	2355-31-9	0.909	UT	G1802-FS1(0)	1.000	11/19/2020	0.318	0.909	4.55	
NEtFOSAA	2991-50-6	0.909	UT	G1802-FS1(0)	1.000	11/19/2020	0.455	0.909	4.55	
PFBS	375-73-5	1.85	JT J	G1802-FS1(0)	1.000	11/19/2020	0.131	0.455	4.55	
PFHxS	355-46-4	95.2	T	G1802-FS1(0)	1.000	11/19/2020	0.102	0.364	4.55	
PFOS	1763-23-1	11.8	T	G1802-FS1(0)	1.000	11/19/2020	0.397	0.909	4.55	
HFPO-DA	13252-13-6	0.455	UT UJ	G1802-FS1(0)	1.000	11/19/2020	0.225	0.455	4.55	
Adona	919005-14-4	0.909	UT	G1802-FS1(0)	1.000	11/19/2020	0.241	0.909	4.55	
9Cl-PF3ONS	756426-58-1	0.455	UT	G1802-FS1(0)	1.000	11/19/2020	0.244	0.455	4.55	
11Cl-PF3OUdS	763051-92-9	0.909	UT	G1802-FS1(0)	1.000	11/19/2020	0.210	0.909	4.55	

MW 1/11/21

Analyzed by: Griffith, Lauren
Printed: 11/20/2020

BATTELLE
It can be done

3

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW09-1020
Battelle ID	G1802-FS1
Sample Type	SA
Collection Date	10/21/2020
Extraction Date	11/18/2020
Analytical Instrument	Sciex 5500 (AC) LC/MS/MS

use mg.val

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	96	G1802-FS1(0)	11/19/2020
13C4-PFHpA	92	G1802-FS1(0)	11/19/2020
13C8-PFOA	95	G1802-FS1(0)	11/19/2020
13C9-PFNA	93	G1802-FS1(0)	11/19/2020
13C6-PFDA	86	G1802-FS1(0)	11/19/2020
13C7-PFUnA	69	G1802-FS1(0)	11/19/2020
13C2-PFDoA	50	G1802-FS1(0)	11/19/2020
13C2-PFTeDA	19 y	G1802-FS1(0)	11/19/2020
d3-MeFOSAA	78	G1802-FS1(0)	11/19/2020
d5-EtFOSAA	71	G1802-FS1(0)	11/19/2020
13C3-PFBS	102	G1802-FS1(0)	11/19/2020
13C3-PFHxS	96	G1802-FS1(0)	11/19/2020
13C8-PFOS	97	G1802-FS1(0)	11/19/2020
13C3-HFPO-DA	87	G1802-FS1(0)	11/19/2020

nw 1/11/21

Analyzed by: Griffith, Lauren
Printed: 11/20/2020

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: 20-1519
Laboratory: Battelle Norwell Operations, Norwell, Massachusetts
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 11, 2021

PFAS			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-MW06-1020	G2203-FS1	Water
2	CBD-AOA-MW12-1020	G2205-FS1	Water
3	CBD-AOA-MW11-1020	G2206-FS1	Water
4	CBD-AOA-MW11P-1020	G2207-FS1	Water
5	CBD-AOA-EB01-102820-GW	G2209-FS1	Water
6	CBD-AOA-MW14-1020	G2210-FS1	Water

A Stage 2B/4 data validation was performed on the analytical data for five water samples and one aqueous equipment blank sample collected on October 27-28, 2020 by CH2M HILL at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Analysis of Poly and Perfluoroalkyl Substances in Environmental Samples by Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS).

Specific method references are as follows:

Analysis	*Method References*
PFAS	Battelle SOP 5-369-08

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, including the following Module:

- The Department of Defense (DoD) Data Validation Guidelines Module 3, Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by Quality Systems Manual for Environmental Laboratories (QSM) Table B-15, May 2020;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Liquid Chromatography/Mass Spectrometry (LC/MS) Tuning
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Laboratory Fortified Blank (LFB)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Internal standard area and retention time summary forms
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Per- and Polyfluoroalkyl Substances (PFAS)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted outside of holding times for water samples at 26 and 27 days. All samples were qualified as estimated (J/UJ).

LC/MS Tuning

- All criteria were met.

Initial Calibration

- All relative standard deviation (%RSD) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- Field QC sample results are summarized below.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
CBD-AOA-EB01-102820-GW	None - ND	-	-	-
CBD-AOA-FB01-102820	None - ND	-	-	-

Surrogate Spike Recoveries

- Several samples exhibited percent recoveries that exceeded QC limits. However, all results were previously qualified (J/UJ) due to holding time exceedances. See summary forms behind Form Is for specifics.

Laboratory Fortified Blank (LFB)

- The LFB samples exhibited acceptable percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- MS/MSD samples were not analyzed.

Internal Standard (IS) Area Performance

- All internal standards met response and retention time (RT) criteria.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All samples were re-extracted outside of holding times from SDG 20-1375 to verify surrogate recovery deficiencies. Use the original analysis results in SDG 20-1375 for reporting purposes.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	CBD-AOA-MW11-1020 ng/L	CBD-AOA-MW11P-1020 ng/L	RPD	Qualifier
PFHxA	0.934	1.73	60%	None - <5X LOQ

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

BATTELLE
It can be done

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW06-1020
Battelle ID	G2203-FS1
Sample Type	SA
Collection Date	10/27/2020
Extraction Date	11/23/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.270
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	2.28 JT	J	G2203-FS1(0)	1.000	11/25/2020	0.488	1.39	4.63
PFHpA	375-85-9	1.86 JT		G2203-FS1(0)	1.000	11/25/2020	0.244	0.926	4.63
PFOA	335-67-1	55.5 T		G2203-FS1(0)	1.000	11/25/2020	0.473	1.39	4.63
PFNA	375-95-1	0.367 JT		G2203-FS1(0)	1.000	11/25/2020	0.286	0.926	4.63
PFDA	335-76-2	0.463 UT	UJ	G2203-FS1(0)	1.000	11/25/2020	0.131	0.463	4.63
PFUnA	2058-94-8	0.463 UT		G2203-FS1(0)	1.000	11/25/2020	0.203	0.463	4.63
PFDoA	307-55-1	0.463 UT		G2203-FS1(0)	1.000	11/25/2020	0.178	0.463	4.63
PFTrDA	72629-94-8	0.463 UT		G2203-FS1(0)	1.000	11/25/2020	0.143	0.463	4.63
PFTeDA	376-06-7	1.85 UT		G2203-FS1(0)	1.000	11/25/2020	0.679	1.85	4.63
NMeFOSAA	2355-31-9	0.926 UT		G2203-FS1(0)	1.000	11/25/2020	0.324	0.926	4.63
NEtFOSAA	2991-50-6	0.926 UT		G2203-FS1(0)	1.000	11/25/2020	0.463	0.926	4.63
PFBS	375-73-5	1.45 JT	J	G2203-FS1(0)	1.000	11/25/2020	0.133	0.463	4.63
PFHxS	355-46-4	13.4 T		G2203-FS1(0)	1.000	11/25/2020	0.104	0.370	4.63
PFOS	1763-23-1	7.48 T		G2203-FS1(0)	1.000	11/25/2020	0.405	0.926	4.63
HFPO-DA	13252-13-6	0.463 UT	UJ	G2203-FS1(0)	1.000	11/25/2020	0.230	0.463	4.63
Adona	919005-14-4	0.926 UT		G2203-FS1(0)	1.000	11/25/2020	0.245	0.926	4.63
9Cl-PF3ONS	756426-58-1	0.463 UT		G2203-FS1(0)	1.000	11/25/2020	0.248	0.463	4.63
11Cl-PF3OUdS	763051-92-9	0.926 UT		G2203-FS1(0)	1.000	11/25/2020	0.214	0.926	4.63

1

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

1

Client ID	CBD-AOA-MW06-1020
Battelle ID	G2203-FS1
Sample Type	SA
Collection Date	10/27/2020
Extraction Date	11/23/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

use original

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	66	G2203-FS1(0)	11/25/2020
13C4-PFHpA	79	G2203-FS1(0)	11/25/2020
13C8-PFOA	88	G2203-FS1(0)	11/25/2020
13C9-PFNA	88	G2203-FS1(0)	11/25/2020
13C6-PFDA	98	G2203-FS1(0)	11/25/2020
13C7-PFUnA	85	G2203-FS1(0)	11/25/2020
13C2-PFDoA	66	G2203-FS1(0)	11/25/2020
13C2-PFTeDA	27	G2203-FS1(0)	11/25/2020
d3-MeFOSAA	101	G2203-FS1(0)	11/25/2020
d5-EtFOSAA	106	G2203-FS1(0)	11/25/2020
13C3-PFBS	94	G2203-FS1(0)	11/25/2020
13C3-PFHxS	108	G2203-FS1(0)	11/25/2020
13C8-PFOS	97	G2203-FS1(0)	11/25/2020
13C3-HFPO-DA	89	G2203-FS1(0)	11/25/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

2

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Client ID		CBD-AOA-MW12-1020							
Battelle ID		G2205-FS1							
Sample Type		SA							
Collection Date		10/28/2020							
Extraction Date		11/23/2020							
Analytical Instrument		Sciex 6500+ (AE) LC/MS/MS							
% Moisture		NA							
Matrix		GW							
Sample Size		0.265							
Size Unit-Basis		L							
Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.01	JT	G2205-FS1(0)	1.000	11/25/2020	0.497	1.42	4.72
PFHpA	375-85-9	0.943	UT	G2205-FS1(0)	1.000	11/25/2020	0.248	0.943	4.72
PFOA	335-67-1	1.42	UT	G2205-FS1(0)	1.000	11/25/2020	0.482	1.42	4.72
PFNA	375-95-1	0.943	UT	G2205-FS1(0)	1.000	11/25/2020	0.292	0.943	4.72
PFDA	335-76-2	0.472	UT	G2205-FS1(0)	1.000	11/25/2020	0.134	0.472	4.72
PFUnA	2058-94-8	0.472	UT	G2205-FS1(0)	1.000	11/25/2020	0.207	0.472	4.72
PFDoA	307-55-1	0.472	UT	G2205-FS1(0)	1.000	11/25/2020	0.181	0.472	4.72
PFTrDA	72629-94-8	0.472	UT	G2205-FS1(0)	1.000	11/25/2020	0.145	0.472	4.72
PFTeDA	376-06-7	1.89	UT	G2205-FS1(0)	1.000	11/25/2020	0.692	1.89	4.72
NMeFOSAA	2355-31-9	0.943	UT	G2205-FS1(0)	1.000	11/25/2020	0.330	0.943	4.72
NEtFOSAA	2991-50-6	0.943	UT	G2205-FS1(0)	1.000	11/25/2020	0.472	0.943	4.72
PFBS	375-73-5	0.472	UT	G2205-FS1(0)	1.000	11/25/2020	0.136	0.472	4.72
PFHxS	355-46-4	0.226	JT	G2205-FS1(0)	1.000	11/25/2020	0.106	0.377	4.72
PFOS	1763-23-1	0.943	UT	G2205-FS1(0)	1.000	11/25/2020	0.412	0.943	4.72
HFPO-DA	13252-13-6	0.472	UT	G2205-FS1(0)	1.000	11/25/2020	0.234	0.472	4.72
Adona	919005-14-4	0.943	UT	G2205-FS1(0)	1.000	11/25/2020	0.250	0.943	4.72
9Cl-PF3ONS	756426-58-1	0.472	UT	G2205-FS1(0)	1.000	11/25/2020	0.253	0.472	4.72
11Cl-PF3OUdS	763051-92-9	0.943	UT	G2205-FS1(0)	1.000	11/25/2020	0.218	0.943	4.72

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

3

Client ID	CBD-AOA-MW11-1020
Battelle ID	G2206-FS1
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/23/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.250
Size Unit-Basis	L

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Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	0.934	JT	G2206-FS1(0)	1.000	11/25/2020	0.527	1.50	5.00	
PFHpA	375-85-9	1.00	UT	G2206-FS1(0)	1.000	11/25/2020	0.263	1.00	5.00	
PFOA	335-67-1	1.50	UT	G2206-FS1(0)	1.000	11/25/2020	0.511	1.50	5.00	
PFNA	375-95-1	1.00	UT	G2206-FS1(0)	1.000	11/25/2020	0.309	1.00	5.00	
PFDA	335-76-2	0.500	UT	G2206-FS1(0)	1.000	11/25/2020	0.142	0.500	5.00	
PFUnA	2058-94-8	0.500	UT	G2206-FS1(0)	1.000	11/25/2020	0.219	0.500	5.00	
PFDoA	307-55-1	0.500	UT	G2206-FS1(0)	1.000	11/25/2020	0.192	0.500	5.00	
PFTrDA	72629-94-8	0.500	UT	G2206-FS1(0)	1.000	11/25/2020	0.154	0.500	5.00	
PFTeDA	376-06-7	2.00	UT	G2206-FS1(0)	1.000	11/25/2020	0.733	2.00	5.00	
NMeFOSAA	2355-31-9	1.00	UT	G2206-FS1(0)	1.000	11/25/2020	0.350	1.00	5.00	
NEtFOSAA	2991-50-6	1.00	UT	G2206-FS1(0)	1.000	11/25/2020	0.500	1.00	5.00	
PFBS	375-73-5	0.500	UT	G2206-FS1(0)	1.000	11/25/2020	0.144	0.500	5.00	
PFHxS	355-46-4	0.400	UT	G2206-FS1(0)	1.000	11/25/2020	0.112	0.400	5.00	
PFOS	1763-23-1	1.00	UT	G2206-FS1(0)	1.000	11/25/2020	0.437	1.00	5.00	
HFPO-DA	13252-13-6	0.500	UT	G2206-FS1(0)	1.000	11/25/2020	0.248	0.500	5.00	
Adona	919005-14-4	1.00	UT	G2206-FS1(0)	1.000	11/25/2020	0.265	1.00	5.00	
9Cl-PF3ONS	756426-58-1	0.500	UT	G2206-FS1(0)	1.000	11/25/2020	0.268	0.500	5.00	
11Cl-PF3OUdS	763051-92-9	1.00	UT	G2206-FS1(0)	1.000	11/25/2020	0.231	1.00	5.00	

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW11-1020
Battelle ID	G2206-FS1
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/23/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	50	G2206-FS1(0)	11/25/2020
13C4-PFHpA	28	G2206-FS1(0)	11/25/2020
13C8-PFOA	92	G2206-FS1(0)	11/25/2020
13C9-PFNA	104	G2206-FS1(0)	11/25/2020
13C6-PFDA	88	G2206-FS1(0)	11/25/2020
13C7-PFUnA	106	G2206-FS1(0)	11/25/2020
13C2-PFDoA	86	G2206-FS1(0)	11/25/2020
13C2-PFTeDA	65	G2206-FS1(0)	11/25/2020
d3-MeFOSAA	66	G2206-FS1(0)	11/25/2020
d5-EtFOSAA	149	G2206-FS1(0)	11/25/2020
13C3-PFBS	74	G2206-FS1(0)	11/25/2020
13C3-PFHxS	55	G2206-FS1(0)	11/25/2020
13C8-PFOS	103	G2206-FS1(0)	11/25/2020
13C3-HFPO-DA	108	G2206-FS1(0)	11/25/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

4

Client ID	CBD-AOA-MW11P-1020
Battelle ID	G2207-FS1
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/23/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.260
Size Unit-Basis	L

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Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ	
PFHxA	307-24-4	1.73	JT	G2207-FS1(0)	1.000	11/25/2020	0.507	1.44	4.81	HT
PFHpA	375-85-9	0.962	UT	G2207-FS1(0)	1.000	11/25/2020	0.253	0.962	4.81	
PFOA	335-67-1	1.44	UT	G2207-FS1(0)	1.000	11/25/2020	0.491	1.44	4.81	
PFNA	375-95-1	0.962	UT	G2207-FS1(0)	1.000	11/25/2020	0.297	0.962	4.81	
PFDA	335-76-2	0.481	UT	G2207-FS1(0)	1.000	11/25/2020	0.137	0.481	4.81	
PFUnA	2058-94-8	0.481	UT	G2207-FS1(0)	1.000	11/25/2020	0.211	0.481	4.81	
PFDoA	307-55-1	0.481	UT	G2207-FS1(0)	1.000	11/25/2020	0.185	0.481	4.81	
PFTrDA	72629-94-8	0.481	UT	G2207-FS1(0)	1.000	11/25/2020	0.148	0.481	4.81	
PFTeDA	376-06-7	1.92	UT	G2207-FS1(0)	1.000	11/25/2020	0.705	1.92	4.81	
NMeFOSAA	2355-31-9	0.962	UT	G2207-FS1(0)	1.000	11/25/2020	0.397	0.962	4.81	
NEtFOSAA	2991-50-6	0.962	UT	G2207-FS1(0)	1.000	11/25/2020	0.481	0.962	4.81	
PFBS	375-73-5	0.481	UT	G2207-FS1(0)	1.000	11/25/2020	0.138	0.481	4.81	
PFHxS	355-46-4	0.385	UT	G2207-FS1(0)	1.000	11/25/2020	0.108	0.385	4.81	
PFOS	1763-23-1	0.962	UT	G2207-FS1(0)	1.000	11/25/2020	0.420	0.962	4.81	
HFPO-DA	13252-13-6	0.481	UT	G2207-FS1(0)	1.000	11/25/2020	0.238	0.481	4.81	
Adona	919005-14-4	0.962	UT	G2207-FS1(0)	1.000	11/25/2020	0.255	0.962	4.81	
9Cl-PF3ONS	756426-58-1	0.481	UT	G2207-FS1(0)	1.000	11/25/2020	0.258	0.481	4.81	
11Cl-PF3OUdS	763051-92-9	0.962	UT	G2207-FS1(0)	1.000	11/25/2020	0.222	0.962	4.81	

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4

Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW11P-1020
Battelle ID	G2207-FS1
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/23/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

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Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	51	G2207-FS1(0)	11/25/2020
13C4-PFHpA	28	G2207-FS1(0)	11/25/2020
13C8-PFOA	84	G2207-FS1(0)	11/25/2020
13C9-PFNA	143	G2207-FS1(0)	11/25/2020
13C6-PFDA	91	G2207-FS1(0)	11/25/2020
13C7-PFUnA	116	G2207-FS1(0)	11/25/2020
13C2-PFDoA	108	G2207-FS1(0)	11/25/2020
13C2-PFTeDA	95	G2207-FS1(0)	11/25/2020
d3-MeFOSAA	141	G2207-FS1(0)	11/25/2020
d5-EtFOSAA	206	G2207-FS1(0)	11/25/2020
13C3-PFBS	63	G2207-FS1(0)	11/25/2020
13C3-PFHxS	51	G2207-FS1(0)	11/25/2020
13C8-PFOS	101	G2207-FS1(0)	11/25/2020
13C3-HFPO-DA	111	G2207-FS1(0)	11/25/2020

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Analyzed by: Schumitz, Denise
Printed: 12/1/2020

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

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Client ID		CBD-AOA-EB01-102820-GW							
Battelle ID		G2209-FS1							
Sample Type		SA							
Collection Date		10/28/2020							
Extraction Date		11/23/2020							
Analytical Instrument		Sciex 6500+ (AE) LC/MS/MS							
% Moisture		NA							
Matrix		AQ							
Sample Size		0.280							
Size Unit-Basis		L							
Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	1.34	UJ	G2209-FS1(0)	1.000	11/25/2020	0.471	1.34	4.46
PFHpA	375-85-9	0.893	UT	G2209-FS1(0)	1.000	11/25/2020	0.235	0.893	4.46
PFOA	335-67-1	1.34	UT	G2209-FS1(0)	1.000	11/25/2020	0.456	1.34	4.46
PFNA	375-95-1	0.893	UT	G2209-FS1(0)	1.000	11/25/2020	0.276	0.893	4.46
PFDA	335-76-2	0.446	UT	G2209-FS1(0)	1.000	11/25/2020	0.127	0.446	4.46
PFUnA	2058-94-8	0.446	UT	G2209-FS1(0)	1.000	11/25/2020	0.196	0.446	4.46
PFDoA	307-55-1	0.446	UT	G2209-FS1(0)	1.000	11/25/2020	0.171	0.446	4.46
PFTrDA	72629-94-8	0.446	UT	G2209-FS1(0)	1.000	11/25/2020	0.138	0.446	4.46
PFTeDA	376-06-7	1.79	UT	G2209-FS1(0)	1.000	11/25/2020	0.654	1.79	4.46
NMeFOSAA	2355-31-9	0.893	UT	G2209-FS1(0)	1.000	11/25/2020	0.313	0.893	4.46
NEtFOSAA	2991-50-6	0.893	UT	G2209-FS1(0)	1.000	11/25/2020	0.446	0.893	4.46
PFBS	375-73-5	0.446	UT	G2209-FS1(0)	1.000	11/25/2020	0.129	0.446	4.46
PFHxS	355-46-4	0.357	UT	G2209-FS1(0)	1.000	11/25/2020	0.100	0.357	4.46
PFOS	1763-23-1	0.893	UT	G2209-FS1(0)	1.000	11/25/2020	0.390	0.893	4.46
HFPO-DA	13252-13-6	0.446	UT	G2209-FS1(0)	1.000	11/25/2020	0.221	0.446	4.46
Adona	919005-14-4	0.893	UT	G2209-FS1(0)	1.000	11/25/2020	0.237	0.893	4.46
9Cl-PF3ONS	756426-58-1	0.446	UT	G2209-FS1(0)	1.000	11/25/2020	0.239	0.446	4.46
11Cl-PF3OUdS	763051-92-9	0.893	UT	G2209-FS1(0)	1.000	11/25/2020	0.206	0.893	4.46

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW14-1020
Battelle ID	G2210-FS1
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/23/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS
% Moisture	NA
Matrix	GW
Sample Size	0.255
Size Unit-Basis	L

Analyte	CAS No.	Result (ng/L)		Extract ID	DF	Analysis Date	DL	LOD	LOQ
PFHxA	307-24-4	4.30 JT	J	G2210-FS1(0)	1.000	11/25/2020	0.517	1.47	4.90
PFHpA	375-85-9	1.73 JT	J	G2210-FS1(0)	1.000	11/25/2020	0.258	0.980	4.90
PFOA	335-67-1	5.05 T		G2210-FS1(0)	1.000	11/25/2020	0.501	1.47	4.90
PFNA	375-95-1	0.934 JT	J	G2210-FS1(0)	1.000	11/25/2020	0.303	0.980	4.90
PFDA	335-76-2	0.490 UT	UJ	G2210-FS1(0)	1.000	11/25/2020	0.139	0.490	4.90
PFUnA	2058-94-8	0.490 UT		G2210-FS1(0)	1.000	11/25/2020	0.215	0.490	4.90
PFDoA	307-55-1	0.490 UT		G2210-FS1(0)	1.000	11/25/2020	0.188	0.490	4.90
PFTrDA	72629-94-8	0.490 UT		G2210-FS1(0)	1.000	11/25/2020	0.151	0.490	4.90
PFTeDA	376-06-7	1.96 UT		G2210-FS1(0)	1.000	11/25/2020	0.719	1.96	4.90
NMeFOSAA	2355-31-9	0.980 UT		G2210-FS1(0)	1.000	11/25/2020	0.343	0.980	4.90
NEtFOSAA	2991-50-6	0.980 UT		G2210-FS1(0)	1.000	11/25/2020	0.490	0.980	4.90
PFBS	375-73-5	0.608 JT	J	G2210-FS1(0)	1.000	11/25/2020	0.141	0.490	4.90
PFHxS	355-46-4	8.33 T	J	G2210-FS1(0)	1.000	11/25/2020	0.110	0.392	4.90
PFOS	1763-23-1	4.03 JT	J	G2210-FS1(0)	1.000	11/25/2020	0.428	0.980	4.90
HFPO-DA	13252-13-6	0.490 UT	UJ	G2210-FS1(0)	1.000	11/25/2020	0.243	0.490	4.90
Adona	919005-14-4	0.980 UT		G2210-FS1(0)	1.000	11/25/2020	0.260	0.980	4.90
9Cl-PF3ONS	756426-58-1	0.490 UT		G2210-FS1(0)	1.000	11/25/2020	0.263	0.490	4.90
11Cl-PF3OUdS	763051-92-9	0.980 UT		G2210-FS1(0)	1.000	11/25/2020	0.226	0.980	4.90

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Project Client: CH2M
Project Name: CTO-4532: NRL Chesapeake Bay Detachment (NRL-CBD) Site 10
Project No.: 100142218

Client ID	CBD-AOA-MW14-1020
Battelle ID	G2210-FS1
Sample Type	SA
Collection Date	10/28/2020
Extraction Date	11/23/2020
Analytical Instrument	Sciex 6500+ (AE) LC/MS/MS

use original

Surrogate Recoveries (%)	Recovery	Extract ID	Analysis Date
13C5-PFHxA	51	G2210-FS1(0)	11/25/2020
13C4-PFHpA	**65**	**G2210-FS1(0)**	**11/25/2020**
13C8-PFOA	78	G2210-FS1(0)	11/25/2020
13C9-PFNA	**95**	**G2210-FS1(0)**	**11/25/2020**
13C6-PFDA	88	G2210-FS1(0)	11/25/2020
13C7-PFUnA	**94**	**G2210-FS1(0)**	**11/25/2020**
13C2-PFDoA	91	G2210-FS1(0)	11/25/2020
13C2-PFTeDA	**78**	**G2210-FS1(0)**	**11/25/2020**
d3-MeFOSAA	96	G2210-FS1(0)	11/25/2020
d5-EtFOSAA	**175**	G2210-FS1(0)	11/25/2020
13C3-PFBS	86	G2210-FS1(0)	11/25/2020
13C3-PFHxS	**103**	G2210-FS1(0)	11/25/2020
13C8-PFOS	115	G2210-FS1(0)	11/25/2020
13C3-HFPO-DA	**114**	G2210-FS1(0)	11/25/2020

11/11/21

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAVAL RESEARCH LABORATORY, MARYLAND

Client: CH2M HILL, Inc., Herndon, Virginia
SDG: J2014423
Laboratory: Advanced Environmental Laboratories, Jacksonville, Florida
Site: Naval Research Laboratory (NRL), Chesapeake Beach, Maryland
Date: January 8, 2021

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CBD-AOA-MW01-1020	J2014423001	Water
2	CBD-AOA-MW01P-1020	J2014423002	Water
3	CBD-AOA-MW02-1020	J2014423003	Water
4	CBD-AOA-MW03-1020	J2014423004	Water
5	CBD-AOA-MW04-1020	J2014423005	Water
6	CBD-AOA-MW08-1020	J2014423006	Water
6MS	CBD-AOA-MW08-1020MS	J2014423006MS	Water
6MSD	CBD-AOA-MW08-1020MSD	J2014423006MSD	Water
7	CBD-S03-MW01-1020	J2014423007	Water
8	CBD-AOA-EB01-101920-GW	J2014423008	Water
9*	CBD-AOA-TB01-101920	J2014423009	Water
10*	CBD-AOA-TB01-102020	J2014423010	Water
11	CBD-S03-MW02-1020	J2014423011	Water

* - GRO Only

A Stage 2B/4 data validation was performed on the analytical data for eight water samples, one aqueous equipment blank sample, and two aqueous trip blank samples collected on October 19-20, 2020 by CH2M HILL at the at the Naval Research Laboratory Site 10 Fire Testing Area in Maryland. The samples were analyzed under the Environmental Protection Agency (USEPA) "Test Methods for the Evaluation of Solid Waste, USEPA SW-846, Third Edition, September 1986, with revisions".

Specific method references are as follows:

Analysis	*Method References*
TPH-DRO	USEPA SW-846 Method 8015C
TPH-GRO	USEPA SW-846 Method 8015C

The data have been validated according to the protocols and quality control (QC) requirements of the analytical methods, the Final Sampling and Analysis Plan Site 10 Fire Testing Area Site Inspection, Naval Research Laboratory, August 2020, and the DoD Final General Data Validation Guidelines, November 2019, and the USEPA National Functional Guidelines for Organic Data Review as follows:

- The USEPA Contract Laboratories Program National Functional Guidelines for Organic Superfund Methods Data Review, January 2017;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Holding times and sample preservation
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate Spike recoveries
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) recoveries
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Stage 2B/4) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no serious deficiencies of data.

The data are acceptable for the intended purposes as qualified for the deficiencies detailed in this report.

Please note that any results qualified (U) due to blank contamination may be then qualified (J) due to another action. Therefore, the results may be qualified (UJ) due to the culmination of the blank contaminations and actions from other exceedances of QC criteria.

Total Petroleum Hydrocarbons - DRO

Holding Times

- All samples were extracted within 7 days for water samples and analyzed within 40 days for all samples.

Initial Calibration

- All %RSD and/or correlation coefficient criteria were met.

Continuing Calibration

- All %D criteria were met.

Method Blank

- The method blanks were free of contamination.

Field Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ug/L	Qualifier	Affected Samples
CBD-AOA-EB01-101920-GW	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R) except for the following.

EDS Sample	Surrogate	%R	Qualifier
11	o-Terphenyl	38.1%	J

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples acceptable percent recoveries (%R) and RPD values.

Laboratory Control Samples

- The LCS samples exhibited acceptable percent recoveries (%R).

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision is acceptable.

TPH-DRO				
Compound	CBD-AOA-MW01-1020 ug/L	CBD-AOA-MW01P-1020 ug/L	RPD	Qualifier
DRO	190	300U	NC	None

GC Column Difference Results

- All criteria were met.

Total Petroleum Hydrocarbons - GRO

Holding Times

- All samples were analyzed within 14 days for preserved water samples.

Initial Calibration

- All %RSD and/or correlation coefficient criteria were met.

Continuing Calibration

- All %D criteria were met.

Method Blank

- The method blanks were free of contamination.

Field Blank

- Field QC results are summarized below.

Blank ID	Compound	Conc. ug/L	Qualifier	Affected Samples
CBD-AOA-EB01-101920-GW	None - ND	-	-	-
CBD-AOA-TB01-101920	None - ND	-	-	-
CBD-AOA-TB01-102020	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate percent recoveries (%R).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD samples exhibited acceptable percent recoveries (%R) and RPD values.

Laboratory Control Samples

- The LCS samples exhibited acceptable percent recoveries (%R).

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision is acceptable.

TPH-GRO				
Compound	CBD-AOA-MW01-1020 ug/L	CBD-AOA-MW01P-1020 ug/L	RPD	Qualifier
GRO	100U	52	NC	None

GC Column Difference Results

- All criteria were met.

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 1/14/21

Nancy Weaver
Senior Chemist

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

Advanced Environmental Laboratories, Inc.

1

Semi Volatile GC Analysis Results

FORM 1

SW-846 8015C DRO

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423001		**Client ID:**	CBD-AOA-MW01-1020	
Date Collected:	10/19/2020		**Matrix:**	WATER	
Date Analyzed:	10/26/2020	16:12:29	**File ID:**	E26A012	
Date Extracted:	10/23/2020	11:00	**Instrument ID:**	J7E	
Dilution:	1		**Analytical Run ID:**	201026E-DRO	
Sample Wt/Vol:	995.00	mL	**% Moisture:**	100	
Extract Vol:	1000	uL	**Lims Prep Batch:**	2446	
Prep Method:	SW-846 8015C DRO		**Lims Analytical Batch:**	2007	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
DRO (C10-C28)	DRO	190	J	180	300	700	ug/L

NW 11/11/21

2

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8015C DRO

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423002		**Client ID:**	CBD-AOA-MW01P-1020	
Date Collected:	10/19/2020		**Matrix:**	WATER	
Date Analyzed:	10/26/2020	16:44:07	**File ID:**	E26A013	
Date Extracted:	10/23/2020	11:00	**Instrument ID:**	J7E	
Dilution:	1		**Analytical Run ID:**	201026E-DRO	
Sample Wt/Vol:	1001.00	mL	**% Moisture:**	100	
Extract Vol:	1000	uL	**Lims Prep Batch:**	2446	
Prep Method:	SW-846 8015C DRO		**Lims Analytical Batch:**	2007	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
DRO (C10-C28)	DRO	300	U	170	300	700	ug/L

MW 11/12/21

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8015C DRO

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423003		**Client ID:**	CBD-AOA-MW02-1020
Date Collected:	10/19/2020		**Matrix:**	WATER
Date Analyzed:	10/26/2020	17:15:41	**File ID:**	E26A014
Date Extracted:	10/23/2020	11:00	**Instrument ID:**	J7E
Dilution:	1		**Analytical Run ID:**	201026E-DRO
Sample Wt/Vol:	990.00	mL	**% Moisture:**	100
Extract Vol:	1000	uL	**Lims Prep Batch:**	2446
Prep Method:	SW-846 8015C DRO		**Lims Analytical Batch:**	2007

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
DRO (C10-C28)	DRO	810		180	300	710	ug/L

MW11121

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8015C DRO

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423004		**Client ID:**	CBD-AOA-MW03-1020	
Date Collected:	10/19/2020		**Matrix:**	WATER	
Date Analyzed:	10/26/2020	17:46:16	**File ID:**	E26A015	
Date Extracted:	10/23/2020	11:00	**Instrument ID:**	J7E	
Dilution:	1		**Analytical Run ID:**	201026E-DRO	
Sample Wt/Vol:	993.00	mL	**% Moisture:**	100	
Extract Vol:	1000	uL	**Lims Prep Batch:**	2446	
Prep Method:	SW-846 8015C DRO		**Lims Analytical Batch:**	2007	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
DRO (C10-C28)	DRO	300	U	180	300	700	ug/L

MW 11/11/21

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8015C DRO

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423005		**Client ID:**	CBD-AOA-MW04-1020
Date Collected:	10/19/2020		**Matrix:**	WATER
Date Analyzed:	10/26/2020	18:17:43	**File ID:**	E26A016
Date Extracted:	10/23/2020	11:00	**Instrument ID:**	J7E
Dilution:	1		**Analytical Run ID:**	201026E-DRO
Sample Wt/Vol:	1004.00	mL	**% Moisture:**	100
Extract Vol:	1000	uL	**Lims Prep Batch:**	2446
Prep Method:	SW-846 8015C DRO		**Lims Analytical Batch:**	2007

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
DRO (C10-C28)	DRO	300	U	170	300	700	ug/L

Advanced Environmental Laboratories, Inc.

b

Semi Volatile GC Analysis Results

FORM 1

SW-846 8015C DRO

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423006		**Client ID:**	CBD-AOA-MW08-1020	
Date Collected:	10/19/2020		**Matrix:**	WATER	
Date Analyzed:	10/26/2020	15:40:49	**File ID:**	E26A011	
Date Extracted:	10/23/2020	11:00	**Instrument ID:**	J7E	
Dilution:	1		**Analytical Run ID:**	201026E-DRO	
Sample Wt/Vol:	1000.00	mL	**% Moisture:**	100	
Extract Vol:	1000	uL	**Lims Prep Batch:**	2446	
Prep Method:	SW-846 8015C DRO		**Lims Analytical Batch:**	2007	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
DRO (C10-C28)	DRO	300	U	180	300	700	ug/L

MW 1/11/21

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8015C DRO

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423007		**Client ID:**	CBD-S03-MW01-1020
Date Collected:	10/19/2020		**Matrix:**	WATER
Date Analyzed:	10/26/2020	18:49:03	**File ID:**	E26A017
Date Extracted:	10/23/2020	11:00	**Instrument ID:**	J7E
Dilution:	1		**Analytical Run ID:**	201026E-DRO
Sample Wt/Vol:	1002.00	mL	**% Moisture:**	100
Extract Vol:	1000	uL	**Lims Prep Batch:**	2446
Prep Method:	SW-846 8015C DRO		**Lims Analytical Batch:**	2007

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
DRO (C10-C28)	DRO	180	J	170	300	700	ug/L

MW 11/12/21

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8015C DRO

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423008		**Client ID:**	CBD-AOA-EB01-101920-GW
Date Collected:	10/19/2020		**Matrix:**	WATER
Date Analyzed:	10/26/2020	19:20:36	**File ID:**	E26A018
Date Extracted:	10/23/2020	11:00	**Instrument ID:**	J7E
Dilution:	1		**Analytical Run ID:**	201026E-DRO
Sample Wt/Vol:	1003.00	mL	**% Moisture:**	100
Extract Vol:	1000	uL	**Lims Prep Batch:**	2446
Prep Method:	SW-846 8015C DRO		**Lims Analytical Batch:**	2007

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
DRO (C10-C28)	DRO	300	U	170	300	700	ug/L

NW 11/11/21

Advanced Environmental Laboratories, Inc.

Semi Volatile GC Analysis Results

FORM 1

SW-846 8015C DRO

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423011		**Client ID:**	CBD-S03-MW02-1020	
Date Collected:	10/20/2020		**Matrix:**	WATER	
Date Analyzed:	10/26/2020	19:50:51	**File ID:**	E26A019	
Date Extracted:	10/23/2020	11:00	**Instrument ID:**	J7E	
Dilution:	1		**Analytical Run ID:**	201026E-DRO	
Sample Wt/Vol:	1002.00	mL	**% Moisture:**	100	
Extract Vol:	1000	uL	**Lims Prep Batch:**	2446	
Prep Method:	SW-846 8015C DRO		**Lims Analytical Batch:**	2007	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
DRO (C10-C28)	DRO	220 J	✓	170	300	700	ug/L SSL

11/11/21

Advanced Environmental Laboratories, Inc.

Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423001		**Client ID:**	CBD-AOA-MW01-1020	
			File ID:	20103015.D	
Date Collected:	10/19/2020				
Date Analyzed:	10/30/2020	20:57	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

NW 11/11/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

2

Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423002		**Client ID:**	CBD-AOA-MW01P-1020	
			File ID:	20103022.D	
Date Collected:	10/19/2020				
Date Analyzed:	10/31/2020	01:57	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**52**	J	50	100	200	ug/L

NW 11/1/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

3

Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423003		**Client ID:**	CBD-AOA-MW02-1020	
			File ID:	20103009.D	
Date Collected:	10/19/2020				
Date Analyzed:	10/30/2020	16:40	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

MW 11/11/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423004		**Client ID:**	CBD-AOA-MW03-1020	
			File ID:	20103010.D	
Date Collected:	10/19/2020				
Date Analyzed:	10/30/2020	17:23	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

NW 11/11/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423005		**Client ID:**	CBD-AOA-MW04-1020	
			File ID:	20103011.D	
Date Collected:	10/19/2020				
Date Analyzed:	10/30/2020	18:06	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

MW 11/12/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

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Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423006		**Client ID:**	CBD-AOA-MW08-1020	
			File ID:	20103012.D	
Date Collected:	10/19/2020				
Date Analyzed:	10/30/2020	18:49	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

NW 11/11/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423007		**Client ID:**	CBD-S03-MW01-1020
			File ID:	20103013.D
Date Collected:	10/19/2020			
Date Analyzed:	10/30/2020	19:32	**Matrix:**	WATER
Date Prepared:			**Instrument ID:**	J1P
Dilution:	1		**Analytical Run ID:**	201030P-GROW
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100
Final Vol:	5000	uL	**Lims Prep Batch:**	
Prep Method:			**Lims Analytical Batch:**	1160

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

11/11/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

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Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423008		**Client ID:**	CBD-AOA-EB01-101920-GW	
			File ID:	20103008.D	
Date Collected:	10/19/2020				
Date Analyzed:	10/30/2020	15:57	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

MW 11/12/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423009		**Client ID:**	CBD-AOA-TB01-101920	
			File ID:	20103006.D	
Date Collected:	10/19/2020				
Date Analyzed:	10/30/2020	14:32	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

NW 11/11/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

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Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423010		**Client ID:**	CBD-AOA-TB01-102020	
			File ID:	20103007.D	
Date Collected:	10/20/2020				
Date Analyzed:	10/30/2020	15:15	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

nw 11/11/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Advanced Environmental Laboratories, Inc.

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Volatile Analysis Results

FORM 1

SW-846 8015C (GRO)

SDG No.: J2014423

Client: Jacobs - CH2M Hill

Sample ID:	J2014423011		**Client ID:**	CBD-S03-MW02-1020	
			File ID:	20103014.D	
Date Collected:	10/20/2020				
Date Analyzed:	10/30/2020	20:15	**Matrix:**	WATER	
Date Prepared:			**Instrument ID:**	J1P	
Dilution:	1		**Analytical Run ID:**	201030P-GROW	
Sample Wt/Vol:	5.00	mL	**% Moisture:**	100	
Final Vol:	5000	uL	**Lims Prep Batch:**		
Prep Method:			**Lims Analytical Batch:**	1160	

Parameter	CAS Number	Results	Q	DL	LOD	LOQ	Units
Gasoline Range Organics (GRO)	9408	**100**	U	50	100	200	ug/L

11/11/21

** This analyte is reported as not certified. The LOQ listed on the report is the low point of the calibration curve. The MDL and LOD values are set to the LOQ at this time.

Appendix F
Laboratory Analytical Data

Appendix F
Surface Soil Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SO01		CBD-AOA-SO02	CBD-AOA-SO03	CBD-AOA-SO04	CBD-AOA-SO05	CBD-AOA-SO06	CBD-AOA-SO07
Sample ID	CBD-AOA-SS01-000H	CBD-AOA-SS01P-000H	CBD-AOA-SS02-000H	CBD-AOA-SS03-000H	CBD-AOA-SS04-000H	CBD-AOA-SS05-000H	CBD-AOA-SS06-000H	CBD-AOA-SS07-000H
Sample Date	10/01/20	10/01/20	09/30/20	09/30/20	10/01/20	10/06/20	09/30/20	10/05/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/G)								
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2.56 U	2.4 U	3.08 U	2.55 U	2.21 U	2.35 U	2.58 U	2.37 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	1.28 U	1.2 U	1.54 U	1.27 U	1.1 U	1.18 U	1.29 U	1.18 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	1.92 U	1.8 U	2.31 U	1.91 U	1.66 U	1.76 U	1.94 U	1.78 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2.56 U	2.4 U	3.08 U	1.72 J	2.21 U	2.35 U	2.58 U	2.37 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	3.21 U	2.99 U	3.85 U	3.18 U	2.76 U	2.94 U	3.23 U	2.96 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	2.56 U	2.4 U	3.08 U	2.55 U	2.21 U	2.35 U	2.58 U	2.37 U
Perfluorooctane sulfonic acid (PFOS)	19.6 U	20.4 U	58.7 U	84.6 U	168	11 U	19.7 U	34.3 U
Perfluoroundecanoic Acid (PFUnA)	158 J	136	93.9	70.3	176	3.86 J	92.6	32.9
Perfluorohexanoic Acid (PFHxA)	1.44 J	1.48 J	1.19 J	3.73 J	2.63 J	2.12 J	1.77 J	2.05 J
Perfluorododecanoic Acid (PFDoA)	5.55 J	5.28 J	6.52 J	9.77	7.91	2.35 U	7.08	5.23 J
Perfluorooctanoic acid (PFOA)	0.92 J	0.82 J	2.22 J	4.02 J	4.76 J	2.35 U	1.76 J	1.46 J
Perfluorodecanoic Acid (PFDA)	2.1 J	2.09 J	2.9 J	4.83 J	9.9	1.18 U	3.89 J	1.92 J
Perfluorohexanesulfonic acid (PFHxS)	3.33 J	3.42 J	6.82 J	23.1	13.5	2.35 U	5.36 J	7.17
Perfluorobutanesulfonic acid (PFBS)	1.28 U	1.2 U	1.54 U	1.27 U	1.1 U	1.18 U	1.29 U	1.18 U
Perfluoroheptanoic acid (PFHpA)	1.92 U	1.8 U	1.5 J	3.17 J	3.27 J	1.16 J	2.3 J	1.39 J
Perfluorononanoic acid (PFNA)	1.5 J	1.7 J	5.66 J	6.52	6.14	0.83 J	2.41 J	2 J
Perfluorotetradecanoic Acid (PFTeDA)	3.21 U	2.99 U	3.85 U	2.39 J	1.99 J	2.94 U	1.59 J	1.98 J
Perfluorotridecanoic Acid (PFTrDA)	99.4	97	85.4	164	129	2.15 J	124	144

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/G - Nanograms per gram

Appendix F
Surface Soil Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SO08	CBD-AOA-SO09	CBD-AOA-SO10	CBD-AOA-SO11		CBD-AOA-SO12	CBD-AOA-SO13	CBD-AOA-SO14
Sample ID	CBD-AOA-SS08-000H	CBD-AOA-SS09-000H	CBD-AOA-SS10-000H	CBD-AOA-SS11-000H	CBD-AOA-SS11P-000H	CBD-AOA-SS12-000H	CBD-AOA-SS13-000H	CBD-AOA-SS14-000H
Sample Date	09/30/20	10/01/20	10/01/20	10/05/20	10/05/20	10/05/20	10/06/20	10/06/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/G)								
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2.84 U	2.67 U	2.47 U	3.1 U	3.51 U	2.52 U	2.23 U	2.15 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	1.42 U	1.33 U	1.23 U	1.55 U	1.75 U	1.26 U	1.12 U	1.08 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	2.13 U	2 U	1.85 U	2.33 U	2.63 U	1.89 U	1.68 U	1.61 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2.84 U	2.67 U	2.47 U	3.1 U	3.51 U	2.52 U	2.23 U	2.15 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	3.55 U	3.33 U	3.09 U	3.88 U	4.39 U	3.14 U	2.79 U	2.69 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	2.84 U	2.67 U	2.47 U	3.1 U	3.51 U	2.52 U	2.23 U	2.15 U
Perfluorooctane sulfonic acid (PFOS)	195	178	138	128 U	114 U	36.2 U	6.18 U	3.87 U
Perfluoroundecanoic Acid (PFUnA)	115	148	82.9	58.6	57.6	101	25.5	1.02 J
Perfluorohexanoic Acid (PFHxA)	4.85 J	3.24 J	3.03 J	7.22 J	6.43 J	2.52 U	2.23 U	2.15 U
Perfluorododecanoic Acid (PFDoA)	8.86	9.75	2.98 J	3.16 J	3.01 J	2.45 J	1.57 J	2.15 U
Perfluorooctanoic acid (PFOA)	4.05 J	2.67 J	1.82 J	2.07 J	2.08 J	2.52 U	2.23 U	2.15 U
Perfluorodecanoic Acid (PFDA)	5.52 J	3.51 J	2.01 J	3.71 J	3.36 J	3.61 J	0.67 J	1.08 U
Perfluorohexanesulfonic acid (PFHxS)	33.3	15.1	6.98	6.75 J	4.93 J	2.24 J	1.37 J	2.15 U
Perfluorobutanesulfonic acid (PFBS)	0.58 J	1.33 U	1.23 U	1.55 U	1.75 U	1.26 U	1.12 U	1.08 U
Perfluoroheptanoic acid (PFHpA)	2.12 J	2.46 J	2.25 J	4.66 J	4.28 J	1.89 U	1.68 U	1.61 U
Perfluorononanoic acid (PFNA)	5.71 J	4.06 J	61.8	2.98 J	4.13 J	1.12 J	1.12 U	1.08 U
Perfluorotetradecanoic Acid (PFTeDA)	1.68 J	2.93 J	3.09 U	3.88 U	4.39 U	3.14 U	2.79 U	2.69 U
Perfluorotridecanoic Acid (PFTrDA)	110	145	62.2	48.8	48	48	47.6	0.64 J

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/G - Nanograms per gram

Appendix F
Surface Soil Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SO15	CBD-AOA-SO16	CBD-AOA-SO17	CBD-AOA-SO18	CBD-AOA-SO19	CBD-AOA-SO20	CBD-AOA-SO21	
Sample ID	CBD-AOA-SS15-000H	CBD-AOA-SS16-000H	CBD-AOA-SS17-000H	CBD-AOA-SS18-000H	CBD-AOA-SS19-000H	CBD-AOA-SS20-000H	CBD-AOA-SS21-000H	CBD-AOA-SS21P-000H
Sample Date	10/06/20	10/06/20	10/05/20	10/05/20	10/05/20	10/05/20	10/02/20	10/02/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/G)								
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2.38 U	2.55 U	2.37 U	2.15 U	2.08 U	2.53 U	2.34 U	2.55 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	1.19 U	1.27 U	1.18 U	1.08 U	1.04 U	1.27 U	1.17 U	1.27 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	1.79 U	1.91 U	1.78 U	1.61 U	1.56 U	1.9 U	1.75 U	1.91 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2.38 U	2.55 U	2.37 U	2.15 U	2.55 J	2.53 U	2.34 U	2.55 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2.98 U	3.18 U	2.96 U	2.69 U	8.05 J	3.16 U	2.92 U	3.18 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	2.38 U	2.55 U	2.37 U	2.15 U	2.08 U	2.53 U	2.34 U	2.55 U
Perfluorooctane sulfonic acid (PFOS)	6.51 U	16.1 U	4,660	82.1 U	224	231	7.12 U	6.41 U
Perfluoroundecanoic Acid (PFUnA)	17.9	30.6	154	3.16 J	961	101	5.11 J	5.57 J
Perfluorohexanoic Acid (PFHxA)	2.38 U	2.55 U	13.6	2.15 U	3.76 J	4.02 J	2.34 U	2.55 U
Perfluorododecanoic Acid (PFDoA)	3.45 J	0.9 J	5.99	2.15 U	32.7	7.19	2.34 U	2.55 U
Perfluorooctanoic acid (PFOA)	2.38 U	2.55 U	25.4	2.15 U	8.07	4.06 J	2.34 U	2.55 U
Perfluorodecanoic Acid (PFDA)	1.19 U	0.77 J	9.57	1.08 U	13.3	6.8	1.17 U	1.27 U
Perfluorohexanesulfonic acid (PFHxS)	0.99 J	2.55 U	155	1.41 J	20.9	37.5	1.1 J	1.16 J
Perfluorobutanesulfonic acid (PFBS)	1.19 U	1.27 U	0.66 J	1.08 U	1.04 U	1.27 U	1.17 U	1.27 U
Perfluoroheptanoic acid (PFHpA)	1.79 U	1.91 U	10.8	1.61 U	2.15 J	2.1 J	1.75 U	1.91 U
Perfluorononanoic acid (PFNA)	1.19 U	1.27 U	152	0.75 J	3.47 J	16.1	1.17 U	1.27 U
Perfluorotetradecanoic Acid (PFTeDA)	2.98 U	3.18 U	1.42 J	2.69 U	14	2.81 J	2.92 U	3.18 U
Perfluorotridecanoic Acid (PFTrDA)	101	18.1	89.6	0.38 J	728	124	4.46 J	3.75 J

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/G - Nanograms per gram

Appendix F
Surface Soil Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SO22	CBD-AOA-SO23	CBD-AOA-SO24	CBD-AOA-SO25	CBD-AOA-SO26	CBD-AOA-SO27	CBD-AOA-SO28	CBD-AOA-SO29
Sample ID	CBD-AOA-SS22-000H	CBD-AOA-SS23-000H	CBD-AOA-SS24-000H	CBD-AOA-SS25-000H	CBD-AOA-SS26-000H	CBD-AOA-SS27-000H	CBD-AOA-SS28-000H	CBD-AOA-SS29-000H
Sample Date	10/02/20	10/09/20	10/02/20	10/01/20	10/06/20	10/06/20	10/09/20	10/02/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/G)								
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2.27 U	2.19 U	2.21 U	2.56 U	2.35 U	2.48 U	2.07 U	2.38 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	1.14 U	1.09 U	1.1 U	1.28 U	1.18 U	1.24 U	1.04 U	1.19 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	1.7 U	1.64 U	1.66 U	1.92 U	1.76 U	1.86 U	1.55 U	1.79 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2.27 U	2.19 U	2.21 U	2.56 U	2.35 U	2.48 U	2.07 U	2.38 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2.84 U	2.73 U	2.76 U	3.21 U	5.73 J	3.11 U	2.59 U	2.98 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	2.27 U	2.19 U	2.21 U	2.56 U	2.35 U	2.48 U	2.07 U	2.38 U
Perfluorooctane sulfonic acid (PFOS)	7.91 U	16.1 U	7.1 U	91 U	1,160	64.2 U	2.07 U	6.4 U
Perfluoroundecanoic Acid (PFUnA)	6.41	1.05 J	3.85 J	77.4	85.7	9.41	1.04 U	3.11 J
Perfluorohexanoic Acid (PFHxA)	2.27 U	2.19 U	2.21 U	3.18 J	3.1 J	0.99 J	2.07 U	2.38 U
Perfluorododecanoic Acid (PFDoA)	2.27 U	2.19 U	2.21 U	3.42 J	3.2 J	2.48 U	2.07 U	0.83 J
Perfluorooctanoic acid (PFOA)	2.27 U	2.19 U	2.21 U	2.29 J	20.2	3.16 J	2.07 U	2.38 U
Perfluorodecanoic Acid (PFDA)	1.14 U	1.09 U	1.1 U	3.82 J	2.36 J	1.66 J	1.04 U	0.88 J
Perfluorohexanesulfonic acid (PFHxS)	2.27 U	2.19 U	2.21 U	16.6	31.6	4.14 J	2.07 U	2.38 U
Perfluorobutanesulfonic acid (PFBS)	1.14 U	1.09 U	1.1 U	1.28 U	1.18 U	1.24 U	1.04 U	1.19 U
Perfluoroheptanoic acid (PFHpA)	1.7 U	1.64 U	1.66 U	3.05 J	2.31 J	0.92 J	1.55 U	1.79 U
Perfluorononanoic acid (PFNA)	1.14 U	1.14 J	1.1 U	4.24 J	1.95 J	8.46	1.04 U	1.19 U
Perfluorotetradecanoic Acid (PFTeDA)	2.84 U	2.73 U	2.76 U	3.21 U	1.38 J	3.11 U	2.59 U	2.98 U
Perfluorotridecanoic Acid (PFTrDA)	3.33 J	1.09 U	2.4 J	55.3	103	3.05 J	1.04 U	1.41 J

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/G - Nanograms per gram

Appendix F
Subsurface Soil Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SO01	CBD-AOA-SO02	CBD-AOA-SO03	CBD-AOA-SO04	CBD-AOA-SO05		CBD-AOA-SO06	CBD-AOA-SO07	CBD-AOA-SO08	CBD-AOA-SO09	
Sample ID	CBD-AOA-SB01-0709	CBD-AOA-SB02-0810	CBD-AOA-SB03-0810	CBD-AOA-SB04-1618	CBD-AOA-SB05-1113	CBD-AOA-SB05P-1113	CBD-AOA-SB06-0709	CBD-AOA-SB07-0809	CBD-AOA-SB08-0810	CBD-AOA-SB09-0103	CBD-AOA-SB09-0608
Sample Date	10/01/20	09/30/20	09/30/20	10/01/20	10/06/20	10/06/20	09/30/20	10/05/20	09/30/20	10/01/20	10/01/20
Chemical Name											
Per- and Polyfluorinated Alkyl Substances (NG/G)											
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2.53 U	2.9 U	3.17 U	3.39 U	2.35 U	2.53 U	2.84 U	3.25 U	3.03 U	2.3 U	3.17 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	1.27 U	1.45 U	1.59 U	1.69 U	1.18 U	1.27 U	1.42 U	1.63 U	1.52 U	1.15 U	1.59 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	1.9 U	2.17 U	2.38 U	2.54 U	1.76 U	1.9 U	2.13 U	2.44 U	2.27 U	1.72 U	2.38 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2.53 U	2.9 U	3.17 U	3.39 U	2.35 U	2.53 U	2.84 U	3.25 U	3.03 U	1.24 J	3.17 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	3.16 U	3.62 U	3.97 U	4.24 U	2.94 U	3.16 U	3.55 U	4.07 U	3.79 U	4.26 J	3.97 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	2.53 U	2.9 U	3.17 U	3.39 U	2.35 U	2.53 U	2.84 U	3.25 U	3.03 U	2.3 U	3.17 U
Perfluorooctane sulfonic acid (PFOS)	214	10.4 U	96.7 U	106	11 U	12.9 U	41 U	16.3 U	24.9 U	7,150	7,950
Perfluoroundecanoic Acid (PFUnA)	1.94 J	5.1 J	3.65 J	5.74 J	0.85 J	1.08 J	1.42 U	1.63 U	1.17 J	517	175
Perfluorohexanoic Acid (PFHxA)	2.53 U	2.9 U	5.84 J	5.93 J	2.35 U	2.53 U	2.74 J	2.55 J	2.85 J	54	71.6
Perfluorododecanoic Acid (PFDoA)	2.53 U	2.9 U	3.17 U	3.39 U	2.35 U	2.53 U	2.84 U	3.25 U	3.03 U	12.5	2.96 J
Perfluorooctanoic acid (PFOA)	2.53 U	2.9 U	5.68 J	3.52 J	2.35 U	2.53 U	2.11 J	3.25 U	1.66 J	68	17.8
Perfluorodecanoic Acid (PFDA)	1.27 U	1.45 U	1.59 U	1.69 U	1.18 U	1.27 U	1.42 U	1.63 U	1.52 U	23.8	6.92 J
Perfluorohexanesulfonic acid (PFHxS)	1.95 J	1.32 J	12.6	10.7	2.35 U	2.53 U	6.78 J	3.19 J	5.36 J	227	52.4
Perfluorobutanesulfonic acid (PFBS)	1.27 U	1.45 U	1.59 U	1.69 U	1.18 U	1.27 U	0.59 J	1.63 U	1.52 U	5.37 J	0.86 J
Perfluoroheptanoic acid (PFHpA)	1.9 U	2.17 U	1.41 J	1.67 J	1.76 U	1.9 U	1.38 J	2.44 U	1.26 J	13.4	5.79 J
Perfluorononanoic acid (PFNA)	9.04	1.45 U	13.8	8.12 J	1.18 U	1.27 U	9.66	1.18 J	4.37 J	364	67.8
Perfluorotetradecanoic Acid (PFTeDA)	3.16 U	3.62 U	3.97 U	4.24 U	2.94 U	3.16 U	3.55 U	4.07 U	3.79 U	5.49 J	3.97 U
Perfluorotridecanoic Acid (PFTrDA)	1.27 U	1.55 J	1.59 U	1.69 U	1.18 U	1.27 U	1.42 U	1.63 U	1.52 U	299	65.9

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/G - Nanograms per gram

Appendix F
Subsurface Soil Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SO10		CBD-AOA-SO11	CBD-AOA-SO12	CBD-AOA-SO13	CBD-AOA-SO14	CBD-AOA-SO15			CBD-AOA-SO16	CBD-AOA-SO17
Sample ID	CBD-AOA-SB10-0608	CBD-AOA-SB10P-0608	CBD-AOA-SB11-1315	CBD-AOA-SB12-0103	CBD-AOA-SB13-0103	CBD-AOA-SB14-1012	CBD-AOA-SB15-1113	CBD-AOA-SB15P-1113	CBD-AOA-SB15-0810	CBD-AOA-SB16-0608	CBD-AOA-SB17-0608
Sample Date	10/01/20	10/01/20	10/05/20	10/05/20	10/06/20	10/06/20	10/06/20	10/06/20	10/06/20	10/06/20	10/05/20
Chemical Name											
Per- and Polyfluorinated Alkyl Substances (NG/G)											
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2.78 U	3.08 U	3.36 U	2.3 U	2.21 U	2.33 U	2.42 U	2.47 U	2.29 U	2.55 U	2.6 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	1.39 U	1.54 U	1.68 U	1.15 U	1.1 U	1.16 U	1.21 U	1.23 U	1.14 U	1.27 U	1.3 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	2.08 U	2.31 U	2.52 U	1.72 U	1.66 U	1.74 U	1.82 U	1.85 U	1.71 U	1.91 U	1.95 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2.78 U	3.08 U	3.36 U	2.3 U	2.21 U	2.33 U	2.42 U	2.47 U	2.29 U	2.55 U	2.6 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	3.47 U	3.85 U	4.2 U	2.87 U	2.76 U	2.91 U	3.03 U	3.09 U	2.86 U	3.18 U	3.25 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	2.78 U	3.08 U	3.36 U	2.3 U	2.21 U	2.33 U	2.42 U	2.47 U	2.29 U	2.55 U	2.6 U
Perfluorooctane sulfonic acid (PFOS)	1,200	915	115 U	568	613	6.58 U	15.2 U	14.7 U	5.29 U	6.69 U	653
Perfluoroundecanoic Acid (PFUnA)	16.1	14.7	2.72 J	119	237	1.16 U	1.21 U	1.23 U	1.14 U	1.27 U	1.3 U
Perfluorohexanoic Acid (PFHxA)	51.8	55.7	6.1 J	1.11 J	2.21 U	2.33 U	2.42 U	2.47 U	2.29 U	2.55 U	32.2
Perfluorododecanoic Acid (PFDoA)	2.78 U	3.08 U	3.36 U	2.09 J	3.91 J	2.33 U	2.42 U	2.47 U	2.29 U	2.55 U	2.6 U
Perfluorooctanoic acid (PFOA)	34.7	33.7	4.04 J	7.01	1.24 J	2.33 U	2.42 U	2.47 U	2.29 U	2.55 U	20.6
Perfluorodecanoic Acid (PFDA)	5.84 J	5.42 J	1.68 U	19.2	22.9	1.16 U	1.21 U	1.23 U	1.14 U	1.27 U	1.3 U
Perfluorohexanesulfonic acid (PFHxS)	174	163	9.95	7.49	2.09 J	2.33 U	2.4 J	2.56 J	2.1 J	2.55 U	124
Perfluorobutanesulfonic acid (PFBS)	6.08 J	5.97 J	1.68 U	1.15 U	1.1 U	1.16 U	1.21 U	1.23 U	1.14 U	1.27 U	2.35 J
Perfluoroheptanoic acid (PFHpA)	10.4	10.5	1.1 J	1.51 J	0.64 J	1.74 U	1.82 U	1.85 U	1.71 U	1.91 U	7.89
Perfluorononanoic acid (PFNA)	110	101	12.6	25	4.2 J	1.16 U	5.29 J	6.35	2.98 J	1.27 U	172
Perfluorotetradecanoic Acid (PFTeDA)	3.47 U	3.85 U	4.2 U	2.87 U	1.21 J	2.91 U	3.03 U	3.09 U	2.86 U	3.18 U	3.25 U
Perfluorotridecanoic Acid (PFTrDA)	0.57 J	0.48 J	1.68 U	39.9	96.4	1.16 U	1.21 U	1.23 U	1.14 U	1.27 U	1.3 U

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/G - Nanograms per gram

Appendix F
Subsurface Soil Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SO18		CBD-AOA-SO19	CBD-AOA-SO20	CBD-AOA-SO21	CBD-AOA-SO22	CBD-AOA-SO23	CBD-AOA-SO24	CBD-AOA-SO25		
Sample ID	CBD-AOA-SB18-0204	CBD-AOA-SB18-0809	CBD-AOA-SB19-0608	CBD-AOA-SB20-0810	CBD-AOA-SB21-1516	CBD-AOA-SB22-0911	CBD-AOA-SB23-1516	CBD-AOA-SB24-0103	CBD-AOA-SB25-1517	CBD-AOA-SB25-0810	CBD-AOA-SB25P-0810
Sample Date	10/05/20	10/05/20	10/05/20	10/05/20	10/02/20	10/02/20	10/09/20	10/02/20	10/01/20	10/01/20	10/01/20
Chemical Name											
Per- and Polyfluorinated Alkyl Substances (NG/G)											
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2.41 U	3.2 U	2.58 U	2.9 U	2.65 U	2.38 U	2.6 U	2.38 U	2.8 U	2.31 U	2.27 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	1.2 U	1.6 U	1.29 U	1.45 U	1.32 U	1.19 U	1.3 U	1.19 U	1.4 U	1.16 U	1.14 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	1.81 U	2.4 U	1.94 U	2.17 U	1.99 U	1.79 U	1.95 U	1.79 U	2.1 U	1.73 U	1.7 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2.41 U	3.2 U	2.58 U	2.9 U	2.65 U	2.38 U	2.6 U	2.38 U	2.8 U	2.31 U	2.27 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	3.01 U	4 U	3.23 U	3.62 U	3.31 U	2.98 U	3.25 U	2.98 U	3.5 U	2.89 U	2.84 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	2.41 U	3.2 U	2.58 U	2.9 U	2.65 U	2.38 U	2.6 U	2.38 U	2.8 U	2.31 U	2.27 U
Perfluorooctane sulfonic acid (PFOS)	84.6 U	6.1 U	123 U	4.63 U	15 U	2.38 U	2.6 U	39.5 U	204	145	150
Perfluoroundecanoic Acid (PFUnA)	18.8	1.6 U	1.29 U	0.89 J	1.08 J	1.19 U	1.3 U	0.81 J	15.8	1.16 U	1.14 U
Perfluorohexanoic Acid (PFHxA)	3.11 J	3.2 U	2.71 J	2.9 U	2.65 U	2.38 U	2.6 U	2.38 U	3.61 J	2.31 U	2.27 U
Perfluorododecanoic Acid (PFDoA)	2.41 U	3.2 U	2.58 U	2.9 U	2.65 U	2.38 U	2.6 U	2.38 U	2.8 U	2.31 U	2.27 U
Perfluorooctanoic acid (PFOA)	75.9	3.2 U	2.15 J	2.9 U	2.65 U	2.38 U	2.6 U	2.38 U	3.34 J	0.76 J	0.89 J
Perfluorodecanoic Acid (PFDA)	1.2 U	1.6 U	1.09 J	1.45 U	1.32 U	1.19 U	1.3 U	1.19 U	1.11 J	1.16 U	1.14 U
Perfluorohexanesulfonic acid (PFHxS)	15	3.2 U	6.22 J	1.52 J	2.65 U	2.38 U	2.6 U	2.38 U	7.69	2.31 U	2.27 U
Perfluorobutanesulfonic acid (PFBS)	1.2 U	1.6 U	1.29 U	1.45 U	1.32 U	1.19 U	1.3 U	1.19 U	1.4 U	1.16 U	1.14 U
Perfluoroheptanoic acid (PFHpA)	0.8 J	2.4 U	1.16 J	2.17 U	1.99 U	1.79 U	1.95 U	1.79 U	0.85 J	1.73 U	1.7 U
Perfluorononanoic acid (PFNA)	13.2	1.6 U	1.29 U	1.45 U	1.32 U	1.19 U	1.3 U	0.91 J	47.6 J	143	138 J
Perfluorotetradecanoic Acid (PFTeDA)	3.01 U	4 U	3.23 U	3.62 U	3.31 U	2.98 U	3.25 U	2.98 U	3.5 U	2.89 U	2.84 U
Perfluorotridecanoic Acid (PFTrDA)	1.2 U	6.11 J	1.29 U	1.45 U	1.32 U	1.19 U	1.3 U	1.19 U	1.84 J	1.16 U	1.14 U

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/G - Nanograms per gram

Appendix F
Subsurface Soil Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SO26		CBD-AOA-SO27		CBD-AOA-SO28		CBD-AOA-SO29	
Sample ID	CBD-AOA-SB26-1012	CBD-AOA-SB26-0810	CBD-AOA-SB27-1012	CBD-AOA-SB27P-1012	CBD-AOA-SB28-1516	CBD-AOA-SB28-0809	CBD-AOA-SB29-0608	CBD-AOA-SB29-0810
Sample Date	10/06/20	10/06/20	10/06/20	10/06/20	10/09/20	10/09/20	10/02/20	10/02/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/G)								
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2.55 U	2.47 U	2.45 U	2.16 U	2.52 U	2.02 U	2.16 U	2.44 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	1.27 U	1.23 U	1.23 U	1.08 U	1.26 U	1.01 U	1.08 U	1.22 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	1.91 U	1.85 U	1.84 U	1.62 U	1.89 U	1.52 U	1.62 U	1.83 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2.55 U	2.47 U	2.45 U	2.16 U	2.52 U	2.02 U	2.16 U	2.44 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	3.18 U	3.09 U	3.07 U	2.7 U	3.14 U	2.53 U	2.7 U	3.05 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	2.55 U	2.47 U	2.45 U	2.16 U	2.52 U	2.02 U	2.16 U	2.44 U
Perfluorooctane sulfonic acid (PFOS)	309	392	2.45 U	2.16 U	15.2 U	2.83 U	3.15 U	3.61 U
Perfluoroundecanoic Acid (PFUnA)	113	10.4	1.23 U	1.08 U	1.26 U	1.01 U	1.08 U	1.22 U
Perfluorohexanoic Acid (PFHxA)	2.55 U	2.47 U	2.45 U	2.16 U	2.52 U	2.02 U	2.16 U	2.44 U
Perfluorododecanoic Acid (PFDoA)	2.55 U	2.47 U	2.45 U	2.16 U	2.52 U	2.02 U	2.16 U	2.44 U
Perfluorooctanoic acid (PFOA)	9.76	2.77 J	2.45 U	2.16 U	2.52 U	2.02 U	2.16 U	2.44 U
Perfluorodecanoic Acid (PFDA)	4.09 J	4.1 J	1.23 U	1.08 U	1.26 U	1.01 U	1.08 U	1.22 U
Perfluorohexanesulfonic acid (PFHxS)	11.7	3.45 J	2.45 U	2.16 U	2.52 U	2.02 U	2.16 U	2.44 U
Perfluorobutanesulfonic acid (PFBS)	1.27 U	1.23 U	1.23 U	1.08 U	1.26 U	1.01 U	1.08 U	1.22 U
Perfluoroheptanoic acid (PFHpA)	0.72 J	1.85 U	1.84 U	1.62 U	1.89 U	1.52 U	1.62 U	1.83 U
Perfluorononanoic acid (PFNA)	18.2	12	1.23 U	1.08 U	1.26 U	1.01 U	1.08 U	1.22 U
Perfluorotetradecanoic Acid (PFTeDA)	3.18 U	3.09 U	3.07 U	2.7 U	3.14 U	2.53 U	2.7 U	3.05 U
Perfluorotridecanoic Acid (PFTrDA)	21.2	1.23 U	1.23 U	1.08 U	1.26 U	1.01 U	1.08 U	1.22 U

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/G - Nanograms per gram

Appendix F
Groundwater Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-MW01		CBD-AOA-MW02	CBD-AOA-MW03	CBD-AOA-MW04	CBD-AOA-MW05	CBD-AOA-MW06	CBD-AOA-MW07
Sample ID	CBD-AOA-MW01-1020	CBD-AOA-MW01P-1020	CBD-AOA-MW02-1020	CBD-AOA-MW03-1020	CBD-AOA-MW04-1020	CBD-AOA-MW05-1020	CBD-AOA-MW06-1020	CBD-AOA-MW07-1020
Sample Date	10/19/20	10/19/20	10/19/20	10/19/20	10/19/20	10/21/20	10/27/20	10/20/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/L)								
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	0.96 U	0.94 U	0.9 U	0.94 U	0.98 U	0.94 U	0.96 U	0.9 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	0.48 U	0.47 U	0.45 U	0.47 U	0.49 U	0.47 U	0.48 U	0.45 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.96 U	0.94 U	0.9 U	0.94 U	0.98 U	0.94 U	0.96 U	0.9 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	1.7 J	1.99 J	0.9 U	2.03 J	18.5	0.94 U	0.96 U	0.9 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	0.96 U	0.94 U	0.9 U	1.05 U	7.27	0.94 U	0.96 U	0.9 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	0.48 U	0.47 U	0.45 U	0.47 U	0.49 U	0.47 U	0.48 U	0.45 U
Perfluorooctane sulfonic acid (PFOS)	23,700	21,600	171,000	112,000	10,800	0.94 U	5.96	3.94 U
Perfluoroundecanoic Acid (PFUnA)	776	942	868	763	3,390	0.47 U	0.48 U	0.45 U
Perfluorohexanoic Acid (PFHxA)	2,880	2,970	3,860	6,210	1,360	0.82 J	1.46 U	2.85 J
Perfluorododecanoic Acid (PFDoA)	2.39 J	2.68 J	5.16	4.01 J	175	0.47 U	0.48 U	0.45 U
Perfluorooctanoic acid (PFOA)	1,970	2,330	3,870	6,800	1,090	1.42 U	55	1.36 U
Perfluorodecanoic Acid (PFDA)	210	225	849	306	360	0.47 U	0.48 U	0.45 U
Perfluorohexanesulfonic acid (PFHxS)	6,180	7,140	12,300	25,600	3,170	3.51 J	15.1	7.28
Perfluorobutanesulfonic acid (PFBS)	167	171	261	574	88.8	0.93 U	1.04 J	2.45 J
Perfluoroheptanoic acid (PFHpA)	1,600	1,740	1,850	5,820	471	0.94 U	1.54 J	0.53 J
Perfluorononanoic acid (PFNA)	2,150	2,130	31,000	8,720	1,130	0.94 U	0.42 J	0.9 U
Perfluorotetradecanoic Acid (PFTeDA)	1.92 U	1.89 U	1.82 U	1.89 U	1.96 U	1.89 U	1.92 UJ	1.82 U
Perfluorotridecanoic Acid (PFTrDA)	5.02	5.57	86.9	25	488	0.47 U	0.48 U	0.45 U
Total Petroleum Hydrocarbons (UG_L)								
TPH-diesel range (UG/L)	190 J	300 U	810	300 U	300 U	NA	NA	NA
TPH-gas range (UG/L)	100 U	52 J	100 U	100 U	100 U	NA	NA	NA

Notes:
Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
NG/L - Nanograms per liter

Appendix F
Groundwater Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-MW08	CBD-AOA-MW09	CBD-AOA-MW10	CBD-AOA-MW11		CBD-AOA-MW12	CBD-AOA-MW13	CBD-AOA-MW14
Sample ID	CBD-AOA-MW08-1020	CBD-AOA-MW09-1020	CBD-AOA-MW10-1020	CBD-AOA-MW11-1020	CBD-AOA-MW11P-1020	CBD-AOA-MW12-1020	CBD-AOA-MW13-1020	CBD-AOA-MW14-1020
Sample Date	10/19/20	10/21/20	10/15/20	10/28/20	10/28/20	10/28/20	10/28/20	10/28/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/L)								
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	0.96 U	0.92 U	1 U	0.92 U	0.98 U	0.9 U	1 U	1 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	0.48 U	0.46 U	0.5 U	0.46 U	0.49 U	0.45 U	0.5 U	0.5 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.96 U	0.92 U	1 U	0.92 U	0.98 U	0.9 U	1 U	1 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	0.96 U	0.92 U	1 U	0.92 U	0.98 U	0.9 U	1 U	1 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	0.96 U	0.92 U	1 U	0.92 U	0.98 U	0.9 U	1 U	1 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	0.48 UJ	0.46 U	0.5 U	0.46 UJ	0.49 UJ	0.45 U	0.5 U	0.5 U
Perfluorooctane sulfonic acid (PFOS)	13,300	15.6	325	0.92 U	0.98 U	0.9 U	17.9	4.25 U
Perfluoroundecanoic Acid (PFUnA)	3.49 J	0.46 U	0.5 U	0.46 U	0.49 U	0.45 U	1.09 J	0.5 U
Perfluorohexanoic Acid (PFHxA)	2,280	8.96	241	1.39 UJ	1.47 UJ	1.36 UJ	16.6	4.36 UJ
Perfluorododecanoic Acid (PFDoA)	0.48 U	0.46 U	0.5 U	0.46 U	0.49 U	0.45 U	0.5 U	0.5 U
Perfluorooctanoic acid (PFOA)	4,630	9.05	248	0.68 J	0.76 J	0.68 J	10	5.99
Perfluorodecanoic Acid (PFDA)	33.6	0.46 U	2.48 J	0.46 U	0.49 U	0.45 U	0.89 J	0.5 U
Perfluorohexanesulfonic acid (PFHxS)	7,690	75.1	658	0.37 U	0.39 U	0.15 J	42.9	9.2
Perfluorobutanesulfonic acid (PFBS)	501	1.88 J	33.3	0.46 U	0.49 U	0.45 U	0.5 U	0.75 J
Perfluoroheptanoic acid (PFHpA)	881	2.01 J	142	0.92 UJ	0.98 UJ	0.9 UJ	7.02	1.97 J
Perfluorononanoic acid (PFNA)	2,430	0.44 J	88.7	0.92 U	0.98 U	0.9 U	3.09 J	1.32 J
Perfluorotetradecanoic Acid (PFTeDA)	1.92 U	1.85 UJ	2 U	1.85 U	1.96 U	1.82 U	2 U	2 U
Perfluorotridecanoic Acid (PFTrDA)	0.48 U	0.46 U	0.5 U	0.46 U	0.49 U	0.45 U	0.5 U	0.5 U
Total Petroleum Hydrocarbons (UG_L)								
TPH-diesel range (UG/L)	300 U	NA	NA	NA	NA	NA	NA	NA
TPH-gas range (UG/L)	100 U	NA	NA	NA	NA	NA	NA	NA

Notes:
Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
NG/L - Nanograms per liter

Appendix F
Groundwater Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-MW15	CBD-AOA-MW16	CBD-AOA-MW17	CBD-AOA-MW18	CBD-AOA-MW19	CBD-HVGGW09	CBD-HVGGW10	CBD-BKG-MW01
Sample ID	CBD-AOA-MW15-1020	CBD-AOA-MW16-1020	CBD-AOA-MW17-1020	CBD-AOA-MW18-1020	CBD-AOA-MW19-1020	CBD-HVGGW09-1020	CBD-HVGGW10-1020	CBD-BKG-MW01-1020
Sample Date	10/16/20	10/16/20	10/20/20	10/19/20	10/20/20	10/14/20	10/14/20	10/20/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/L)								
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	0.96 U	0.96 U	0.92 U	0.98 U	0.9 U	0.94 U	1 U	0.92 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	0.48 U	0.48 U	0.46 U	0.49 U	0.45 U	0.47 U	0.5 U	0.46 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.96 U	0.96 U	0.92 U	0.98 U	0.9 U	0.94 U	1 U	0.92 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	0.96 UJ	0.96 U	0.92 U	0.98 U	0.9 U	0.94 U	1 U	0.92 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	0.96 U	0.96 U	0.92 U	0.98 U	0.9 U	0.94 U	1 U	0.92 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	0.48 U	0.48 U	0.46 U	0.49 U	0.45 U	0.47 U	0.5 U	0.46 U
Perfluorooctane sulfonic acid (PFOS)	34.5	92 J	9.67	12,700	21.1	3.17 J	3.27 J	10.8
Perfluoroundecanoic Acid (PFUnA)	0.48 U	0.48 U	0.46 U	30.8	0.45 U	0.47 U	0.5 U	0.46 U
Perfluorohexanoic Acid (PFHxA)	149	27.6	5.49	636	12.1	1.42 UJ	1.5 UJ	1.74 J
Perfluorododecanoic Acid (PFDoA)	0.48 UJ	0.48 UJ	0.46 U	0.49 U	0.45 U	0.47 U	0.5 U	0.46 U
Perfluorooctanoic acid (PFOA)	431	22	2.56 J	1,030	23.7	1.42 U	1.47 J	1.4 J
Perfluorodecanoic Acid (PFDA)	0.48 U	0.48 U	0.46 U	8.21	0.45 U	0.47 U	0.5 U	0.46 U
Perfluorohexanesulfonic acid (PFHxS)	901	118 J	28	12,800	59	13	42.5	13.5
Perfluorobutanesulfonic acid (PFBS)	30.2	9.89	1.72 J	62	1.81 J	2.7 J	2.82 J	1.19 U
Perfluoroheptanoic acid (PFHpA)	86.7	9.99	1.43 J	412	5.49	0.94 U	1 UJ	0.5 J
Perfluorononanoic acid (PFNA)	46.3	6.91	1.5 J	631	1.2 J	0.94 U	1 U	0.92 U
Perfluorotetradecanoic Acid (PFTeDA)	1.92 UJ	1.92 UJ	1.85 UJ	1.96 UJ	1.82 U	1.89 U	2 UJ	1.85 U
Perfluorotridecanoic Acid (PFTrDA)	0.48 U	0.48 U	0.46 U	0.49 U	0.45 U	0.47 U	0.5 U	0.46 U
Total Petroleum Hydrocarbons (UG_L)								
TPH-diesel range (UG/L)	NA	NA	NA	NA	NA	NA	NA	NA
TPH-gas range (UG/L)	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
NG/L - Nanograms per liter

Appendix F
Groundwater Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-BKG-MW02	CBD-BKG-MW03	CBD-S03-MW01	CBD-S03-MW02	CBD-S04-MW01	
Sample ID	CBD-BKG-MW02-1020	CBD-BKG-MW03-1020	CBD-S03-MW01-1020	CBD-S03-MW02-1020	CBD-S04-MW01-1020	CBD-S04-MW01P-1020
Sample Date	10/20/20	10/15/20	10/19/20	10/20/20	10/15/20	10/15/20
Chemical Name						
Per- and Polyfluorinated Alkyl Substances (NG/L)						
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	0.92 U	0.94 U	0.9 U	1 U	1 U	0.94 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	0.46 U	0.47 U	0.45 U	0.5 U	0.5 U	0.47 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.92 U	0.94 U	0.9 U	1 U	1 U	0.94 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	0.92 U	0.94 U	0.9 U	1 U	1 U	0.94 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	0.92 U	0.94 U	0.9 U	1 U	1 U	0.94 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	0.46 U	0.47 U	0.45 U	0.5 U	0.5 U	0.47 U
Perfluorooctane sulfonic acid (PFOS)	2.25 U	10.6	1,090	323	1,850	1,900
Perfluoroundecanoic Acid (PFUnA)	0.46 U	0.47 U	2.96 J	0.5 U	0.5 U	0.47 U
Perfluorohexanoic Acid (PFHxA)	1.39 U	1.34 J	39.2	69.7	291	289
Perfluorododecanoic Acid (PFDoA)	0.46 U	0.47 U	0.45 U	0.5 U	0.5 U	0.47 U
Perfluorooctanoic acid (PFOA)	0.98 J	2.89 J	59.6	94.2	12.1	12.9
Perfluorodecanoic Acid (PFDA)	0.46 U	0.47 U	0.7 J	0.5 U	0.5 U	0.47 U
Perfluorohexanesulfonic acid (PFHxS)	17.5	9.72	393	252	736	883
Perfluorobutanesulfonic acid (PFBS)	0.99 U	1.11 J	7.5	10.1	168	154
Perfluoroheptanoic acid (PFHpA)	0.92 U	1.06 J	14.5	40.6	51.1 J	53.7 J
Perfluorononanoic acid (PFNA)	0.92 U	1.26 J	67.7	60.7	3.51 J	4.19 J
Perfluorotetradecanoic Acid (PFTeDA)	1.85 U	1.89 U	1.82 U	2 UJ	2 U	1.89 U
Perfluorotridecanoic Acid (PFTrDA)	0.46 U	0.47 U	0.45 U	0.5 U	0.5 U	0.47 U
Total Petroleum Hydrocarbons (UG_L)						
TPH-diesel range (UG/L)	NA	NA	180 J	220 J	NA	NA
TPH-gas range (UG/L)	NA	NA	100 U	100 U	NA	NA

Notes:
Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
NG/L - Nanograms per liter

Appendix F
Surface Water Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SW01	CBD-AOA-SW03	CBD-AOA-SW05	CBD-AOA-SW07	CBD-AOA-SW09	CBD-AOA-SW10	CBD-AOA-SW11	
Sample ID	CBD-AOA-SW01-1020	CBD-AOA-SW03-1020	CBD-AOA-SW05-1020	CBD-AOA-SW07-1020	CBD-AOA-SW09-1020	CBD-AOA-SW10-1020	CBD-AOA-SW11-1020	CBD-AOA-SW11P-1020
Sample Date	10/13/20	10/13/20	10/13/20	10/13/20	10/13/20	10/13/20	10/13/20	10/13/20
Chemical Name								
Per- and Polyfluorinated Alkyl Substances (NG/L)								
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	0.92 U	1 U	0.96 U	0.94 U	1 U	0.9 U	0.94 U	0.92 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	0.46 U	0.5 U	0.48 U	0.47 U	0.5 U	0.45 U	0.47 U	0.46 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.92 U	1 U	0.96 U	0.94 U	1 U	0.9 U	0.94 U	0.92 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	0.92 U	1 U	0.96 U	0.94 U	1 U	0.9 U	0.94 U	0.92 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	0.92 U	1 U	0.96 U	0.94 U	1 U	0.9 U	0.94 U	0.92 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	0.46 UJ	0.5 U	0.48 U	0.47 U	0.5 U	0.45 U	0.47 U	0.46 U
Perfluorooctane sulfonic acid (PFOS)	12.8 J	137	1,230	1,140	2,990	4,050	4,370	3,820
Perfluoroundecanoic Acid (PFUnA)	0.46 J	0.69 J	16.5	13.7	185	99 J	81.4 J	114 J
Perfluorohexanoic Acid (PFHxA)	2.84 J	34.3 J	128 J	124 J	190	363	452	494
Perfluorododecanoic Acid (PFDoA)	0.46 UJ	0.5 U	0.48 U	0.47 U	3.14 J	0.41 J	1.75 J	1.69 J
Perfluorooctanoic acid (PFOA)	2.93 J	80.4	127	124	140	413	550	578
Perfluorodecanoic Acid (PFDA)	0.46 U	0.28 J	5.22	4.35 J	20	27.6	32.1	38.6
Perfluorohexanesulfonic acid (PFHxS)	19	137	282	353	301	1,130	1,760	1,730
Perfluorobutanesulfonic acid (PFBS)	1.74 J	6.97	19.5	23.3	18.4	64.1	45	51.2
Perfluoroheptanoic acid (PFHpA)	1.44 J	17.9 J	57.1 J	59.5 J	223	295	365	360
Perfluorononanoic acid (PFNA)	1.33 J	23.2	243	226	120	495	354	443
Perfluorotetradecanoic Acid (PFTeDA)	1.85 UJ	2 UJ	1.92 UJ	1.89 U	2 UJ	1.82 U	1.89 UJ	1.85 UJ
Perfluorotridecanoic Acid (PFTrDA)	0.46 U	0.5 U	0.48 U	0.47 U	13.9	4 J	23.4	26.4

Notes:

Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
NG/L - Nanograms per liter

Appendix F
Surface Water Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SWSD02		CBD-AOA-SWSD04	CBD-AOA-SWSD06	CBD-AOA-SWSD08
Sample ID	CBD-AOA-SW02-1020	CBD-AOA-SW02P-1020	CBD-AOA-SW04-1020	CBD-AOA-SW06-1020	CBD-AOA-SW08-1020
Sample Date	10/13/20	10/13/20	10/13/20	10/13/20	10/13/20
Chemical Name					
Per- and Polyfluorinated Alkyl Substances (NG/L)					
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	0.94 UJ	0.94 U	1.01 U	0.96 U	0.94 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	0.47 UJ	0.47 U	0.5 U	0.48 U	0.47 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.94 UJ	0.94 U	1.01 U	0.96 U	0.94 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	0.94 UJ	0.94 U	1.01 U	0.96 U	0.94 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	0.94 UJ	0.94 U	1.01 U	0.96 U	0.94 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	0.47 UJ	0.47 U	0.5 U	0.48 U	0.47 U
Perfluorooctane sulfonic acid (PFOS)	58.4 J	42.4	165	4,140	4,960
Perfluoroundecanoic Acid (PFUnA)	2.17 J	0.8 J	0.72 J	112	116
Perfluorohexanoic Acid (PFHxA)	9.51 J	10.6 J	24 J	392	384
Perfluorododecanoic Acid (PFDoA)	0.47 UJ	0.47 U	0.5 UJ	1.51 J	1.43 J
Perfluorooctanoic acid (PFOA)	10.1 J	11.1	23.9	521	453
Perfluorodecanoic Acid (PFDA)	0.36 J	0.47 U	0.5 U	40.2	37.6
Perfluorohexanesulfonic acid (PFHxS)	56.8 J	56.8	90.6	1,520	1,700
Perfluorobutanesulfonic acid (PFBS)	2.41 J	3.33 J	5.57	51.2	51.1
Perfluoroheptanoic acid (PFHpA)	4.36 J	4.64 J	10.1 J	305	310
Perfluorononanoic acid (PFNA)	5.16 J	4.7 J	18.6	416	407
Perfluorotetradecanoic Acid (PFTeDA)	1.89 UJ	1.89 UJ	2.02 UJ	1.92 UJ	1.89 U
Perfluorotridecanoic Acid (PFTrDA)	0.32 J	0.47 U	0.5 U	30.8	12.1

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
NG/L - Nanograms per liter

Appendix F
Sediment Analytical Results
Site 10 PFAS SI
NRL-CBD
Chesapeake Beach, Maryland

Station ID	CBD-AOA-SWSD02	CBD-AOA-SWSD04	CBD-AOA-SWSD06	CBD-AOA-SWSD08	
Sample ID	CBD-AOA-SD02-000H	CBD-AOA-SD04-000H	CBD-AOA-SD06-000H	CBD-AOA-SD08-000H	CBD-AOA-SD08P-000H
Sample Date	10/13/20	10/13/20	10/13/20	10/13/20	10/13/20
Chemical Name					
Per- and Polyfluorinated Alkyl Substances (NG/G)					
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	3.81 U	2.65 U	2.7 U	2.63 U	2.41 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	1.9 U	1.32 U	1.35 U	1.32 U	1.2 U
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	2.86 U	1.99 U	2.03 U	1.97 U	1.81 U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	3.81 U	2.65 U	2.7 U	2.63 U	2.41 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	4.76 U	3.31 U	3.38 U	3.29 U	3.01 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)	3.81 U	2.65 U	2.7 U	2.63 U	2.41 U
Perfluorooctane sulfonic acid (PFOS)	2.64 J	1.63 J	34.9	7.49	6.1
Perfluoroundecanoic Acid (PFUnA)	1.9 U	1.32 U	3.39 J	1.24 J	1.11 J
Perfluorohexanoic Acid (PFHxA)	3.81 U	2.65 U	2.7 U	2.63 U	2.41 U
Perfluorododecanoic Acid (PFDoA)	3.81 U	2.65 U	2.7 U	2.63 U	2.41 U
Perfluorooctanoic acid (PFOA)	3.81 U	2.65 U	2.7 U	2.63 U	2.41 U
Perfluorodecanoic Acid (PFDA)	1.9 U	1.32 U	1.35 U	1.32 U	1.2 U
Perfluorohexanesulfonic acid (PFHxS)	3.81 U	2.65 U	1.4 J	2.63 U	2.41 U
Perfluorobutanesulfonic acid (PFBS)	1.9 U	1.32 U	1.35 U	1.32 U	1.2 U
Perfluoroheptanoic acid (PFHpA)	2.86 U	1.99 U	2.03 U	1.97 U	1.81 U
Perfluorononanoic acid (PFNA)	1.9 U	1.32 U	1.19 J	1.32 U	1.2 U
Perfluorotetradecanoic Acid (PFTeDA)	4.76 U	3.31 U	3.38 U	3.29 U	3.01 U
Perfluorotridecanoic Acid (PFTrDA)	1.9 U	1.32 U	5.23 J	1.1 J	0.97 J

Notes:
Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/G - Nanograms per gram

Appendix G
Human Health Risk ProUCL Data

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation			ProUCL 5.14/29/2021 3:34:04 PM								
5	From File			NRL-CBD-SSSB_ProUCL_input.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	**Perfluorooctane sulfonic acid (PFOS)**											
11												
12	**General Statistics**											
13	Total Number of Observations					29		Number of Distinct Observations				28
14	Number of Detects					8		Number of Non-Detects				21
15	Number of Distinct Detects					8		Number of Distinct Non-Detects				20
16	Minimum Detect					138		Minimum Non-Detect				2.07
17	Maximum Detect					4660		Maximum Non-Detect				128
18	Variance Detects					2462421		Percent Non-Detects				72.41%
19	Mean Detects					869.3		SD Detects				1569
20	Median Detects					209.5		CV Detects				1.805
21	Skewness Detects					2.593		Kurtosis Detects				6.85
22	Mean of Logged Detects					5.858		SD of Logged Detects				1.237
23												
24	**Normal GOF Test on Detects Only**											
25	Shapiro Wilk Test Statistic					0.544		**Shapiro Wilk GOF Test**				
26	5% Shapiro Wilk Critical Value					0.818		Detected Data Not Normal at 5% Significance Level				
27	Lilliefors Test Statistic					0.408		**Lilliefors GOF Test**				
28	5% Lilliefors Critical Value					0.283		Detected Data Not Normal at 5% Significance Level				
29	**Detected Data Not Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32	KM Mean					241.3		KM Standard Error of Mean				171.3
33	KM SD					862.9		95% KM (BCA) UCL				551.1
34	95% KM (t) UCL					532.7		95% KM (Percentile Bootstrap) UCL				545.8
35	95% KM (z) UCL					523.1		95% KM Bootstrap t UCL				2417
36	90% KM Chebyshev UCL					755.2		95% KM Chebyshev UCL				988
37	97.5% KM Chebyshev UCL					1311		99% KM Chebyshev UCL				1946
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40	A-D Test Statistic					1.374		**Anderson-Darling GOF Test**				
41	5% A-D Critical Value					0.751		Detected Data Not Gamma Distributed at 5% Significance Level				
42	K-S Test Statistic					0.425		**Kolmogorov-Smirnov GOF**				
43	5% K-S Critical Value					0.306		Detected Data Not Gamma Distributed at 5% Significance Level				
44	**Detected Data Not Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47	k hat (MLE)					0.669		k star (bias corrected MLE)				0.501
48	Theta hat (MLE)					1300		Theta star (bias corrected MLE)				1734
49	nu hat (MLE)					10.7		nu star (bias corrected)				8.019
50	Mean (detects)					869.3						

	A	B	C	D	E	F	G	H	I	J	K	L
51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.01					Mean	239.8
59					Maximum	4660					Median	0.01
60					SD	878.6					CV	3.664
61					k hat (MLE)	0.111					k star (bias corrected MLE)	0.123
62					Theta hat (MLE)	2155					Theta star (bias corrected MLE)	1954
63					nu hat (MLE)	6.454					nu star (bias corrected)	7.12
64					Adjusted Level of Significance (β)	0.0407						
65					Approximate Chi Square Value (7.12, α)	2.236					Adjusted Chi Square Value (7.12, β)	2.077
66					95% Gamma Approximate UCL (use when n>=50)	763.4					95% Gamma Adjusted UCL (use when n<50)	822.2
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	241.3					SD (KM)	862.9
70					Variance (KM)	744599					SE of Mean (KM)	171.3
71					k hat (KM)	0.0782					k star (KM)	0.0931
72					nu hat (KM)	4.535					nu star (KM)	5.399
73					theta hat (KM)	3086					theta star (KM)	2592
74					80% gamma percentile (KM)	150.1					90% gamma percentile (KM)	622
75					95% gamma percentile (KM)	1405					99% gamma percentile (KM)	3972
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (5.40, α)	1.341					Adjusted Chi Square Value (5.40, β)	1.225
79					95% Gamma Approximate KM-UCL (use when n>=50)	971.5					95% Gamma Adjusted KM-UCL (use when n<50)	1063
80	95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)											
81												
82	**Lognormal GOF Test on Detected Observations Only**											
83					Shapiro Wilk Test Statistic	0.729					**Shapiro Wilk GOF Test**	
84					5% Shapiro Wilk Critical Value	0.818					Detected Data Not Lognormal at 5% Significance Level	
85					Lilliefors Test Statistic	0.381					**Lilliefors GOF Test**	
86					5% Lilliefors Critical Value	0.283					Detected Data Not Lognormal at 5% Significance Level	
87	**Detected Data Not Lognormal at 5% Significance Level**											
88												
89	**Lognormal ROS Statistics Using Imputed Non-Detects**											
90					Mean in Original Scale	243.3					Mean in Log Scale	2.737
91					SD in Original Scale	877.6					SD in Log Scale	2.071
92					95% t UCL (assumes normality of ROS data)	520.6					95% Percentile Bootstrap UCL	548.6
93					95% BCA Bootstrap UCL	793.2					95% Bootstrap t UCL	2555
94					95% H-UCL (Log ROS)	636.3						
95												
96	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
97					KM Mean (logged)	2.143					KM Geo Mean	8.523
98					KM SD (logged)	2.372					95% Critical H Value (KM-Log)	4.506
99					KM Standard Error of Mean (logged)	0.471					95% H-UCL (KM -Log)	1071
100					KM SD (logged)	2.372					95% Critical H Value (KM-Log)	4.506

	A	B	C	D	E	F	G	H	I	J	K	L
101	KM Standard Error of Mean (logged)					0.471						
102												
103	**DL/2 Statistics**											
104	**DL/2 Normal**						**DL/2 Log-Transformed**					
105	Mean in Original Scale					252	Mean in Log Scale					3.222
106	SD in Original Scale					875.3	SD in Log Scale					2.031
107	95% t UCL (Assumes normality)					528.5	95% H-Stat UCL					902.3
108	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
109												
110	**Nonparametric Distribution Free UCL Statistics**											
111	**Data do not follow a Discernible Distribution at 5% Significance Level**											
112												
113	**Suggested UCL to Use**											
114	95% KM (Chebyshev) UCL					988						
115												
116	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
117	Recommendations are based upon data size, data distribution, and skewness.											
118	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
119	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
120												

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation	ProUCL 5.14/18/2022 9:13:15 AM										
5	From File	NRL-CBD_SB_macro output.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10	**Perfluorooctane sulfonic acid (PFOS)**											
11												
12	**General Statistics**											
13	Total Number of Observations	36	Number of Distinct Observations	35								
14	Number of Detects	12	Number of Non-Detects	24								
15	Number of Distinct Detects	12	Number of Distinct Non-Detects	23								
16	Minimum Detect	106	Minimum Non-Detect	2.38								
17	Maximum Detect	7950	Maximum Non-Detect	123								
18	Variance Detects	7776667	Percent Non-Detects	66.67%								
19	Mean Detects	1626	SD Detects	2789								
20	Median Detects	480	CV Detects	1.715								
21	Skewness Detects	2.021	Kurtosis Detects	2.631								
22	Mean of Logged Detects	6.354	SD of Logged Detects	1.384								
23												
24	**Normal GOF Test on Detects Only**											
25	Shapiro Wilk Test Statistic	0.566	**Shapiro Wilk GOF Test**									
26	5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level									
27	Lilliefors Test Statistic	0.394	**Lilliefors GOF Test**									
28	5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level									
29	**Detected Data Not Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32	KM Mean	543.8	KM Standard Error of Mean	299.6								
33	KM SD	1721	95% KM (BCA) UCL	1161								
34	95% KM (t) UCL	1050	95% KM (Percentile Bootstrap) UCL	1082								
35	95% KM (z) UCL	1037	95% KM Bootstrap t UCL	3734								
36	90% KM Chebyshev UCL	1442	95% KM Chebyshev UCL	1850								
37	97.5% KM Chebyshev UCL	2415	99% KM Chebyshev UCL	3524								
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40	A-D Test Statistic	1.272	**Anderson-Darling GOF Test**									
41	5% A-D Critical Value	0.778	Detected Data Not Gamma Distributed at 5% Significance Level									
42	K-S Test Statistic	0.312	**Kolmogorov-Smirnov GOF**									
43	5% K-S Critical Value	0.257	Detected Data Not Gamma Distributed at 5% Significance Level									
44	**Detected Data Not Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47	k hat (MLE)	0.595	k star (bias corrected MLE)	0.502								
48	Theta hat (MLE)	2732	Theta star (bias corrected MLE)	3239								
49	nu hat (MLE)	14.28	nu star (bias corrected)	12.05								
50	Mean (detects)	1626										

	A	B	C	D	E	F	G	H	I	J	K	L
51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.01				Mean	541.9	
59					Maximum	7950				Median	0.01	
60					SD	1746				CV	3.222	
61					k hat (MLE)	0.111				k star (bias corrected MLE)	0.12	
62					Theta hat (MLE)	4899				Theta star (bias corrected MLE)	4519	
63					nu hat (MLE)	7.964				nu star (bias corrected)	8.634	
64					Adjusted Level of Significance (β)	0.0428						
65					Approximate Chi Square Value (8.63, α)	3.107				Adjusted Chi Square Value (8.63, β)	2.958	
66					95% Gamma Approximate UCL (use when n>=50)	1506				95% Gamma Adjusted UCL (use when n<50)	1582	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	543.8				SD (KM)	1721	
70					Variance (KM)	2961588				SE of Mean (KM)	299.6	
71					k hat (KM)	0.0998				k star (KM)	0.11	
72					nu hat (KM)	7.188				nu star (KM)	7.922	
73					theta hat (KM)	5447				theta star (KM)	4942	
74					80% gamma percentile (KM)	429.7				90% gamma percentile (KM)	1500	
75					95% gamma percentile (KM)	3133				99% gamma percentile (KM)	8230	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (7.92, α)	2.69				Adjusted Chi Square Value (7.92, β)	2.553	
79					95% Gamma Approximate KM-UCL (use when n>=50)	1601				95% Gamma Adjusted KM-UCL (use when n<50)	1687	
80	95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)											
81												
82	**Lognormal GOF Test on Detected Observations Only**											
83					Shapiro Wilk Test Statistic	0.884				**Shapiro Wilk GOF Test**		
84					5% Shapiro Wilk Critical Value	0.859				Detected Data appear Lognormal at 5% Significance Level		
85					Lilliefors Test Statistic	0.213				**Lilliefors GOF Test**		
86					5% Lilliefors Critical Value	0.243				Detected Data appear Lognormal at 5% Significance Level		
87	**Detected Data appear Lognormal at 5% Significance Level**											
88												
89	**Lognormal ROS Statistics Using Imputed Non-Detects**											
90					Mean in Original Scale	546.6				Mean in Log Scale	3.39	
91					SD in Original Scale	1744				SD in Log Scale	2.274	
92					95% t UCL (assumes normality of ROS data)	1038				95% Percentile Bootstrap UCL	1109	
93					95% BCA Bootstrap UCL	1342				95% Bootstrap t UCL	3768	
94					95% H-UCL (Log ROS)	1919						
95												
96	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
97					KM Mean (logged)	2.705				KM Geo Mean	14.96	
98					KM SD (logged)	2.698				95% Critical H Value (KM-Log)	4.765	
99					KM Standard Error of Mean (logged)	0.471				95% H-UCL (KM -Log)	4997	
100					KM SD (logged)	2.698				95% Critical H Value (KM-Log)	4.765	

	A	B	C	D	E	F	G	H	I	J	K	L
101	KM Standard Error of Mean (logged)					0.471						
102												
103	**DL/2 Statistics**											
104	**DL/2 Normal**						**DL/2 Log-Transformed**					
105	Mean in Original Scale					551	Mean in Log Scale					3.322
106	SD in Original Scale					1743	SD in Log Scale					2.533
107	95% t UCL (Assumes normality)					1042	95% H-Stat UCL					4727
108	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
109												
110	**Nonparametric Distribution Free UCL Statistics**											
111	**Detected Data appear Lognormal Distributed at 5% Significance Level**											
112												
113	**Suggested UCL to Use**											
114	KM H-UCL					4997						
115												
116	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
117	Recommendations are based upon data size, data distribution, and skewness.											
118	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
119	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
120												

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation	ProUCL 5.14/16/2021 1:17:45 PM										
5	From File	NRL-CBD_ShallowGW_macro output.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10	**Perfluorooctane sulfonic acid (PFOS)**											
11												
12	**General Statistics**											
13	Total Number of Observations	23				Number of Distinct Observations	23					
14	Number of Detects	20				Number of Non-Detects	3					
15	Number of Distinct Detects	20				Number of Distinct Non-Detects	3					
16	Minimum Detect	3.17				Minimum Non-Detect	0.94					
17	Maximum Detect	171000				Maximum Non-Detect	3.94					
18	Variance Detects	1.935E+9				Percent Non-Detects	13.04%					
19	Mean Detects	17367				SD Detects	43994					
20	Median Detects	207.5				CV Detects	2.533					
21	Skewness Detects	3.024				Kurtosis Detects	8.774					
22	Mean of Logged Detects	5.654				SD of Logged Detects	3.65					
23												
24	**Normal GOF Test on Detects Only**											
25	Shapiro Wilk Test Statistic	0.457				**Shapiro Wilk GOF Test**						
26	5% Shapiro Wilk Critical Value	0.905				Detected Data Not Normal at 5% Significance Level						
27	Lilliefors Test Statistic	0.387				**Lilliefors GOF Test**						
28	5% Lilliefors Critical Value	0.192				Detected Data Not Normal at 5% Significance Level						
29	**Detected Data Not Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32	KM Mean	15102				KM Standard Error of Mean	8645					
33	KM SD	40411				95% KM (BCA) UCL	34236					
34	95% KM (t) UCL	29947				95% KM (Percentile Bootstrap) UCL	29541					
35	95% KM (z) UCL	29322				95% KM Bootstrap t UCL	103190					
36	90% KM Chebyshev UCL	41038				95% KM Chebyshev UCL	52786					
37	97.5% KM Chebyshev UCL	69092				99% KM Chebyshev UCL	101121					
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40	A-D Test Statistic	1.317				**Anderson-Darling GOF Test**						
41	5% A-D Critical Value	0.909				Detected Data Not Gamma Distributed at 5% Significance Level						
42	K-S Test Statistic	0.215				**Kolmogorov-Smirnov GOF**						
43	5% K-S Critical Value	0.216				Detected data appear Gamma Distributed at 5% Significance Level						
44	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47	k hat (MLE)	0.182				k star (bias corrected MLE)	0.188					
48	Theta hat (MLE)	95537				Theta star (bias corrected MLE)	92452					
49	nu hat (MLE)	7.271				nu star (bias corrected)	7.514					
50	Mean (detects)	17367										

	A	B	C	D	E	F	G	H	I	J	K	L
51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.01				Mean	15102	
59					Maximum	171000				Median	34.5	
60					SD	41320				CV	2.736	
61					k hat (MLE)	0.145				k star (bias corrected MLE)	0.155	
62					Theta hat (MLE)	103813				Theta star (bias corrected MLE)	97129	
63					nu hat (MLE)	6.692				nu star (bias corrected)	7.152	
64					Adjusted Level of Significance (β)	0.0389						
65					Approximate Chi Square Value (7.15, α)	2.254				Adjusted Chi Square Value (7.15, β)	2.06	
66					95% Gamma Approximate UCL (use when n>=50)	47910				95% Gamma Adjusted UCL (use when n<50)	52423	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	15102				SD (KM)	40411	
70					Variance (KM)	1.633E+9				SE of Mean (KM)	8645	
71					k hat (KM)	0.14				k star (KM)	0.15	
72					nu hat (KM)	6.424				nu star (KM)	6.92	
73					theta hat (KM)	108136				theta star (KM)	100394	
74					80% gamma percentile (KM)	16478				90% gamma percentile (KM)	44800	
75					95% gamma percentile (KM)	83075				99% gamma percentile (KM)	194078	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (6.92, α)	2.127				Adjusted Chi Square Value (6.92, β)	1.939	
79					95% Gamma Approximate KM-UCL (use when n>=50)	49141				95% Gamma Adjusted KM-UCL (use when n<50)	53883	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.906				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.905				Detected Data appear Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.169				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.192				Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	15102				Mean in Log Scale	4.622	
90					SD in Original Scale	41320				SD in Log Scale	4.361	
91					95% t UCL (assumes normality of ROS data)	29896				95% Percentile Bootstrap UCL	30112	
92					95% BCA Bootstrap UCL	38268				95% Bootstrap t UCL	100361	
93					95% H-UCL (Log ROS)	2.771E+9						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	4.935				KM Geo Mean	139.1	
97					KM SD (logged)	3.805				95% Critical H Value (KM-Log)	7.191	
98					KM Standard Error of Mean (logged)	0.815				95% H-UCL (KM -Log)	66037956	
99					KM SD (logged)	3.805				95% Critical H Value (KM-Log)	7.191	
100					KM Standard Error of Mean (logged)	0.815						

	A	B	C	D	E	F	G	H	I	J	K	L
101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104	Mean in Original Scale					15102	Mean in Log Scale					4.918
105	SD in Original Scale					41320	SD in Log Scale					3.915
106	95% t UCL (Assumes normality)					29897	95% H-Stat UCL					1.383E+8
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113	Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)					53883						
114												
115	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
116	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
117												
118	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
119	Recommendations are based upon data size, data distribution, and skewness.											
120	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
121	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
122												
123	**Perfluorooctanoic acid (PFOA)**											
124												
125	**General Statistics**											
126	Total Number of Observations					23	Number of Distinct Observations					22
127	Number of Detects					20	Number of Non-Detects					3
128	Number of Distinct Detects					20	Number of Distinct Non-Detects					2
129	Minimum Detect					0.98	Minimum Non-Detect					1.36
130	Maximum Detect					6800	Maximum Non-Detect					1.42
131	Variance Detects					3638983	Percent Non-Detects					13.04%
132	Mean Detects					1036	SD Detects					1908
133	Median Detects					57.3	CV Detects					1.842
134	Skewness Detects					2.104	Kurtosis Detects					3.833
135	Mean of Logged Detects					4.258	SD of Logged Detects					2.955
136												
137	**Normal GOF Test on Detects Only**											
138	Shapiro Wilk Test Statistic					0.623	**Shapiro Wilk GOF Test**					
139	5% Shapiro Wilk Critical Value					0.905	Detected Data Not Normal at 5% Significance Level					
140	Lilliefors Test Statistic					0.324	**Lilliefors GOF Test**					
141	5% Lilliefors Critical Value					0.192	Detected Data Not Normal at 5% Significance Level					
142	**Detected Data Not Normal at 5% Significance Level**											
143												
144	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
145	KM Mean					900.8	KM Standard Error of Mean					378.3
146	KM SD					1768	95% KM (BCA) UCL					1549
147	95% KM (t) UCL					1550	95% KM (Percentile Bootstrap) UCL					1550
148	95% KM (z) UCL					1523	95% KM Bootstrap t UCL					2013
149	90% KM Chebyshev UCL					2036	95% KM Chebyshev UCL					2550
150	97.5% KM Chebyshev UCL					3263	99% KM Chebyshev UCL					4665

	A	B	C	D	E	F	G	H	I	J	K	L
151												
152	**Gamma GOF Tests on Detected Observations Only**											
153					A-D Test Statistic	0.787	**Anderson-Darling GOF Test**					
154					5% A-D Critical Value	0.863	Detected data appear Gamma Distributed at 5% Significance Level					
155					K-S Test Statistic	0.187	**Kolmogorov-Smirnov GOF**					
156					5% K-S Critical Value	0.212	Detected data appear Gamma Distributed at 5% Significance Level					
157	**Detected data appear Gamma Distributed at 5% Significance Level**											
158												
159	**Gamma Statistics on Detected Data Only**											
160					k hat (MLE)	0.262			k star (bias corrected MLE)			0.256
161					Theta hat (MLE)	3947			Theta star (bias corrected MLE)			4039
162					nu hat (MLE)	10.5			nu star (bias corrected)			10.26
163					Mean (detects)	1036						
164												
165	**Gamma ROS Statistics using Imputed Non-Detects**											
166	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
167	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
168	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
169	This is especially true when the sample size is small.											
170	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
171					Minimum	0.01			Mean			900.6
172					Maximum	6800			Median			23.7
173					SD	1808			CV			2.008
174					k hat (MLE)	0.199			k star (bias corrected MLE)			0.202
175					Theta hat (MLE)	4526			Theta star (bias corrected MLE)			4459
176					nu hat (MLE)	9.153			nu star (bias corrected)			9.292
177					Adjusted Level of Significance (β)	0.0389						
178					Approximate Chi Square Value (9.29, α)	3.504			Adjusted Chi Square Value (9.29, β)			3.25
179					95% Gamma Approximate UCL (use when n>=50)	2388			95% Gamma Adjusted UCL (use when n<50)			2575
180												
181	**Estimates of Gamma Parameters using KM Estimates**											
182					Mean (KM)	900.8			SD (KM)			1768
183					Variance (KM)	3127538			SE of Mean (KM)			378.3
184					k hat (KM)	0.259			k star (KM)			0.255
185					nu hat (KM)	11.93			nu star (KM)			11.71
186					theta hat (KM)	3472			theta star (KM)			3538
187					80% gamma percentile (KM)	1317			90% gamma percentile (KM)			2700
188					95% gamma percentile (KM)	4337			99% gamma percentile (KM)			8682
189												
190	**Gamma Kaplan-Meier (KM) Statistics**											
191					Approximate Chi Square Value (11.71, α)	5.037			Adjusted Chi Square Value (11.71, β)			4.723
192					95% Gamma Approximate KM-UCL (use when n>=50)	2094			95% Gamma Adjusted KM-UCL (use when n<50)			2234
193												
194	**Lognormal GOF Test on Detected Observations Only**											
195					Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**					
196					5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level					
197					Lilliefors Test Statistic	0.118	**Lilliefors GOF Test**					
198					5% Lilliefors Critical Value	0.192	Detected Data appear Lognormal at 5% Significance Level					
199	**Detected Data appear Lognormal at 5% Significance Level**											
200												

	A	B	C	D	E	F	G	H	I	J	K	L
201	**Lognormal ROS Statistics Using Imputed Non-Detects**											
202					Mean in Original Scale	900.7				Mean in Log Scale		3.547
203					SD in Original Scale	1808				SD in Log Scale		3.334
204				95% t UCL (assumes normality of ROS data)		1548				95% Percentile Bootstrap UCL		1566
205					95% BCA Bootstrap UCL	1747				95% Bootstrap t UCL		2012
206					95% H-UCL (Log ROS)	824622						
207												
208	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
209					KM Mean (logged)	3.71				KM Geo Mean		40.85
210					KM SD (logged)	3.035				95% Critical H Value (KM-Log)		5.828
211				KM Standard Error of Mean (logged)		0.649				95% H-UCL (KM -Log)		177704
212					KM SD (logged)	3.035				95% Critical H Value (KM-Log)		5.828
213				KM Standard Error of Mean (logged)		0.649						
214												
215	**DL/2 Statistics**											
216	**DL/2 Normal**						**DL/2 Log-Transformed**					
217					Mean in Original Scale	900.7				Mean in Log Scale		3.656
218					SD in Original Scale	1808				SD in Log Scale		3.172
219				95% t UCL (Assumes normality)		1548				95% H-Stat UCL		359307
220	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
221												
222	**Nonparametric Distribution Free UCL Statistics**											
223	**Detected Data appear Gamma Distributed at 5% Significance Level**											
224												
225	**Suggested UCL to Use**											
226	Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)					2234						
227												
228	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
229	Recommendations are based upon data size, data distribution, and skewness.											
230	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
231	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
232												

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation	ProUCL 5.14/16/2021 1:18:51 PM										
5	From File	NRL-CBD_SurfWater_macro output.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10	**Perfluorooctane sulfonic acid (PFOS)**											
11												
12	**General Statistics**											
13	Total Number of Observations				11		Number of Distinct Observations				11	
14							Number of Missing Observations				0	
15	Minimum				12.8		Mean				2114	
16	Maximum				4960		Median				1230	
17	SD				1997		Std. Error of Mean				602.2	
18	Coefficient of Variation				0.945		Skewness				0.247	
19												
20	**Normal GOF Test**											
21	Shapiro Wilk Test Statistic				0.84		**Shapiro Wilk GOF Test**					
22	5% Shapiro Wilk Critical Value				0.85		Data Not Normal at 5% Significance Level					
23	Lilliefors Test Statistic				0.216		**Lilliefors GOF Test**					
24	5% Lilliefors Critical Value				0.251		Data appear Normal at 5% Significance Level					
25	**Data appear Approximate Normal at 5% Significance Level**											
26												
27	**Assuming Normal Distribution**											
28	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
29	95% Student's-t UCL				3205		95% Adjusted-CLT UCL (Chen-1995)				3152	
30							95% Modified-t UCL (Johnson-1978)				3213	
31												
32	**Gamma GOF Test**											
33	A-D Test Statistic				0.641		**Anderson-Darling Gamma GOF Test**					
34	5% A-D Critical Value				0.776		Detected data appear Gamma Distributed at 5% Significance Level					
35	K-S Test Statistic				0.217		**Kolmogorov-Smirnov Gamma GOF Test**					
36	5% K-S Critical Value				0.268		Detected data appear Gamma Distributed at 5% Significance Level					
37	**Detected data appear Gamma Distributed at 5% Significance Level**											
38												
39	**Gamma Statistics**											
40	k hat (MLE)				0.575		k star (bias corrected MLE)				0.479	
41	Theta hat (MLE)				3676		Theta star (bias corrected MLE)				4415	
42	nu hat (MLE)				12.65		nu star (bias corrected)				10.53	
43	MLE Mean (bias corrected)				2114		MLE Sd (bias corrected)				3055	
44							Approximate Chi Square Value (0.05)				4.279	
45	Adjusted Level of Significance				0.0278		Adjusted Chi Square Value				3.651	
46												
47	**Assuming Gamma Distribution**											
48	95% Approximate Gamma UCL (use when n>=50))				5205		95% Adjusted Gamma UCL (use when n<50)				6099	
49												
50	**Lognormal GOF Test**											

51	Shapiro Wilk Test Statistic					0.855	**Shapiro Wilk Lognormal GOF Test**					
52	5% Shapiro Wilk Critical Value					0.85	Data appear Lognormal at 5% Significance Level					
53	Lilliefors Test Statistic					0.225	**Lilliefors Lognormal GOF Test**					
54	5% Lilliefors Critical Value					0.251	Data appear Lognormal at 5% Significance Level					
55	**Data appear Lognormal at 5% Significance Level**											
56												
57	**Lognormal Statistics**											
58	Minimum of Logged Data					2.549	Mean of logged Data					6.575
59	Maximum of Logged Data					8.509	SD of logged Data					2.074
60												
61	**Assuming Lognormal Distribution**											
62	95% H-UCL					202296	90% Chebyshev (MVUE) UCL					11876
63	95% Chebyshev (MVUE) UCL					15445	97.5% Chebyshev (MVUE) UCL					20398
64	99% Chebyshev (MVUE) UCL					30129						
65												
66	**Nonparametric Distribution Free UCL Statistics**											
67	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
68												
69	**Nonparametric Distribution Free UCLs**											
70	95% CLT UCL					3104	95% Jackknife UCL					3205
71	95% Standard Bootstrap UCL					3057	95% Bootstrap-t UCL					3293
72	95% Hall's Bootstrap UCL					2945	95% Percentile Bootstrap UCL					3079
73	95% BCA Bootstrap UCL					3085						
74	90% Chebyshev(Mean, Sd) UCL					3920	95% Chebyshev(Mean, Sd) UCL					4739
75	97.5% Chebyshev(Mean, Sd) UCL					5874	99% Chebyshev(Mean, Sd) UCL					8105
76												
77	**Suggested UCL to Use**											
78	95% Student's-t UCL					3205						
79												
80	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
81	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
82												
83	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
84	Recommendations are based upon data size, data distribution, and skewness.											
85	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
86	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
87												
88												