FINAL
Preliminary Assessment Report Wilmington Readiness Center, Wilmington, Delaware

Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites
ARNG Installations, Nationwide

June 2020

Prepared for:

Army National Guard Bureau
111 S. George Mason Drive
Arlington, VA 22204

UNCLASSIFIED

Table of Contents

Figures

Tables

Appendices

Acronyms and Abbreviations

°F	Degrees Fahrenheit
µg/L	micrograms per liter
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous Film Forming Foam
AOI	Area of Interest
amsl	Above Mean Sea Level
AFW	Amec Foster Wheeler
ANGB	Air National Guard Base
ARNG	Army National Guard
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSM	Conceptual Site Model
DEARNG	Delaware Army National Guard
DGS	Delaware Geological Survey
DNREC	Delaware Department of Natural Resources and Environmental Control
DRBC	Delaware River Basin Commission
EDR™	Environmental Data Resources, Inc.™
FTA	Fire Training Area
gpm	gallons per minute
HA	Health Advisory
IED	Installations & Environment Division
NCCDE	New Castle County Delaware Government
PA	Preliminary Assessment
PFAS	Per- and Poly-Fluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
SI	Site Inspection
UCMR3	Unregulated Contaminant Monitoring Rule 3
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VSI	visual site inspection

Executive Summary

The Army National Guard (ARNG) is performing Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) Impacted Sites at ARNG Facilities Nationwide. A PA for per- and polyfluoroalkyl substances (PFAS)-containing materials was completed for Wilmington Readiness Center (also referred to as the "facility") in Wilmington, Delaware, to assess potential PFAS release areas and exposure pathways to receptors. Wilmington Readiness Center is constructed on a parcel of land deeded to the State of Delaware through the Red Clay Creek Consolidation School District. The deed was signed in 1992 and is effective indefinitely.

The performance of this PA included the following tasks:

- Reviewed available administrative record documents and Environmental Data Resources, Inc. (EDR)™ report packages to obtain information relevant to potential PFAS releases, such as: drinking water well locations, historical aerial photographs, Sanborn maps, and environmental compliance actions in the area surrounding the facility;
- Conducted a site visit on 6 August 2019 and completed visual site inspections (VSIs) at locations where PFAS-containing materials were suspected of being stored, used, or disposed;
- Interviewed current Wilmington Readiness Center and Delaware ARNG personnel, including environmental managers and operations staff during the site visit;
- Identified Areas of Interest (AOIs) and developed a preliminary conceptual site model to summarize potential PFAS source-pathway-receptor linkages for each AOI.

No AOIs related to potential PFAS use, release, or storage were identified at Wilmington Readiness Center during the PA (**Figure ES-1**). One potential adjacent source of PFAS was identified downgradient of the facility. Based on facility history and interviews with various personnel, there is no potential for exposure to PFAS contamination in media at or near the facility.

Based on the US Environmental Protection Agency's (USEPA) Unregulated Contaminant Monitoring Rule 3 (UCMR3) data, it was indicated that PFAS were detected in a public water system above the USEPA's lifetime Health Advisory (HAs) within 20 miles of the facility (**Appendix A**). PFAS analyses performed in 2016 had method detection limits that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today.

CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Wilmington Readiness Center, DE			
REVISED	5/11/2020	GIS BY	GC	5/11/2020
SCALE	1:12,000	CHK BY	LS	5/11/2020
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	5/11/2020

Summary of Findings

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure ES-1

C:\Users\samir.khadka\AECOM Directory\Stankevich, Michael - ARNG_PFAS_GIS_60552172\MXDs\DE\Wilmington_Readiness_Center\Fig_ES-1_Wilmington_Summary.mxd

1. Introduction

1.1 Authority and Purpose

The Army National Guard (ARNG)-Installations & Environment Division (IED) is the lead agency in performing *Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) at Impacted Sites at ARNG Facilities Nationwide*. This work is supported by the United States (US) Army Corps of Engineers (USACE) Baltimore District and their contractor AECOM Technical Services, Inc. (AECOM) under Contract Number W912DR-12-D-0014, Task Order W912DR17F0192, issued 11 August 2017.

The ARNG is assessing potential effects on human health related to processes at facilities that used per- and poly-fluoroalkyl substances (PFAS), primarily in the form of aqueous film forming foam (AFFF) released as part of firefighting activities, although other PFAS sources are possible. In addition, the ARNG is assessing businesses or operations adjacent to the ARNG facility (not under the control of ARNG) that could potentially be responsible for a PFAS release.

PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. PFAS formulations contain highly diverse mixtures of compounds. Thus, the fate of PFAS compounds in the environment varies. The regulatory framework at both federal and state levels continues to evolve. The US Environmental Protection Agency (USEPA) issued a lifetime Drinking Water Health Advisory (HA) for PFOA and PFOS in May 2016, but there are currently no promulgated national standards regulating PFAS in drinking water.

This report presents the findings of a PA for PFAS-containing materials at Wilmington Readiness Center (also referred to as the “facility”) in Wilmington, Delaware, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] Part 300), and USACE requirements and guidance.

This PA documents potential locations where PFAS may have been released into the environment at Wilmington Readiness Center. The term PFAS will be used throughout this report to encompass all PFAS chemicals being evaluated, including PFOS and PFOA, which are key components of AFFF.

1.2 Preliminary Assessment Methods

The performance of this PA included the following tasks:

- Reviewed available administrative record documents and Environmental Data Resources, Inc. (EDR)™ report packages to obtain information relevant to potential PFAS releases, such as: drinking water well locations, historical aerial photographs, Sanborn maps, and environmental compliance actions in the area surrounding the facility;
- Conducted a site visit on 6 August 2019 and completed visual site inspections (VSIs) at locations where PFAS-containing materials were suspected of being stored, used, or disposed;
- Interviewed current Wilmington Readiness Center and Delaware ARNG (DEARNG), personnel including environmental managers and operations staff during the site visit;
- Identified Areas of Interest (AOIs) and developed a preliminary conceptual site model (CSM) to summarize potential PFAS source-pathway-receptor linkages for each AOI.

1.3 Report Organization

This report has been prepared in accordance with the USEPA *Guidance for Performing Preliminary Assessments under CERCLA* (USEPA 1991). The report sections and descriptions of each are as follows:

- **Section 1** – **Introduction:** identifies the project purpose and authority and describes the facility location, environmental setting, and methods used to complete the PA.
- **Section 2** – **Fire Training Areas:** describes the fire training areas (FTAs) at the facility identified during the site visit.
- **Section 3** – **Non-Fire Training Areas:** describes other locations of potential PFAS releases at the facility identified during the site visit.
- **Section 4** – **Emergency Response Areas:** describes areas of potential PFAS release at the facility, specifically in response to emergency situations.
- **Section 5** – **Adjacent Sources:** describes sources of potential PFAS release adjacent to the facility that are not under the control of ARNG.
- **Section 6** – **Preliminary Conceptual Site Model:** describes the pathways of PFAS transport and receptors for the AOIs and the facility.
- **Section 7** – **Conclusions:** summarizes the data findings and presents the conclusions and uncertainties of the PA.
- **Section 8** – **References:** provides the references used to develop this document.
- **Appendix A** – Data Resources
- **Appendix B** – Preliminary Assessment Documentation
- **Appendix C** – Photographic Log

1.4 Facility Location and Description

Wilmington Readiness Center occupies approximately 4.5 acres in Wilmington, Delaware and served as the Delaware National Guard Headquarters from 1982 to 2014 (**Figure 1-1**). The facility is located at the former Laura Little Elementary School near Delcastle Recreational Park. Wilmington Readiness Center is co-located with the Mid-County Senior Center and is home to the Delaware Military Museum. Properties surrounding Wilmington Readiness Center are primarily zoned for single-family homes (New Castle County Delaware Government [NCCDE], 2018). The facility operates under a deed enacted in 1992 between the Red Clay Creek Consolidation School District and the State of Delaware.

Wilmington Readiness Center has been used as the Delaware National Guard Headquarters for both Army and Air National Guards. The facility includes three connected buildings that comprise the former elementary school, two parking lots, a paved storage area, and a shed used for storage by the Delaware Emergency Management Agency. Currently, the facility is used for administrative activities.

1.5 Facility Environmental Setting

The facility is located in northern New Castle County, Delaware. Major geographic features include the Christina River, which flows generally northeast, into the Delaware River, and is part of the Christina River Basin reaching into Pennsylvania (Delaware Watersheds, n.d.). The Delaware River flows south to the Delaware Bay. Buildings, asphalt, and concrete cover much of

the facility, but a large empty field lies in the northern area of the property. Wilmington Readiness Center lies within the Coastal Plain region of Delaware and is a predominantly low, flat area about 100 feet above mean sea level (amsl) (**Figure 1-2**).

1.5.1 Geology

The facility is underlain by the Wissahickon Formation, near the contact with the Faulkland Gneiss. The Cambrian to Ordovician Wissahickon Formation is characterized as interlayered psammitic and pelitic gneiss with amphibolite. Quaternary alluvial deposits composed of sand, silt, clay, and gravel are located to the west of the facility, along Mill Creek (Ramsey, 2005). The Ordovician-aged Faulkland Gneiss is a member of the Wilmington Complex and is composed of predominantly fine- to coarse-grained amphibolites and quartz amphibolites with minor felsic rocks. The geology of the site is shown in **Figure 1-2**.

1.5.2 Hydrogeology

At the facility, groundwater flow is influenced by the underlying bedrock and is controlled by the bedrock topography and permeability of the bedrock itself. Permeability is determined by the density of fractures and joints and the degree of weathering. A study in the Red Creek Basin, located adjacent to the facility, noted that the water table is located in the saprolite (weathered bedrock) and acts as an unconfined aquifer (Vogel and Reif, 1993). Groundwater yields from initial pump tests in the crystalline Piedmont rocks range from no yield to up to 500 gallons per minute (gpm). Typically, the higher yields are associated with the Cockeysville Marble, and the lower yields are associated with the Wilmington Complex (Woodruff, 1977) (**Figure 1-3**). Groundwater is inferred to flow to the southeast.

In New Castle County, south of the Chesapeake and Delaware Canal and approximately 13 miles south of the facility, nearly all drinking water is supplied from groundwater provided by public and private wells. However, north of the canal, in northern New Castle County, groundwater supplies only 30 percent of drinking water (Delaware Geological Survey [DGS], 2019).

Based on the USEPA Unregulated Contaminant Monitoring Rule 3 (UCMR3) data, it was indicated that PFAS were detected in a public water system above the HA within 20 miles of the facility (**Appendix A**). PFAS analyses performed in 2016 had method detection limits that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today. The Delaware Department of Natural Resources and Environmental Control (DNREC) reported that Artesian Water Company, a primary drinking water provider in the area, and the City of New Castle Municipal Services Commission detected PFAS above the HA in public water supply wells in the area of Wilmington Readiness Center. According to the New Castle County Airport Area Community Fact Sheet provided in **Appendix A**, the area of contamination is southeast of the facility and is approximately 7 square miles around the New Castle County Airport. The contamination area is bounded to the north by Interstate 295, the Delaware River to the east, Route 273 to the south, and Route 13 and New Castle Airport to the west. The public water supply is treated for PFAS contamination before distribution (DNREC, 2019). There are private domestic supply wells within 1 mile of the facility to the northwest and southeast (EDR™, 2019).

1.5.3 Hydrology

South of Wilmington Readiness Center is the Christina River, a part of the Christina River Basin that extends from Pennsylvania through New Castle County, Delaware. The Christina River Basin is characterized by dendritic interconnected rivers, streams, and wetlands, with outflow to the Delaware River. The Christina River is in the southernmost area of the basin and flows northeast,

into the Delaware River. Surface water accounts for 70 percent of New Castle County's water supply, the majority of which comes from the Christina River Basin, which provides 60 percent of New Castle County's water overall (NCCDE, 2018). The majority of Christina River is in New Castle County, with headwaters in Maryland. The Christina River is tidal from just south of the Town of Christiana to its convergence with the Delaware River. This section of the Christina lies approximately 3.3 miles southeast of the facility, and tidal freshwater wetlands occur by the river (Delaware Watersheds, n.d.).

Wilmington Readiness Center sits primarily on the Lower White Clay Creek Watershed, with the southeastern corner in the Red Clay Creek Watershed. Surrounding the facility, general surface water flow is southeast via Mill Creek. Mill creek flows to White Clay Creek, which converges downstream with the Christina and continues northeast to the Delaware River.

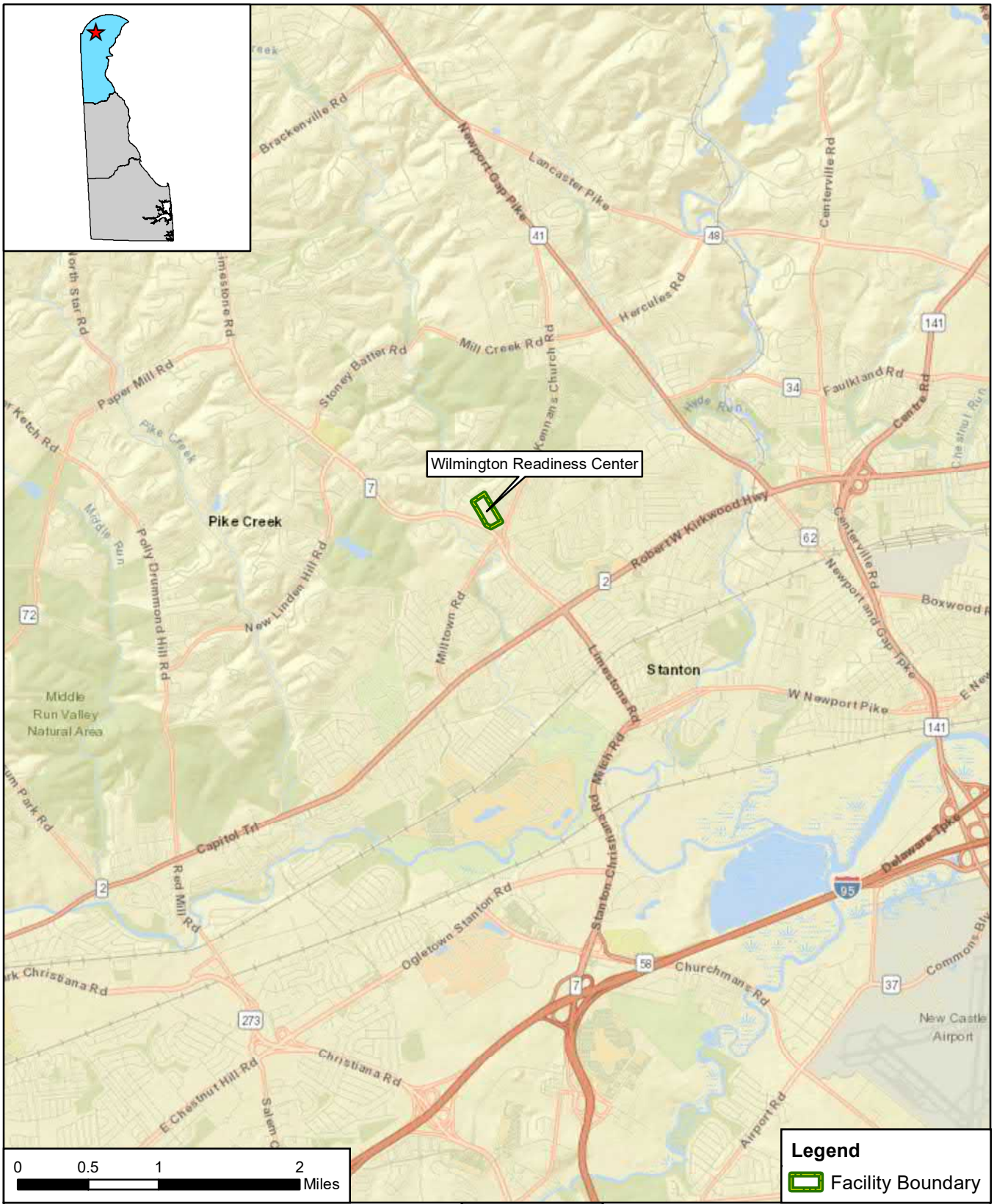
The facility is approximately 7.5 miles west of the Delaware River and is closest to the River's 68-mile marker (Delaware River Basin Commission [DRBC], 2011). A presentation from the DRBC provides 2009 PFAS concentration data for media tested along the Delaware river. PFAS were detected in surface water in the section closest to the facility, between river miles 68 and 70 (DRBC, 2012). The 2009 PFOA concentration at river mile 68.1 was 0.0277 micrograms per liter (µg/L), and the PFOS concentration was 0.00575 µg/L (DRBC, 2012).

1.5.4 Climate

The climate at Wilmington Readiness Center is humid continental. The Delaware Bay and Atlantic Ocean to the east and south, and the Chesapeake Bay to the west moderate temperature extremes in the winter and summer months. Although the extremes are moderated, the climate at Wilmington Readiness Center is still continental, with hot summers, cold winters, and precipitation throughout the year (Amec Foster Wheeler [AFW], 2019). Mean annual temperature in New Castle is 54 degrees Fahrenheit (°F). The average annual high temperature for Wilmington, Delaware is 64.1°F, and the average annual low temperature is 45.8°F. Annual precipitation for Wilmington is approximately 43 inches of rain and 19 inches of snowfall (US Climate Data, 2019).

1.5.5 Current and Future Land Use

Wilmington Readiness Center currently resides on a portion of land deeded to the DEARNG in 1992 from the Red Clay Creek Consolidation School District; it was the DEARNG headquarters from 1982 until 2014. The facility is currently used for administrative activities and houses the Delaware Military Museum. Wings A and B of the building will be demolished in the future; however, DEARNG activities at the facility are not anticipated to change



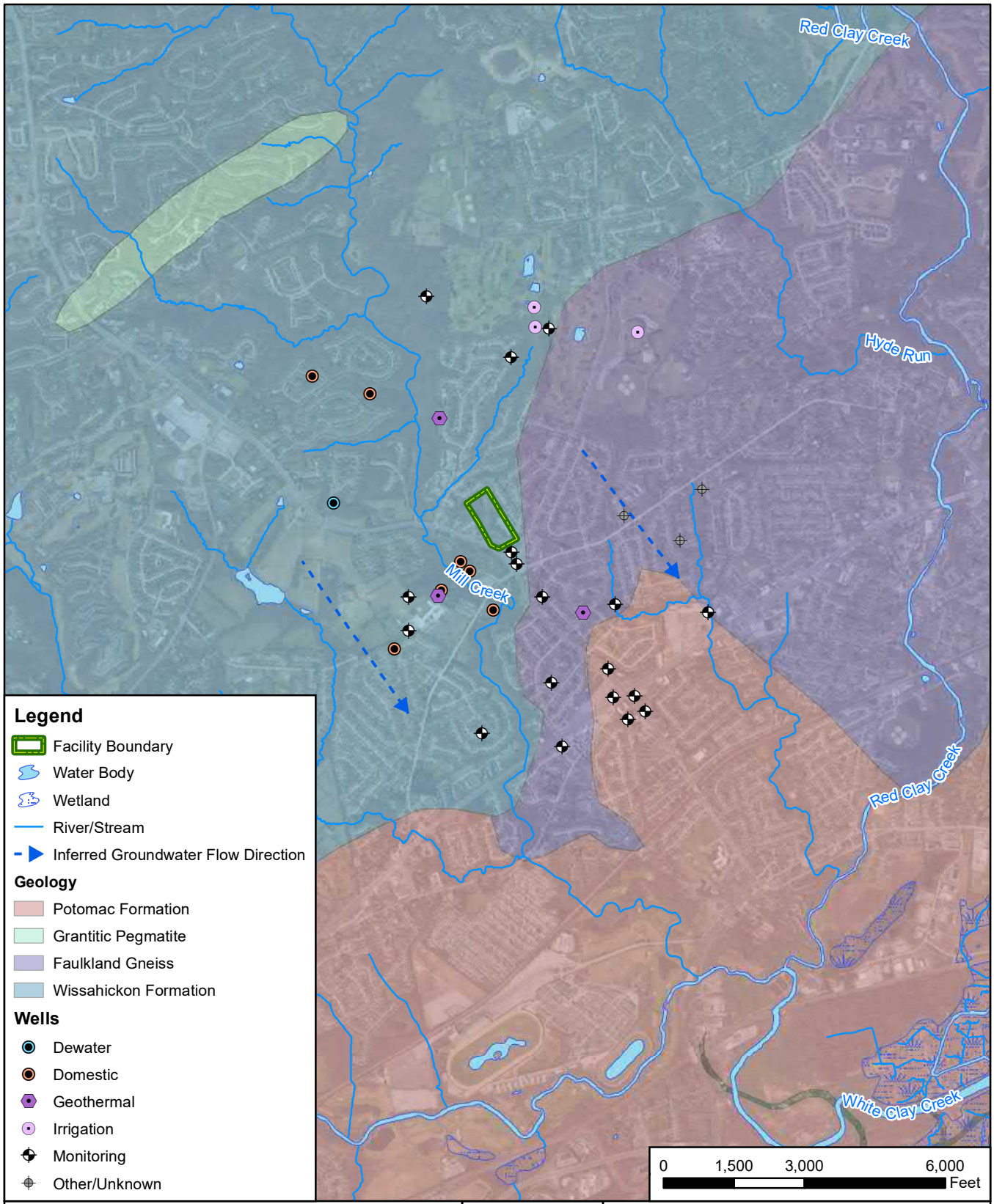
CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Wilmington Readiness Center, DE			
REVISED	5/11/2020	GIS BY	GC	5/11/2020
SCALE	1:63,360	CHK BY	LS	5/11/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	5/11/2020

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-1

C:\Users\samir.khadka\AECOM Directory\Stankevich, Michael - ARNG_PFAS_GIS_60552172\MXDs\DE\Wilmington_Readiness_Center\Fig_1-1_Wilmington_Facility_Location.mxd



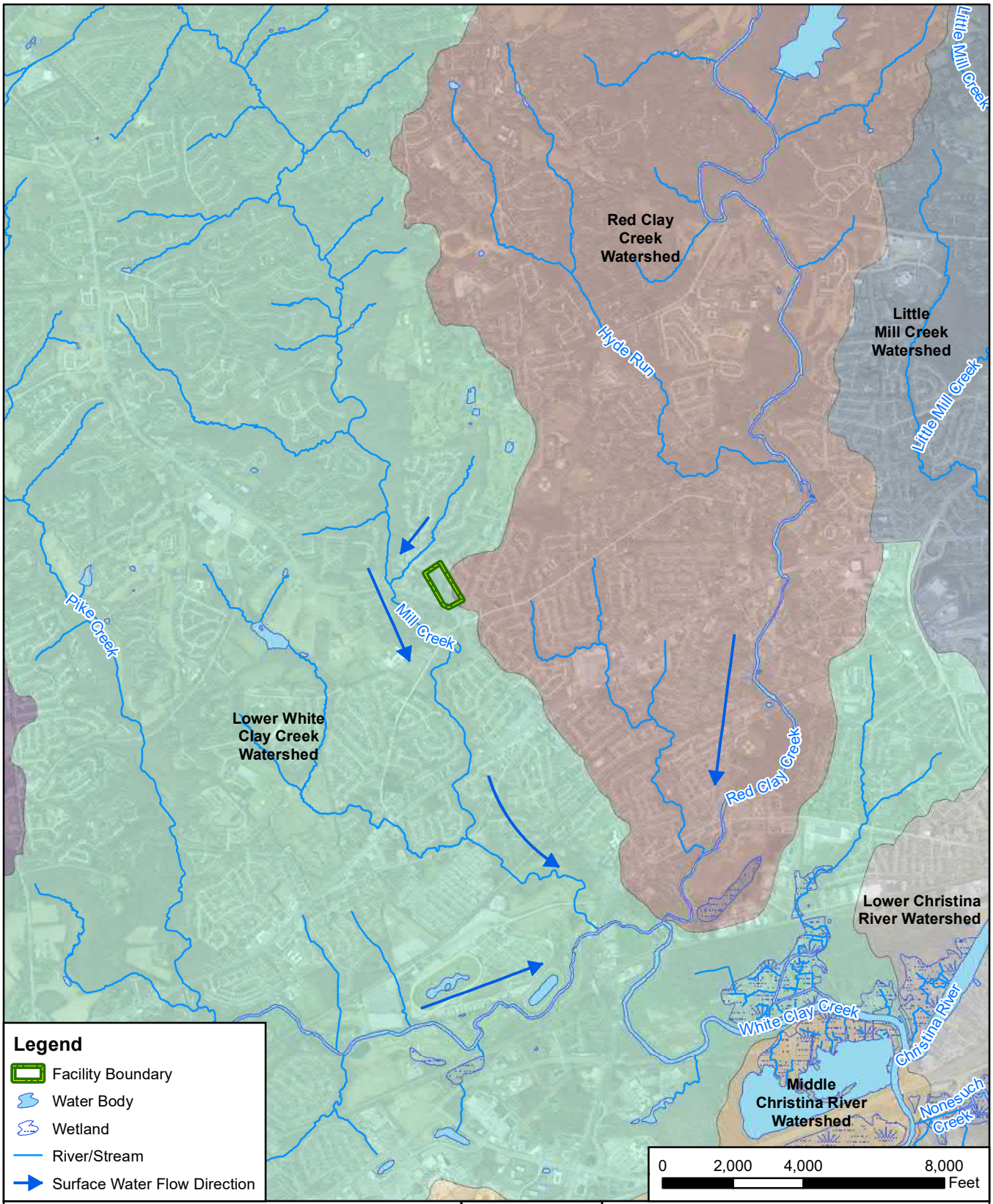
CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Wilmington Readiness Center, DE			
REVISED	5/11/2020	GIS BY	GC	5/11/2020
SCALE	1:36,000	CHK BY	LS	5/11/2020
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	5/11/2020

Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-2

C:\Users\samir.khadka\AECOM Directory\Stankevich, Michael - ARNG_PFAS_GIS_60552172\MXDs\DE\Wilmington_Readiness_Center\Fig_1-2_Wilmington_Groundwater.mxd



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Wilmington Readiness Center, DE			
REVISED	5/11/2020	GIS BY	GC	5/11/2020
SCALE	1:48,000	CHK BY	LS	5/11/2020
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	5/11/2020

Surface Water Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-3

C:\Users\samir.khadka\AECOM Directory\Stankevich, Michael - ARNG_PFAS_GIS_60552172\MXDs\DE\Wilmington_Readiness_Center\Fig_1-3_Wilmington_SurfaceWater.mxd

2. Fire Training Areas

Based on interviewee knowledge of Wilmington Readiness Center history, no FTAs were identified during this PA. Interviewee knowledge for this facility dates back to 1995, 3 years after DEARNG signed a deed taking possession of the property. All information obtained regarding activities at the property from 1982 to 1995 was received secondhand from interviewees.

3. Non-Fire Training Areas

In addition to FTAs, the PA evaluated areas where PFAS-containing materials may have been broadly used, stored, or disposed. This may include buildings with fire suppression systems, paint booths, AFFF storage areas, and areas of compliance demonstrations. Information on these features obtained during the PA are included in **Appendices A** and **B**. No non-FTA areas where AFFF was potentially stored, used, or released were identified during the PA through interviews or historical document review.

4. Emergency Response Areas

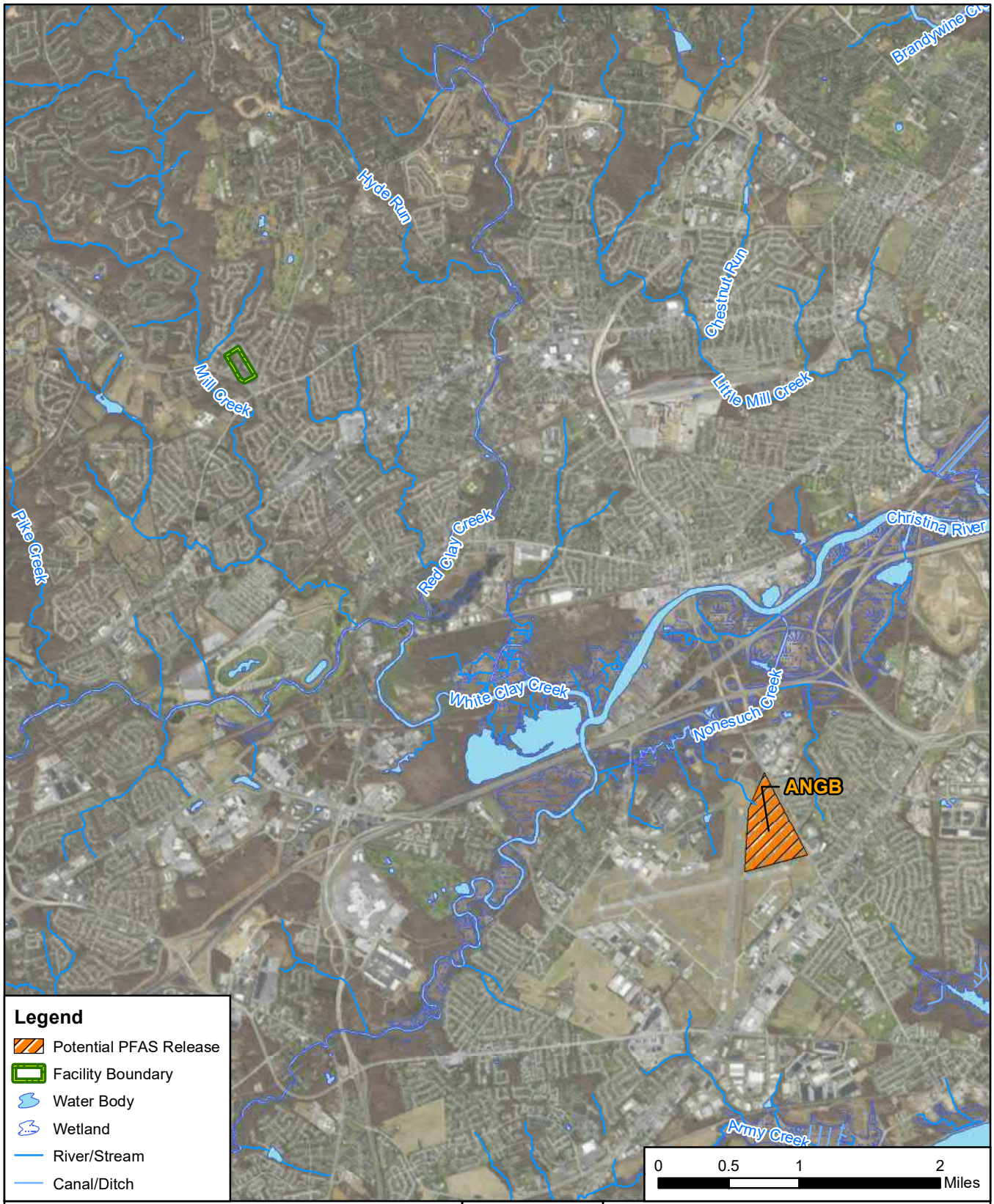
No emergency response areas were identified within the facility during the PA through interviews or Environmental Data Resource Reports. The City of Wilmington Fire Department would handle any potential fire or emergency response incident at Wilmington Readiness Center.

5. Adjacent Sources

One potential off-facility source of PFAS located adjacent to Wilmington Readiness Center, not under the control of ARNG, was identified during the PA through interviews and historical document review.

5.1 Air National Guard Base

The nearby Air National Guard Base (ANGB), located approximately 4.8 miles southeast of the facility and shown in **Figure 5-1**, has undergone an SI for PFAS. Results of the study show HA exceedances for PFAS in groundwater and detections in a surface water sample (AFW, 2019). Of the groundwater sample locations, eight locations had results above the HA, and one of two surface water sample locations had a combined PFOS and PFOA detection of 0.4247 µg/L (AFW, 2019). Due to the ANGB's downgradient location, contamination at the base is not believed to influence Wilmington Readiness Center.



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Wilmington Readiness Center, DE			
REVISED	5/11/2020	GIS BY	GC	5/11/2020
SCALE	1:63,360	CHK BY	LS	5/11/2020
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	5/11/2020

N

Adjacent Sources

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

C:\Users\samir.khadka\AECOM Directory\Stankevich, Michael - ARNG_PFAS_GIS_60552172\MXDs\DE\Wilmington_Readiness_Center\Fig_5-1_Wilmington_AdjacentSource.mxd

6. Preliminary Conceptual Site Model

Based on the PA findings from interviews with facility personnel, on-facility observations, review of EDR™ reports, and online research, no release areas were identified as AOIs at Wilmington Readiness Center. A CSM identifies three components necessary for potentially complete exposure pathways related to a site: (1) source, (2) pathway, and (3) receptor. If any of these elements are missing, the pathway is considered incomplete. However, since no PFAS sources were identified to originate at Wilmington Readiness Center or from activities associated with the facility, CSMs were not developed.

7. Conclusions

This report presents a summary of available information gathered during the PA on the history of AFFF at Wilmington Readiness Center. The PA findings are based on the information presented in **Appendix A** and from interview records.

7.1 Findings

Based on information obtained during interviews conducted with facility personnel, facility observations, and reviewed documentation, it is confirmed that AFFF has not been stored, used, or released at Wilmington Readiness Center; therefore, no AOIs related to PFAS release were identified at Wilmington Readiness Center.

Interviewee knowledge from DEARNG personnel at the Wilmington Readiness Center and other DEARNG facilities dates back to at least 1995. Evidence obtained during the PA supports that current or former ARNG facility activities have not contributed to any potential PFAS contamination in media at or near the facility. No potential areas of PFAS use, release, or storage, current or historic, were identified at Wilmington Readiness Center. One potential adjacent source of PFAS was identified downgradient of the facility during the PA.

7.2 Uncertainties

A number of information sources were investigated during this PA to determine the potential for PFAS-containing materials to have been present, used, or released at the facility. Historically, documentation of PFAS use was not required because PFAS were considered benign. Therefore, records were not typically kept by the facility or available during the PA on the use of PFAS in training, firefighting, or other non-traditional activities, or on its disposition.

The conclusions of this PA are based on all available information, including: previous environmental reports, EDRs™, observations made during the VSI, and interviews. Interviews of personnel with direct knowledge of a facility generally provided the most useful insights regarding a facility's historical and current PFAS-containing materials. Sometimes, the provided information was vague. Gathered information has a degree of uncertainty due to the absence of written documentation, the limited number of personnel with direct knowledge due to staffing changes, the time passed since PFAS were first used (1969 to present), and a reliance on personal recollection. Inaccuracies may arise in potential PFAS release locations, dates of release, volume of releases, and the concentration of AFFF used. There is also a possibility the PA has missed a source of PFAS, as the science of how PFAS may enter the environment continually evolves.

In order to minimize the level of uncertainty, readily available data regarding the use and storage of PFAS were reviewed, retired and current personnel were interviewed, multiple persons were interviewed for the same potential source area, and potential source areas were visually inspected. **Table 7-3** summarizes the uncertainties associated with the PA.

Table 7-1 Uncertainties

Area of Interest	Source of Uncertainty
Wilmington Readiness Center	Interviewee knowledge for this facility dates back to at least 1995; however, a data gap exists between 1982 and 1995. Information received regarding this time period was from secondhand knowledge.

7.3 Potential Future Actions

Based on the absence (1982-present) of the use, storage, or release of PFAS-containing materials at Wilmington Readiness Center, no AOIs were identified during the PA. Evidence does not indicate that current or former ARNG activities contributed PFAS contamination to media at or near the facility. Wilmington Readiness Center will not move forward in the CERCLA process.

CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Wilmington Readiness Center, DE			
REVISED	5/11/2020	GIS BY	GC	5/11/2020
SCALE	1:12,000	CHK BY	LS	5/11/2020
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	5/11/2020

Summary of Findings

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 7-1

C:\Users\samir.khadka\AECOM Directory\Stankevich, Michael - ARNG_PFAS_GIS_60552172\MXDs\DE\Wilmington_Readiness_Center\Fig_7-1_Wilmington_Summary.mxd

8. References

Amec Foster Wheeler (AFW). 2019. *Final Report FY16 Phase 1 Regional Site Inspections for Per and Poly Fluoralkyl Substances Volume I of XII.*

Delaware Department of Natural Resources and Environmental Control (DNREC). *New Castle County Airport Area Community Fact Sheet.* (Accessed September 2019). http://www.dnrec.delaware.gov/dwhs/SIRB/Documents.

Delaware Geological Survey (DGS). 2019. *Hydrologic Information for Delaware.* (Accessed September 2019). https://www.dgs.udel.edu/water-resources.

Delaware River Basin Commission (DRBC). 2012. *Contaminants of Emerging Concern in the Tidal Delaware River*. (Accessed November 1, 2019). https://www.nj.gov/drbc/library/documents/contaminants-of-emerging-concernAug2013rev.pdf.

Delaware River Basin Commission (DRBC). 2011. *River Mileage System*. (Accessed November 11, 2019). https://www.state.nj.us/drbc/basin/river/.

Delaware Watersheds. *Christina River.* (Accessed August 2019). http://delawarewatersheds.org/piedmont/christina-river/.

Environmental Data Resources (EDR) ™, 2019. *The EDR™ Radius Map Report with GeoCheck*.

New Castle County Delaware Government (NCCDE). 2018. *Zoning Map Index.* (Accessed September 2019). http://zoningmaps.nccde.org/.

Ramsey, Kelvin W. 2005. *Geologic Map of New Castle County, Delaware*.

Vogel, K.L., and Reif, A.G. 1993. *Geohydrology and Simulation of Ground-Water Flow in the Red Clay Creek Basin, Chester County, Pennsylvania, and New Castle County, Delaware*. United States Geological Survey. Water-Resources Investigations Report 93-4055.

Woodruff, Kenneth D. 1977. *Geohydrology of the Newark Area, Delaware*. Delaware Geological Society. Hydrologic Map Series No. 2.

U.S. Climate Data. 2019. *Climate Wilmington – Delaware*. (Accessed August 2019). https://www.usclimatedata.com/climate/wilmington/delaware/united-states/usde0055.

U.S. Environmental Protection Agency (USEPA), 1991. *Guidance for Performing Preliminary Assessments under CERCLA*. EPA/540/G91/013.

Appendix A
Data Resources

Data Resources will be provided separately on CD. Data Resources for Wilmington Armory include:

Wilmington Previous Site Investigations

- 2019, Final Report FY16 Phase 1 Regional Site Inspections for Perfluorinated Compounds, Amec Foster Wheeler
- Delaware Department of Natural Resources and Environmental Control's New Castle County Airport Area Fact Sheet, PFOS/PFOA Detected in Ground Water from New Castle Public Wells

Wilmington Site Background Documents

- 1977, Geohydrology of the Newark Area, Delaware, Kenneth D. Woodruff
- 1993, Altitude and Configuration of the Simulated Water-Level Surface of the Aquifer in the Red Clay Creek Basin
- 1993, Geohydrology and Simulation of Ground-Water Flow in the Red Clay Creek Basin, Chester County, Pennsylvania, and New Castle County, Delaware, Karen L. Vogel and Andrew G. Reif
- 1993, Geologic Map of the Red Clay Creek Basin and Location of Wells and Base-Flow Measurement Sites, Karen L. Vogel and Andrew G. Reif
- 2005, USGS Geologic Map of New Castle County, Delaware, Kelvin W. Ramsey
- 2013, Contaminants of Emerging Concern in the Tidal Delaware River: Pilot Monitoring Survey 2007-2009
- UCMR 3 Data

Wilmington Site Property Documents

- 1992, Wilmington Armory Deed, March 10

Environmental Data Resources, Inc.™ Reports

- 2019, Aerial Photo Decade Package, Environmental Data Resources, Inc.™
- 2019, Certified Sanborn Map Report, Environmental Data Resources, Inc.™
- 2019, Radius Map Report with Geocheck, Environmental Data Resources, Inc.™
- 2019, Wilmington Historical Aerials, Environmental Data Resources, Inc.™

Appendix B
Preliminary Assessment Documentation

Appendix B.1
Interview Records

PA Interview Questionnaire - Other

Facility: Wilmington Armory
Interviewer: [redacted]
Date/Time: 8/5/2019 [redacted]

Interviewee: [redacted]	Can your name/role be used in the PA Report? Y or N
Title: General staff officer	Can you recommend anyone we can interview?
Phone Number: [redacted]	Y or N _____
Email: [redacted]	

Roles or activities with the Facility/Years working at the Facility:

DE Army Nat'l Guard since 1995 (July)
- General Staff officer 1995 - Present
- Construction Plans and Programming Supervisor

PFAS Use: Identify accidental/intentional release locations, time frame of release, frequency of releases, storage container size (maintenance, fire training, firefighting, buildings with suppression systems (as builts), fueling stations, crash sites, pest management, recreational, dining facilities, metals plating, or waterproofing). How are materials ordered/purchased/disposed/shared with others?

- DE Nat'l guard HQ since 1992
- Formerly Laura Little Elementary School
- Co-located w/ Mid-County Senior Center
- DE Military museum is also inside
- Area is mostly single family homes
- No AFFF or PFAS on-site ever only handheld extinguishers

Known Uses	
Use	
Procurement	
Disposition	
Storage (Mixed)	
Storage (Solution)	
Inventory, Off-Spec	
Containment	
SOP on Filling	
Leaking Vehicles	
Nozzle and Suppression System Testing	
Dining Facilities	
Vehicle Washing	
Ramp Washing	
Fuel Spill Washing and Fueling Stations	
Chrome Plating or Waterproofing	

Appendix B.2
Visual Site Inspection Checklists

Visual Site Inspection Checklist

Names(s) of people performing VSI: [redacted]

Recorded by: [redacted]

ARNG Contact: [redacted]

Date and Time: 8/5/2019

Method of visit (walking, driving, adjacent): Walking

Source/Release Information

Site Name / Area Name / Unique ID: Wilmington Armory

Site / Area Acreage: 14.68 acres

Historic Site Use (Brief Description): Formerly Laura Little Elementary School (until 1992) 1992- DEARNG HQ

Current Site Use (Brief Description): DEARNG HQ - Administrative, ~~MG~~ DE Military Museum

Physical barriers or access restrictions: None

1. Was PFAS used (or spilled) at the site/area? Y (N)

1a. If yes, document how PFAS was used and usage time (e.g., fire fighting training 2001 to 2014):

2. Has usage been documented? Y / (N)

2a. If yes, keep a record (place electronic files on a disk):

3. What types of businesses are located near the site? **Industrial / Commercial / Plating / Waterproofing / (Residential)**

3a. Indicate what businesses are located near the site Residential + schools

4. Is this site located at an airport/flightline? Y (N)

4a. If yes, provide a description of the airport/flightline tenants:

Visual Survey Inspection Log

Other Significant Site Features:

1. Does the facility have a fire suppression system? Y / (N)

1a. If yes, indicate which type of AFFF has been used:

N/A

1b. If yes, describe maintenance schedule/leaks:

N/A

1c. If yes, how often is the AFFF replaced:

N/A

1d. If yes, does the facility have floor drains and where do they lead? Can we obtain an as built drawing?

N/A

Transport / Pathway Information

Migration Potential:

1. Does site/area drainage flow off installation? (Y) / N

1a. If so, note observation and location:

2. Is there channelized flow within the site/area? Y / (N)

2a. If so, please note observation and location:

3. Are monitoring or drinking water wells located near the site? Y / (N)

3a. If so, please note the location:

4. Are surface water intakes located near the site? Y / (N)

4a. If so, please note the location:

5. Can wind dispersion information be obtained? Y / (N)

5a. If so, please note and observe the location.

6. Does an adjacent non-ARNG PFAS source exist? Y / (N)

6a. If so, please note the source and location.

6b. Will off-site reconnaissance be conducted? Y / N

Visual Survey Inspection Log

Significant Topographical Features:

1. Has the infrastructure changed at the site/area? Y / (N)

1a. If so, please describe change (ex. Structures no longer exist):

2. Is the site/area vegetated? (Y) / N

2a. If not vegetated, briefly describe the site/area composition:

3. Does the site or area exhibit evidence of erosion? Y / (N)

3a. If yes, describe the location and extent of the erosion:

4. Does the site/area exhibit any areas of ponding or standing water? Y / (N)

4a. If yes, describe the location and extent of the ponding:

Receptor Information

1. Is access to the site restricted? Y / (N)

1a. If so, please note to what extent:

2. Who can access the site? (Site Workers) / (Construction Workers) / (Trespassers) / (Residential) / (Recreational Users) / (Ecological)

2a. Circle all that apply, note any not covered above:

3. Are residential areas located near the site? (Y) / N

3a. If so, please note the location/distance:

Immediate Surrounding (all sides)

4. Are any schools/day care centers located near the site? (Y) / N

4a. If so, please note the location/distance/type:

Senior center on western border.

5. Are any wetlands located near the site? (Y) / N

5a. If so, please note the location/distance/type:

SE by White Clay Creek (2.6 mi)

Appendix B.3
Conceptual Site Model Information

Preliminary Assessment – Conceptual Site Model Information

Site Name: Wilmington Armory

Why has this location been identified as a site? A potential for PFAS-containing materials or AFFF storage was identified for this facility. No AFFF/PFAS has been kept/used at this facility

Are there any other activities nearby that could also impact this location? None locally

Training Events

Have any training events with AFFF occurred at this site? None- No AFFF onsite

If so, how often? N/A

How much material was used? Is it documented? N/A

Identify Potential Pathways: Do we have enough information to fully understand over land surface water flow, groundwater flow, and geological formations on and around the facility? Any direct pathways to larger water bodies?

Surface Water:

Surface water flow direction? SW away from site, SE generally

Average rainfall? 43" rainfall

Any flooding during rainy season? Not at this facility

Direct or indirect pathway to ditches? Yes - ditch behind building

Direct or indirect pathway to larger bodies of water? Indirect to Christina River

Does surface water pond any place on site? No

Any impoundment areas or retention ponds? No

Any NPDES location points near the site? No

How does surface water drain on and around the flight line? N/A

Preliminary Assessment – Conceptual Site Model Information

Groundwater:

Groundwater flow direction? Southeast

Depth to groundwater? Water table is ~ 20-30 ft. amsl

Uses (agricultural, drinking water, irrigation)? Drinking

Any groundwater treatment systems? Artesian treats groundwater

Any groundwater monitoring well locations near the site? Unknown

Is groundwater used for drinking water? Yes

Are there drinking water supply wells on installation? No

Do they serve off-post populations? N/A

Are there off-post drinking water wells downgradient N/A

Waste Water Treatment Plant:

Has the installation ever had a WWTP, past or present? No

If so, do we understand the process and which water is/was treated at the plant? N/A

Do we understand the fate of sludge waste? N/A

Is surface water from potential contaminated sites treated? N/A

Equipment Rinse Water

1. Is firefighting equipment washed? Where does the rinse water go? N/A - No firefighting/ training at facility.

2. Are nozzles tested? How often are nozzles tested? Where are nozzles tested? Are nozzles cleaned after use? Where does the rinse water flow after cleaning nozzles? N/A

3. Other?

Preliminary Assessment – Conceptual Site Model Information

Identify Potential Receptors:

Site Worker None

Construction Worker None

Recreational User None

Residential None

Child None

Ecological None

Note what is located near by the site (e.g. daycare, schools, hospitals, churches, agricultural, livestock)?

School, residential areas

Documentation

Ask for Engineering drawings (if applicable).

Has there been a reconstruction or changes to the drainage system? When did that occur?

Appendix C
Photographic Log

APPENDIX C – Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Wilmington Readiness Center	Wilmington, Delaware

Photograph No. 1

Description:

AB fire extinguisher mounted on the wall inside the facility.

Photo Date: 8/5/2019

Photograph No. 2

Description:

Tag from the AB fire extinguisher above. This is the only type of extinguisher at the facility.

Photo Date: 8/5/2019