FINAL
Preliminary Assessment Report
Camp Murray, Washington

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

September 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
AECOM	AECOM Technical Services, Inc.
AFB	Air Force Base
AFFF	aqueous film forming foam
amsl	above mean sea level
AOI	area of interest
ARNG	Army National Guard
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	conceptual site model
CSMS	Combined Support Maintenance Shop
Ecology	Washington Department of Ecology
EDR™	Environmental Data Resources, Inc.™
EP	Earth Point
FEMA	Federal Emergency Management Agency
FTA	fire training area
HA	Health Advisory
HUC	Hydrologic Unit Code
ITRC	Interstate Technology Regulatory Council
JBLM	Joint Base Lewis-McChord
LWD	Lakewood Water District
NGB	National Guard Bureau
NOAA	National Oceanic and Atmospheric Administration
OWS	oil/water separater
PA	Preliminary Assessment
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PFAS	per- and poly-fluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
RV	Recreational Vehicle
SI	Site inspection
UCMR3	Unregulated Contaminant Monitoring Rule 3
US	United States
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USDA	United States Department of Agriculture
USDOA	United States Department of the Army
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

USGS	United States Geological Survey
UW	University of Washington
VOCs	Volatile organic compounds
VSI	Visual Site Inspection
WAANG	Washington Air National Guard
WAARNG	Washington Army National Guard
WDOH	Washington Department of Heatlh
WEMD	Washington State Emergency Management Division
WMD	Washington Military Department
WRIA	Water Resource Inventory Area

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 Camp Murray in Pierce County, Washington, to assess potential PFAS release areas and exposure pathways to receptors.

Camp Murray consists of approximately 240 acres adjacent to Joint Base Lewis-McChord (JBLM). As the headquarters for the Washington Military Department (WMD) since 1928, Camp Murray provides facilities for multiple entities including the Washington Army National Guard (WAARNG), the 194th Wing of the Washington Air National Guard (WAANG), the Washington Emergency Management Division (WEMD), and the Pierce County Readiness Center (WMD, 2017; WMD, 2019a). The WAANG installation is primarily in the southwestern area of Camp Murray since 1974 (WMD, 2019b; Valencia, 2018).

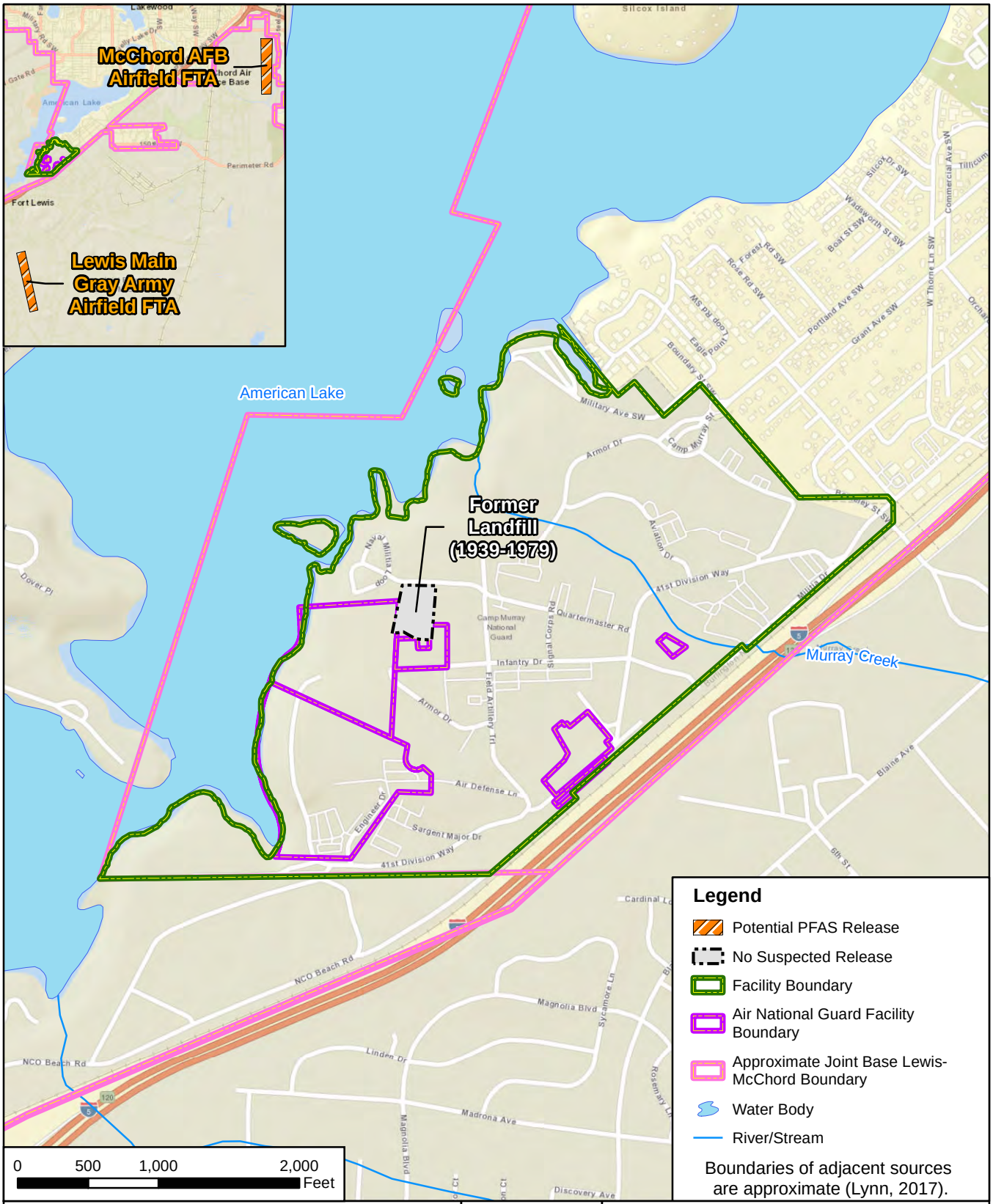
The performance of this PA included the following tasks:

- 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 1-day site visit on 31 October 2019 and completed visual site inspections at locations where PFAS-containing materials were suspected of being stored, used, or disposed; and,
- Interviewed current Camp Murray and WMD-affiliated personnel during the site visit.

No Areas of Interest (AOI) related to potential PFAS releases were identified at Camp Murray during the PA. The summary of PA findings is shown on **Figure ES-1**.

Based on US Environmental Protection Agency's (USEPA) Unregulated Contaminant Monitoring Rule 3 (UCMR3) data (samples collected between 2013 and 2016), PFAS were detected above USEPA's Health Advisory (HA) in public water systems serving the City of Dupont and JBLM, both located within a 2.5-mile radius of Camp Murray (USEPA, 2017). The HA is 70 parts per trillion for PFOS and PFOA, individually or combined. PFAS analyses performed in 2013-2016 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.

Based on the documented absence of the WAARNG's storage, use or release of PFAS-containing materials at Camp Murray since WAARNG began operations at this facility in 1928, evidence does not indicate that current or former ARNG activities contributed PFAS contamination to soil, groundwater, surface water, or sediment at the facility or adjacent areas. Camp Murray will not move forward in the Comprehensive Environmental Response, Compensation, and Liability Act process.



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Murray, WA			
REVISED	9/16/2020	GIS BY	MS	9/16/2020
SCALE	1:12,000	CHK BY	MB	9/16/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	9/16/2020

Summary of Findings

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure ES-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\WA\Camp_Murray_Figures\PA_Figures\Fig_ES-1_Camp_Murray_Summary.mxd

1. Introduction

1.1 Authority and Purpose

The Army National Guard (ARNG) G9 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 their facilities that used per- and poly-fluoroalkyl substances (PFAS) (a suite of related chemicals), primarily releases of aqueous film forming foam (AFFF), although other sources of PFAS 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 these PFAS compounds in the environment will vary. The regulatory framework at both federal and state levels continues to evolve. The US Environmental Protection Agency (USEPA) issued 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. The HA is 70 parts per trillion for PFOS and PFOA, individually or combined (USEPA, 2016).

This report presents findings of a PA for PFAS-containing materials at Camp Murray (also referred to as the “facility”) located in Camp Murray, Pierce County, Washington, 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 Part 300), and Army requirements and guidance.

This PA documents potential locations of where PFAS-containing materials may have been released into the environment at Camp Murray. 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 1-day site visit on 31 October 2019 and completed visual site inspections (VSIs) at locations where PFAS-containing materials were suspected of being stored, used, or disposed; and,
- Interviewed current Camp Murray and Washington Military Department (WMD)-affiliated personnel during the site visit.

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 release(s) at the facility identified during the site visit.
- **Section 4** – **Emergency Response Areas:** describes areas of potential PFAS release(s) at the facility, specifically in response to emergency situations.
- **Section 5** – **Adjacent Off-Site Sources:** describes sources of potential PFAS release(s) adjacent to the facility that are not under the control of ARNG.
- **Section 6** – **Preliminary Conceptual Site Model:** describes the pathways of potential PFAS transport and receptors at each Area of Interest (AOI).
- **Section 7** – **Conclusions:** summarizes the data findings and presents the conclusions of the PA.
- **Section 8** – **References:** provides the references used to develop this document.
- **Appendix A** – Data Resources
- **Appendix B** – Preliminary Assessment Documentation

1.4 Facility Location and Description

Camp Murray is situated in the immediate vicinity of Joint Base Lewis-McChord (JBLM) in a mixed military and residential area of Pierce County, Washington (**Figure 1-1**). Camp Murray includes four parcels (#0219204000, #0219213000, #0219212000, and #0219201001) totaling 240 acres and is developed with 92 buildings occupied by multiple agencies, as described below (Valencia, 2018; WMD, 2019b). The facility is bordered by American Lake along its western boundary, the City of Lakewood along its northern boundary, Interstate 5 along its eastern boundary, and the American Lake Conference Center along its southern boundary (Google Earth, 2018).

The adjacent JBLM encompasses over 413,000 acres and was officially formed in 2010 after McChord Air Force Base (AFB) and Fort Lewis merged in 2005 (AECOM, 2015). These installations were established in 1947 and 1927, respectively (Fort Lewis was originally established as Camp Lewis in 1917) (Army, 2020a). JBLM provides training and infrastructure, mobilization and deployment operations for the Army, Navy, Air Force, and Marines (Army, 2020a, 2020b). Information gathered during this PA regarding JBLM-associated facilities, specifically the McChord Airfield (northeast of Camp Murray) and the Gray Army Airfield (southwest of Camp Murray), is presented in Section 5.

Camp Murray was originally acquisitioned by the State of Washington in 1903 for ARNG troop training and structural development began in 1915 that continued through the 1950s with buildings for artillery/material warehousing, barracks and dining facilities, vehicle maintenance, administration, and training (Valencia, 2018). Since 1928, Camp Murray has served as the WMD headquarters and the installation is shared between the Washington State Emergency Management Division (WEMD), the 194th Wing of the Washington Air National Guard (WAANG), the WAARNG, and the Pierce County Readiness Center.

The State of Washington activated the WAANG in 1950 and the WAANG has occupied three distinct areas of the Camp Murray installation since 1974 (the Headquarters area, the 111th Air Support Operations Squadron, and the 116th Air Support Operations Squadron), encompassing approximately 43 acres (Valencia, 2018; WMD, 2019b; National Guard Bureau [NGB], 2013; Leidos, 2017). The WAANG property is owned by the State of Washington and leased by the USAF, who licenses the property to the WMD for WAANG's use (Leidos, 2017). The mission of the WAANG is to provide air ground support missions training through command and administration. The WAANG area is developed with buildings for civil engineering/administrative support purposes, providing in-classroom trainings. No aircraft, hangars, flight line, or helipads are developed at the WAANG facility. Historical aerial photographs depict the development of the WAANG in the southwestern portion of the installation by at least 1971 (EDR™, 2019a).

Since 2017, the Pierce County Readiness Center has been located at Camp Murray (in the central portion), which replaced the approximate 100-year old Tacoma Readiness Center (WMD, 2017). Construction of the Pierce County Readiness Center (Building 80) began in 2013 (WMD, 2017, 2019b; EDR™, 2019a). The Pierce County Readiness Center is used by soldiers for classroom training and other activities (WMD, 2017).

Activities conducted by the WAARNG at Camp Murray include administrative and logistics, which include the WMD offices, classroom training, and US Property and Fiscal Office warehousing of new and waste materials. The installation is fenced-in and gated, staffed with patrol guards at three separate gates (entrances at the north, northeast, and southern installation boundary).

Since 2017, Camp Murray has been in a similar configuration as observed during the site visit (EDR™, 2019a; WMD, 2019b; Google, 2018).

1.5 Facility Environmental Setting

Camp Murray and surrounding areas are fairly flat, at an average elevation of 275 feet above mean sea level (amsl) (Google Earth, 2018).

1.5.1 Geology

The facility is located in a geologic area characterized as younger glacial drift of the Pleistocene geologic epoch of the Quaternary period (US Geological Survey [USGS], 2019). Major lithologic constituents of younger glacial drift are unconsolidated fine-detrital from alluvial glacial-outwash (USGS, 2019).

The facility is situated in a historically volcanic area of the Pacific Northwest, within the Pacific Border physiographic province, which extends north into Canada and south into southern California (US Department of the Interior [USDOI], 2019). The facility is underlain by a sequence of unconsolidated glacial (till/outwash) and interglacial (fluvial/lacustrine) deposits (USGS, 2010). Parent material consists of sedimentary and volcanic bedrock beneath the unconsolidated deposits. The facility overlies the Puget Sound lowland region of the Puget-Willamette Trough regional aquifer system, which extends approximately 400 miles from the Canadian border to the north to central Oregon to the south (USGS, 1994).

The major aquifer of this system is the unconsolidated-deposit aquifer, found throughout the Pacific Northwest and Idaho (USGS, 1994). The unconsolidated deposits of this aquifer consist of sand and gravel with alluvial deposits of eolian, glacial, or volcanic deposits. The finer particles of clay and silt form confining units and the coarser particles of sand and gravel (with cobbles and boulders) form productive aquifers, where well sorted. The deposits that formed along stream valleys are typically less than 250 feet thick, while in other areas, deposits can reach up to 5,500 feet thick (USGS, 2010). Permeability is mostly found within the uppermost 500 feet as compaction increases with depth. Where bedrock consists of volcanic, igneous, and metamorphic

rock, the basins yield more permeable aquifers due to the presence of more coarse sand, gravel, and cobbles.

1.5.2 Hydrogeology

Soils beneath the ARNG portion of Camp Murray consist generally of the following soil series (in order from most to least present): Spanaway gravelly sandy loam, Everett very gravelly sandy loam, and Spana-Spanaway-Nisqually complex (US Department of Agriculture [USDA], 2019). Collectively, these soils generally consist of somewhat excessively drained soils that formed in glacial outwash mixed in the upper part with volcanic ash (USDA, 1979). The Spana-Spanaway series, however, consists of somewhat poorly drained soils that formed in alluvium containing volcanic ash over very gravelly alluvium. Profile characteristics for each of these soil series are as follows:

- Spanaway gravelly sandy loam: Permeability is moderately rapid. Depth to very gravelly sand ranges from 14 to 28 inches below ground surface (bgs). Decomposed organic material is found at shallower soil depths, increasing near the surface.
- Everett very gravelly sandy loam: Coarse material increases with depth.
- Spana-Spanaway Nisqually complex: Gravel increases with depth. Depth to very gravelly sandy loam ranges from 23 to 30 inches bgs.

Groundwater in the region of the facility is limited to climate and geology; the availability of groundwater is limited during the summer due to the fairly warm, dry climate during summer as compared to the cool, wet climate during winter (USGS, 2010). The aquifer beneath the facility—defined as the A1 aquifer in the Chambers-Clover Creek watershed—is comprised of Vashon recessional outwash deposits from the Fraser Glaciation and ranges in thickness of up to 35 feet, reaching up to 75 feet in certain areas and up to 150 feet south of the facility (USGS, 2010). This aquifer's deposits consist of silt, sand, and gravel. Groundwater in this aquifer is unconfined. Groundwater recharge in the region is dominated by precipitation; approximately 44 percent of rainfall infiltrates the soil to recharge groundwater, with seasonal fluctuations (USGS, 2010). The deepest recorded well in this region's aquifer is 234 feet bgs (USGS, 2010).

Multiple monitoring wells are located throughout the facility, within both the WAARNG and WAANG facilities, as described further below.

<u>WAARNG Monitoring Wells</u>

- Monitoring wells are located within the footprint of the former landfill, in the central-western portion of the facility, for the performance of quarterly groundwater monitoring since 2011 (refer to Section 3.1) (SCS Engineers, 2011, 2012). A previously existing groundwater monitoring well was installed at the former landfill in 1987 (SCS Engineers, 2011). Groundwater measurements collected from these monitoring wells in 2011 and 2012 indicate shallow groundwater at depths ranging from 10 to 20 feet bgs. Groundwater flow beneath the landfill was generally to the northwest, toward American Lake. Groundwater samples were analyzed for volatile organic compounds (VOCs) and metals; no PFAS constituents were documented as part of the analyses (SCS Engineers, 2011, 2012).
- Monitoring wells are located in the south-central portion of the facility for the performance of quarterly groundwater monitoring in 2013 and 2014 as part of a Remedial Investigation of the former vehicle maintenance activities at the Combined Support Maintenance Shop (CSMS) (Robinson Noble, 2014). The CSMS dates back to pre-1980s and encompassed Buildings 28, 29, 31, and 37, and a fueling island. The CSMS was demolished in 2013 and replaced with the present-day Pierce County Readiness Center; vehicle maintenance activities were relocated to JBLM. Groundwater measurements collected from these monitoring wells in 2013 and 2014 indicate shallow groundwater at depths ranging from 10 to 15 feet bgs.

Groundwater flow beneath the CSMS was generally to the west/northwest, towards American Lake. Some of the monitoring wells were decommissioned. Soil and groundwater samples were analyzed for petroleum hydrocarbons, VOCs, metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs); no PFAS constituents were documented as part of the analyses (Robinson Noble, 2014).

- The purpose of the monitoring wells in the eastern portion of the facility is unknown.

WAANG Monitoring Wells

- Monitoring wells are located in the southwestern portion of the facility, specifically in the southwestern area of the WAANG facility, for the performance of groundwater monitoring at Building 102 oil/water separator (OWS) and the former vehicle wash area (Leidos, 2017). Groundwater measurements collected from these monitoring wells in 2012 and 2015 indicate shallow groundwater at depths ranging from 36 to 39 feet bgs. Groundwater flow beneath the WAANG was generally to the west/southwest, towards American Lake. Soil and groundwater samples were analyzed for petroleum hydrocarbons, VOCs, metals, and PAHs; no PFAS constituents were documented as part of the analyses (Leidos, 2017).

Generally, groundwater beneath the facility is shallow (less than 40 feet bgs) and follows the natural topographic gradient to the northwest, towards American Lake, ultimately in the direction of the Puget Sound (Earth Point [EP], 2019). Groundwater wells are shown on **Figure 1-2**, with the exception of wells included in the State's database (Washington Department of Ecology [Ecology], 2020a). For completeness, wells reported by the State up to a 4-mile radius of the facility are included on **Figure A-1** (**Appendix A**).

No groundwater wells used for drinking water are located at the facility (Ecology, 2020a). Camp Murray obtains its drinking water from JBLM, specifically, the *JBLM-Lewis* water system, which is located less than 1 mile to the east/southeast of the facility (ID 26050) (JBLM, 2019a; Leidos, 2017). JBLM provides drinking water to over 55,000 people through two of its water systems: *JBLM-Lewis* (ID 26050) and *JBLM-McChord Field* (ID 52200 (JBLM, 2019a, 2019b). *JBLM-Lewis* obtains its drinking water from one primary source (the Sequalitchew Spring, the largest source since 1918) and seven secondary groundwater wells located in various areas (JBLM, 2019a). *JBLM-McChord Field* obtains its drinking water from ten on-base groundwater wells that draw water from the Vashon and Salmon Springs Aquifers (in-use since the 1930s) (JBLM, 2019b).

Based on USEPA's Unregulated Contaminant Monitoring Rule 3 (UCMR3) data (samples collected between 2013 and 2016), PFAS were detected in public water systems above USEPA's HAs serving the City of Dupont and JBLM, both located within a 2.5-mile radius of Camp Murray, which were sampled in 2013 and 2014 (USEPA, 2017). The HA is 70 parts per trillion for PFOS and PFOA, individually or combined. PFAS analyses performed in 2013-2016 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.

1.5.3 Hydrology

Camp Murray is situated within the Sequalitchew Creek-Frontal Cormorant Passage subwatershed (Hydrologic Unit Code [HUC] 12 [171100190304]), a drainage area delineated within the watershed of the Puget Sound Cataloging Unit (HUC 8 [17110019]) of the Pacific Northwest drainage unit (USEPA, 2020a). Ecology manages the state's water availability by categorizing watersheds as Water Resource Inventory Areas (WRIAs). Camp Murray is located within the Chambers-Clover Watershed (WRIA 12) (Washington Department of Health [WDOH], 2020a). WRIA 12 covers an area of 180 square miles where numerous rivers, streams, and ponds flow through and ultimately drain into the Puget Sound to the north/northwest of the facility (University of Washington [UW], 2018; USGS, 2010).

No surface waterbodies (lakes, ponds, or wetlands) are located within, and no surface water features (rivers, streams, or creeks) flow through Camp Murray, with exception for one small creek and an adjacent-bordering lake (USEPA, 2020a; US Fish and Wildlife Service [USFWS], 2018). Murray Creek originates off-Post at JBLM to the east, transecting Camp Murray to the north, and discharging into American Lake to the north (USEPA, 2020a; WMD, 2019a, 2019b). American Lake borders the western facility boundary, which is a lake of glacial origin that fills as a result of shallow groundwater levels (USGS, 2010). Wetlands are to the east/southeast of the facility (where Murray Creek flows) and the west adjacent to various lakes (USFWS, 2018). The Puget Sound (inlet to the Pacific Ocean) is approximately 4 miles to the west/northwest of the facility (USEPA, 2020a). While the facility is in the vicinity of numerous bodies of water, the facility is located in a zone of minimal flood hazard (Federal Emergency Management Agency [FEMA], 2019). The surface water features are shown on **Figure 1-3**.

Precipitation falling onto Camp Murray would flow as sheet flow on the pavement and enter stormwater catch basins throughout, or infiltrate the unpaved, grass- or gravel-covered areas (WMD, 2019b). Stormwater collected in the facility's stormwater conveyance system discharges into American Lake or infiltrates into groundwater (WMD, 2019a, 2019b). Surface water runoff at Camp Murray would generally occur during heavy precipitation events, where precipitation exceeds the infiltration rate.

1.5.4 Climate

Climate in the region of the facility is characterized as a temperate marine with warm, dry summers and cool, wet winters, which is regulated by the nearby Puget Sound and Pacific Ocean to the west, the Olympic Mountain Range to the west, and the Cascade Mountain Range to the east (USGS, 2010). Precipitation in this region generally falls as rain in the fall/winter. Precipitation averages 45 inches in a year (measured for the 2006 to 2008 period) (USGS, 2010).

Temperatures recorded for 2019 at the nearest climatological station to Camp Murray (Tacoma Number 1 Station) ranged from an average low of 37 degrees Fahrenheit (°F) in February to an average high of 69°F in August (National Oceanic and Atmospheric Administration [NOAA], 2020).

Precipitation recorded for 2019 at the nearest climatological station to Camp Murray (Tacoma Number 1 Station) ranged from an average low of 0.4 inches in May to an average high of 7.4 inches in December (National Oceanic and Atmospheric Administration [NOAA], 2020).

1.5.5 Current and Future Land Use

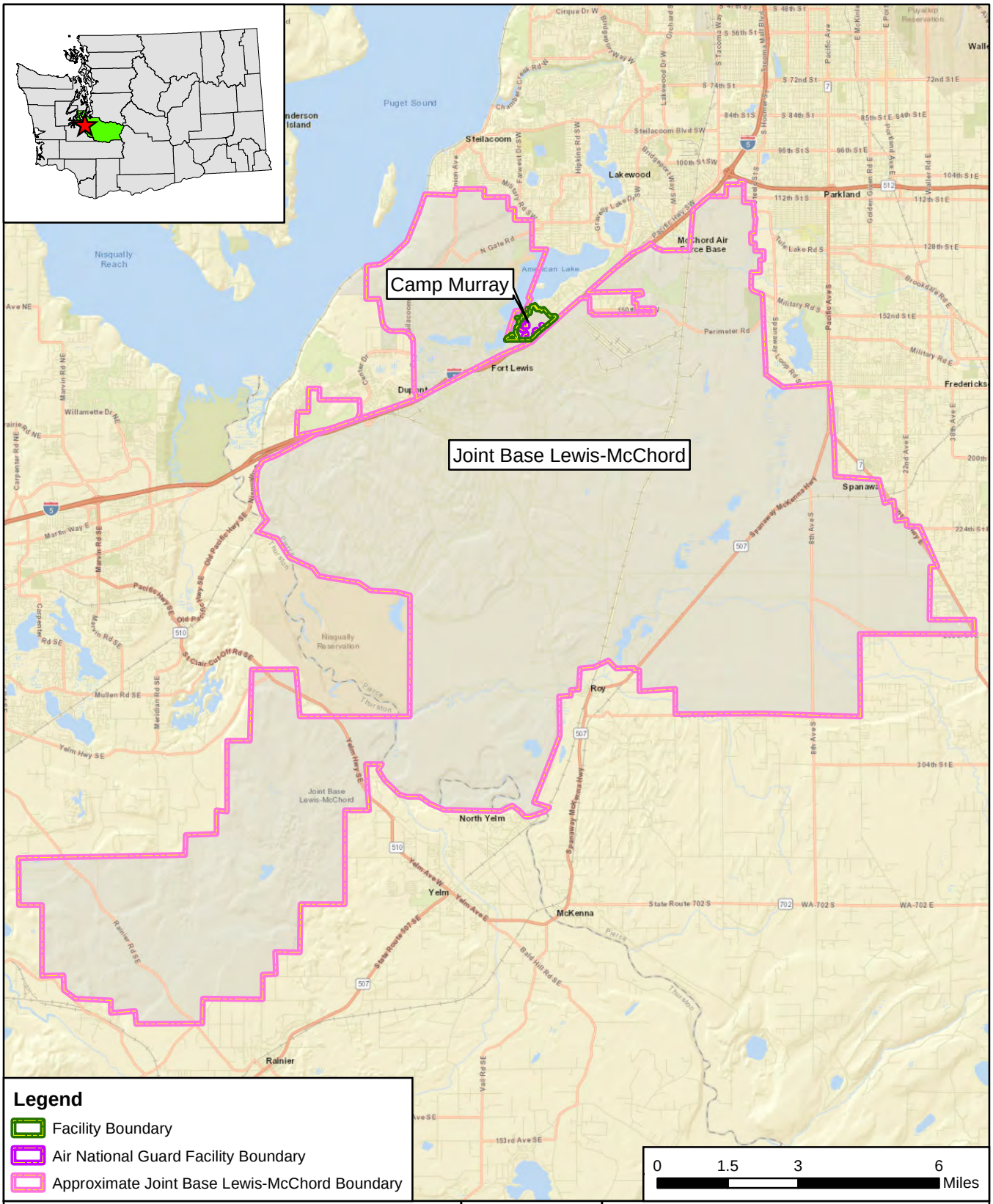
Current Land Use

Camp Murray occupies 240 acres of both developed and undeveloped land with 92 buildings occupied by multiple agencies under the WMD since 1928 (Valencia, 2018; WMD, 2019b). Camp Murray is zoned Urban Military Land in Pierce County (Pierce County, 2020). The areas surrounding Camp Murray to the west, south, and east are similarly zoned Urban Military Land as well as Rural Military Land (i.e., designated areas outside of the military installations), developed JBLM. The Lakewood area to the north/northeast is zoned as a Municipal Area developed with residential properties (Pierce County, 2020). According to the 2010 US Census, the population of Pierce County was 795,222 (Census, 2020).

Future Land Use

The urban growth boundary of Lakewood abuts Camp Murray along the north/northeast boundary (Pierce County, 2020). However, Camp Murray is an overlapping jurisdiction of the Pierce County Urban Growth Boundary for Lakewood, identified as the *Lakewood Urban Growth/Potential Annexation Area* (Pierce County, 2019, 2020b). Plans for the future use of Camp Murray are unknown. However, the WMD holds a long term lease for the land with the State of Washington. Given the designated zoning and cooperation between Pierce County and the military for use of the land for state military purposes, redevelopment of the facility is not likely to occur in the very near future (Pierce County, 2019).

According to the 2019 estimates of the US Census, the population of Pierce County was 904,980, a large increase from 2010 (Census, 2020). According to Pierce County's 2019 *Comprehensive Plan*, the population of Pierce County is expected to increase by an additional 200,000 people by 2030, with growth dominating the Puget Sound region of Tacoma (Pierce County, 2019).



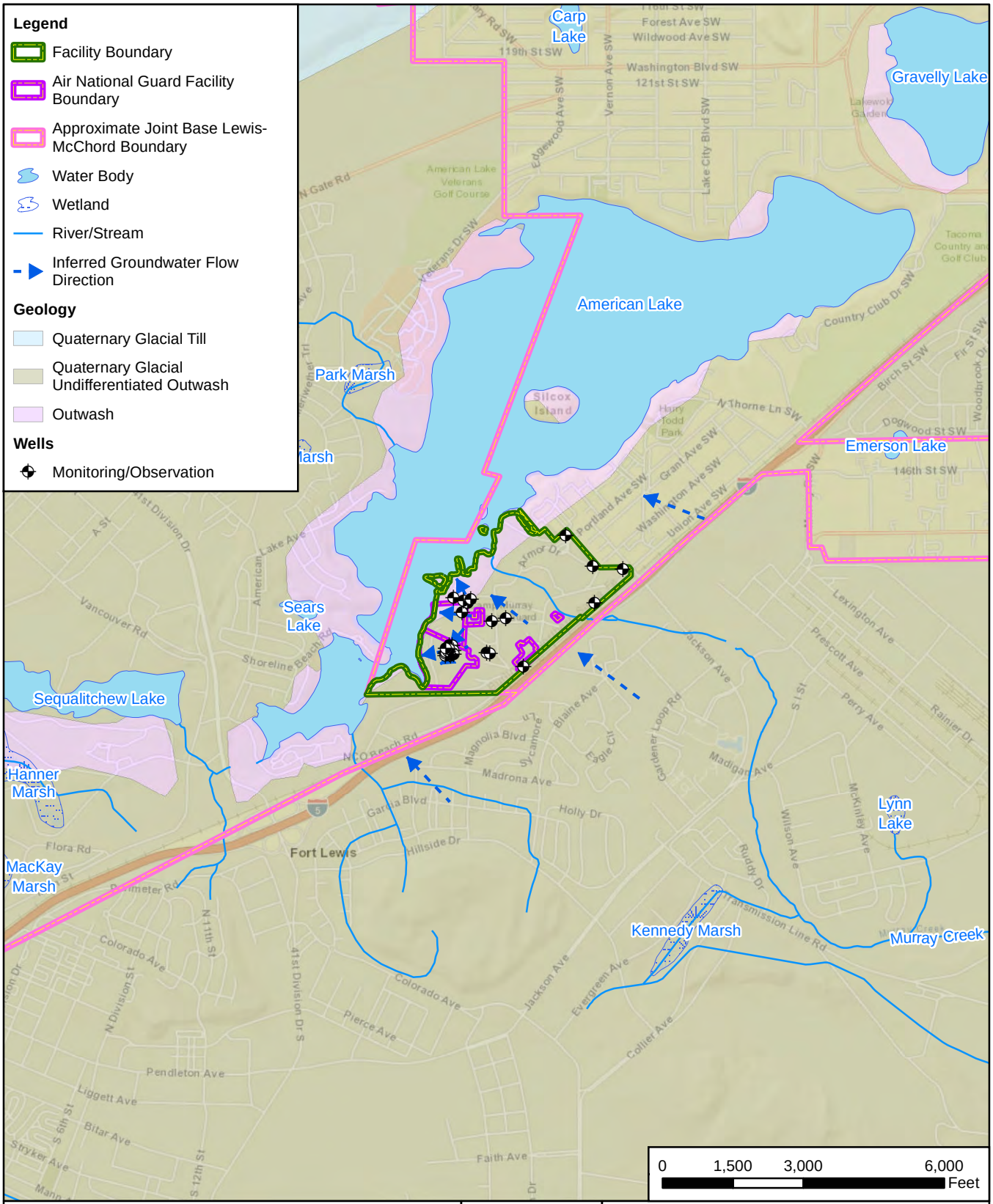
CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Murray, WA			
REVISED	7/6/2020	GIS BY	MS	7/6/2020
SCALE	1:190,080	CHK BY	MB	7/6/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	7/6/2020

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\WA\Camp_Murray_Figures\PA_Figures\Fig_1-1_Camp_Murray_Facility_Location.mxd



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Murray, WA			
REVISED	9/16/2020	GIS BY	MS	9/16/2020
SCALE	1:36,000	CHK BY	MB	9/16/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	9/16/2020

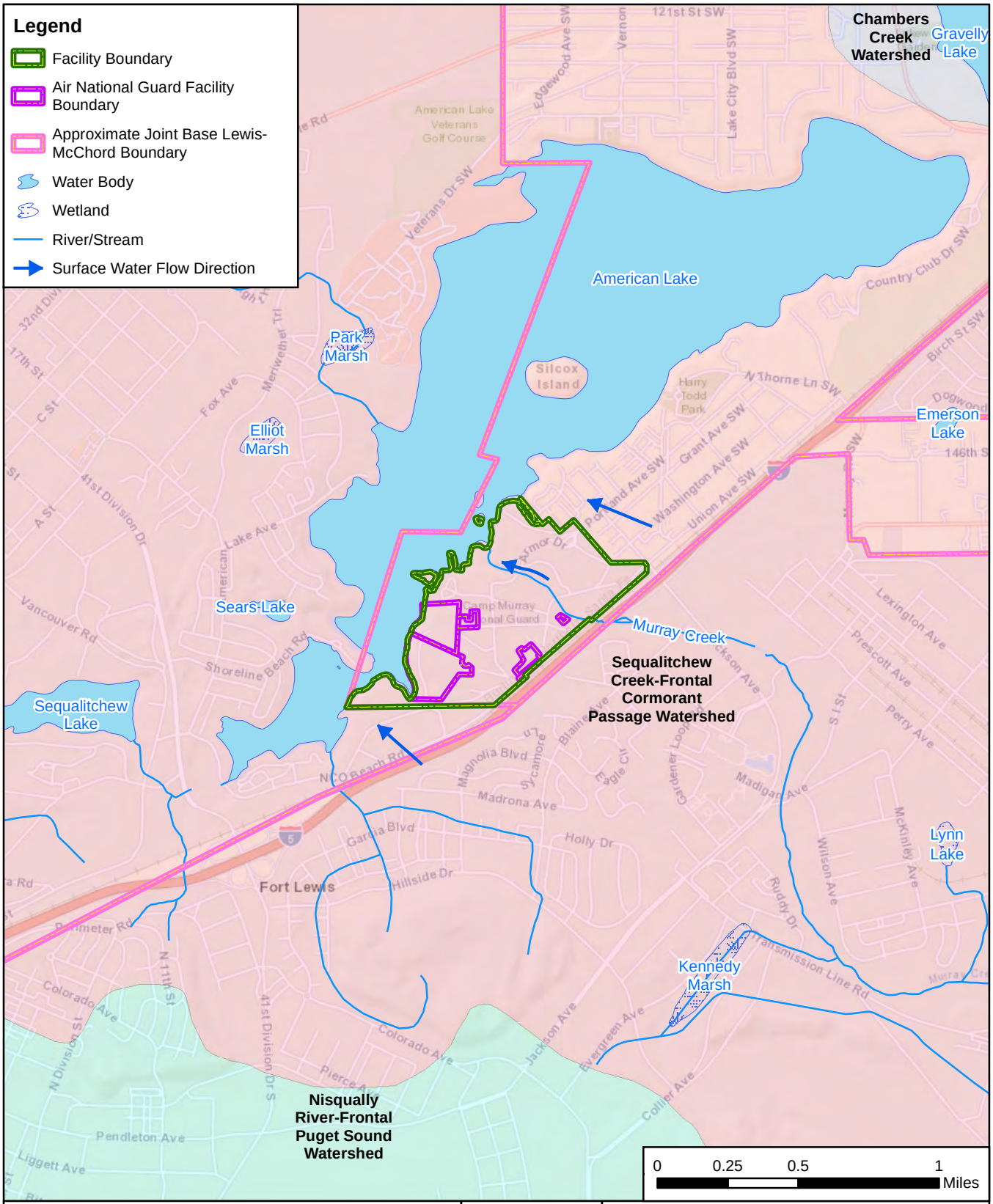
N

Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-2

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\WA\Camp_Murray_Figures\PA_Figures\Fig_1-2_Camp_Murray_Groundwater.mxd



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Murray, WA			
REVISED	9/16/2020	GIS BY	MS	9/16/2020
SCALE	1:31,680	CHK BY	MB	9/16/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	9/16/2020

N

Surface Water Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-3

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\WA\Camp_Murray_Figures\PA_Figures\Fig_1-3_Camp_Murray_Surface_Water.mxd

2. Fire Training Areas

No FTAs where PFAS were potentially released were identified at Camp Murray during the PA. Fire training is not performed at the installation (Valencia, 2018). Interview records are provided in **Appendix B**.

Firefighting support for structural fires at Camp Murray is coordinated with the local fire department, which generally involves the fire department from the nearby JBLM.

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**. One non-FTA was identified at Camp Murray during the PA. A description of the non-FTA is presented below, and the non-FTA is shown on **Figure 3-1.**

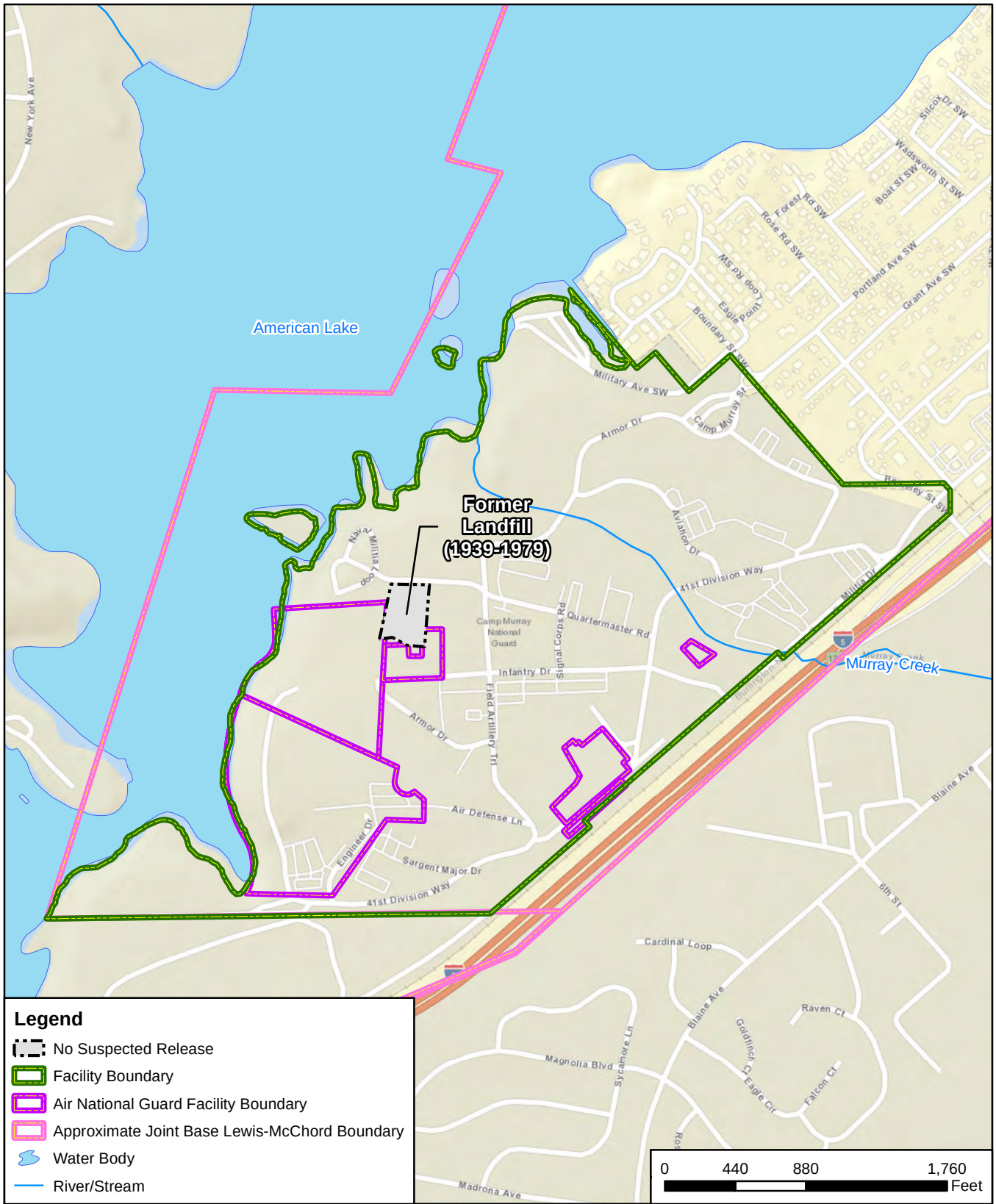
Fire extinguishers currently in-place at various buildings throughout the installation include ABC and Purple K. The dining facilities throughout the facility, which include the following buildings: Buildings 34, 46, 53, and 80 (in addition to Building 101 at the WAANG portion), are equipped with Purple K fire extinguishers. All other building spaces at the facility are equipped with ABC fire extinguishers.

3.1 Former Landfill

Periodically from 1939 to 1979, the WMD operated a landfill in the central-western portion of the facility, along Quartermaster Road east of the main operational area of the facility, less than 600 feet west of American Lake and the Camp Murray recreational vehicle (RV) campground (SCS Engineers, 2011). The geographic coordinates are: 47°7'2.75"N and 121°34'18.17"W. The landfill encompassed approximately 2 acres (SCS Engineers, 2011; Google Earth, 2018).

The landfill was used to dispose of solid wastes generated at the facility as well as non-military solid wastes generated from the nearby community at the time; some of the disposed materials were also burned. The landfill is managed under Ecology's Toxics program and is listed in Ecology's Confirmed and Suspected Contaminated Sites List (Site ID 10603) for solvent-contaminated groundwater at concentrations above state cleanup levels (EDR™, 2019b). Quarterly groundwater monitoring in the landfill area occurred in 2011 and 2012 under Ecology's Voluntary Agreement (SCS Engineers, 2011, 2012). Landfill activities appear visible in a historical 1968 aerial photograph (EDR™, 2019a). Photographs are included in **Appendix C.**

Landfills are not usually a primary potential release area of PFAS, but products disposed of in landfills formulated with PFAS may create a secondary source of contamination. Such products may include: sludge from a wastewater treatment plant that processes PFAS-laden wastewater, used AFFF storage containers, products associated with waterproofing uniforms or boots, or other commercial PFAS-containing products. Since the landfill was used during the period in which PFAS-containing materials were manufactured and used, there is the possibility that PFAS-containing materials were disposed/burned and PFAS subsequently leached into the soil and groundwater (Interstate Technology Regulatory Council [ITRC], 2017). However, based on interviews conducted with facility personnel and review of the 2011 and 2012 quarterly groundwater monitoring reports, no ARNG operations occurred at the facility that are expected to have generated PFAS from materials disposed of in the landfill. PFAS were not analyzed in the 2011 and 2012 quarterly groundwater monitoring events at the former landfill (SCS Engineers, 2011, 2012).



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Murray, WA			
REVISED	9/16/2020	GIS BY	MS	9/16/2020
SCALE	1:10,560	CHK BY	MB	9/16/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	9/16/2020

Non-Fire Training Area

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\WA\Camp_Murray_Figures\PA_Figures\Fig_3-1_Camp_Murray_Non-Fire_Training_Area.mxd

4. Emergency Response Areas

Based on interviews conducted with facility personnel, no emergency response actions using AFFF have occurred at Camp Murray or in the immediate vicinity (**Appendix B**). Firefighting support for structural fires at Camp Murray is coordinated with the local fire department, which generally involves the JBLM Fire Department.

5. Adjacent Sources

Adjacent sources of PFAS contamination were identified during the PA. Based on review of Pierce County, Ecology, and USEPA databases, no historic or currently active landfills, municipal wastewater treatment plants, electrical maintenance or chrome plating shops, or Superfund Sites are located in the vicinity of Camp Murray that would have a potential impact on Camp Murray, with exception for the information summarized in **Table 5-1**, as shown on **Figure 5-1** (Pierce County, 2020; USEPA, 2020b; EDR™, 2019b; Ecology, 2020b).

Table 5-1: Adjacent Sources

Area	Description	Findings
McChord AFB Airfield FTA	The USAF conducted fire training exercises along the eastern side of the airfield with AFFF through the 1990s (Lynn, 2017; Lakewood Water District [LWD], 2020). The type and concentration of AFFF used is not known. The start date of the training is not known; however, AFFF was first used commercially in the 1960s and the USAF began using it in 1970 (ITRC, 2017; USAF, 2017). The exact location of the FTA is not known. This area is located approximately 4.5 miles to the northeast and hydrologically cross-gradient of Camp Murray. Groundwater impacts of PFAS to this site are not likely to have impacted Camp Murray.	PFAS were detected in two onsite groundwater wells in 2017 (in *JBLM-McChord Field South and JBLM-McChord Field North*) that exceeded HAs (Lynn, 2017). Three wells in McChord Field were isolated from the system and one additional well (Golf Course Well #22) is the sole well on the water system that remained online after treatment (JBLM, 2019b). PFOS was detected in the *JBLM-McChord Field* water system in 2018 at concentrations exceeding HAs (JBLM, 2019a, 2019b). The USAF planned to perform a PA and/or SI in 2018; no information has been obtained as of the date of this report (Sullivan, 2018).
Lewis Main Gray Army Airfield FTA	The US Army conducted fire training exercises with AFFF through the 1990s (Lynn, 2017; LWD, 2020). The type and concentration of AFFF used is not known. The start date of the training is not known; however, AFFF was first used commercially in the 1960s and the USAF began using it in 1970 (ITRC, 2017; USAF, 2017). The exact location of the FTA is not known. This area is located approximately 2 miles to the south/southwest and hydrologically cross-gradient of Camp Murray. Although the *JBLM-Lewis Main* water system supplies drinking water to Camp Murray, the potential for this adjacent source to have impacted Camp Murray is low.	PFAS were detected in one onsite groundwater well in 2017 that exceeded HAs (Lynn, 2017). Well #17) was a seasonal groundwater well within the *JBLM-Lewis* water system that was taken off the supply system (JBLM, 2019b). The USAF planned to perform a PA and/or SI in 2018; no information has been obtained as of the date of this report (Sullivan, 2018).

Table 5-1: Adjacent Sources

Area	Description	Findings
Lakewood Water District	The Lakewood Water District reported PFAS constituents in its drinking water supply in 2017 at concentrations well below EPA's HAs (LWD, 2020). Water is supplied from groundwater wells in a shallow aquifer near JBLM.	PFAS constituents were linked to JBLM firefighting activities conducted for decades at McChord AFB airfield. See above.

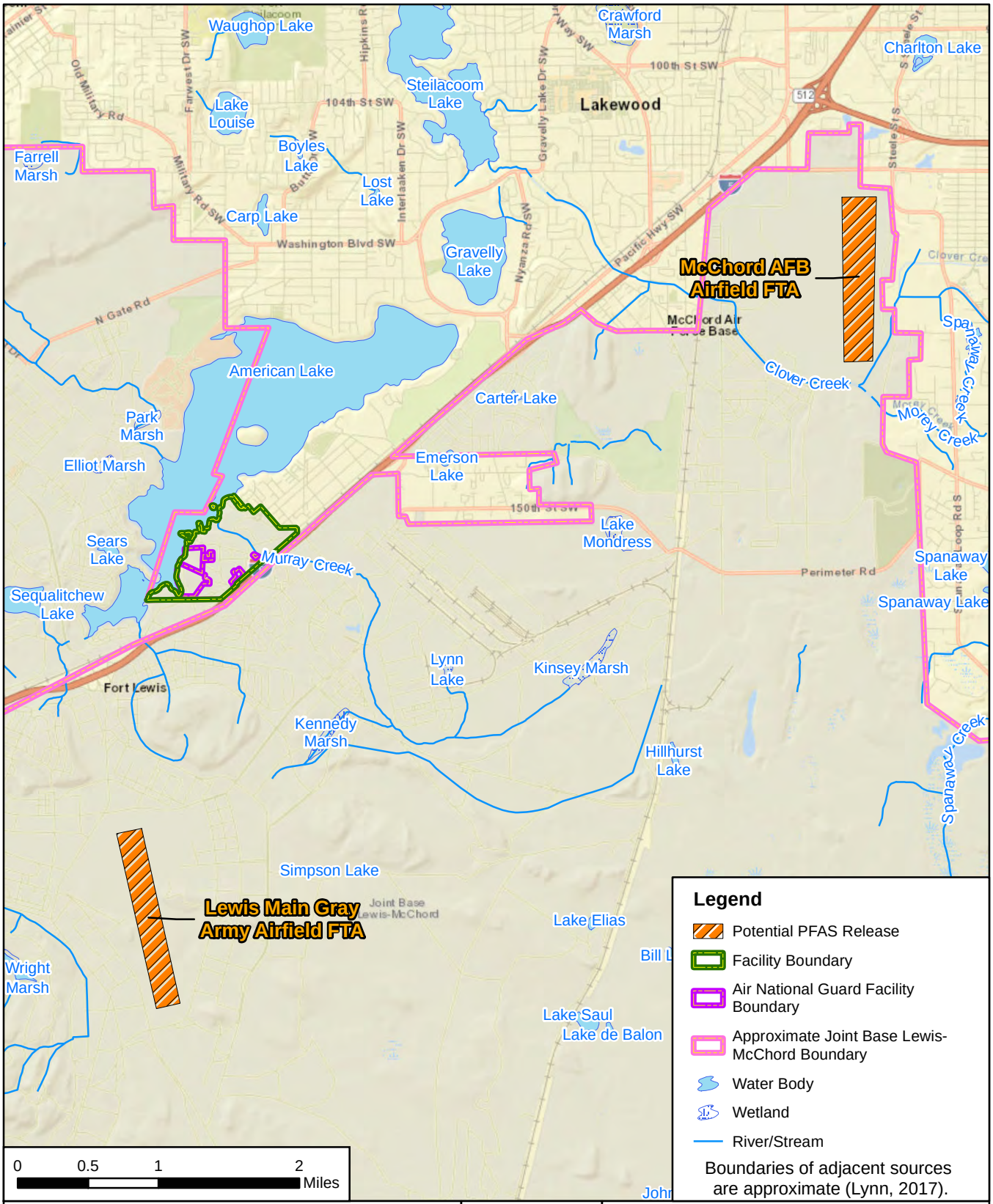
Groundwater monitoring for PFAS contamination is ongoing at JBLM (JBLM, 2019a, 2019b).

Several Superfund Sites are located within a 5-mile radius of Camp Murray for releases of various contaminants to soil and groundwater associated with historical activities, including three to the east and one to the north of the facility.

- JBLM
  - *Fort Lewis Logistics Center* since 1989 (EPA ID WA7210090067); *American Lake Gardens/McChord AFB* since 1984 (EPA ID WAD980833065); *McChord AFB Wash Rack/Treatment Areas* since 1987 (EPA ID WA8570024200). Historic activities resulting in onsite contamination at the JBLM Superfund Sites include waste disposal practices and releases of solvents (USEPA, 2020c, 2020d, 2020e).
- City of Lakewood
  - *Lakewood* since 1983 (EPA ID WAD050075662) (USEPA, 2020b). Historic activities resulting in onsite contamination at the Lakewood Superfund Site involves dry cleaning and releases of solvent (USEPA, 2020f).

Given the lack of documented PFAS-containing materials and PFAS-handling activities at these Superfund Sites, in addition to their regulatory status (based on past/ongoing cleanup activities with limited off-site contamination migration), these Superfund Sites are not a concern to Camp Murray (USEPA, 2020c, 2020d, 2020e, 2020f; USAF, 2010).

The USAF is currently conducting ongoing PFAS investigations at JBLM. As of the date of this report, investigation reports pertaining to the historical use of PFAS-containing materials and their exact locations of use at JBLM have not yet been obtained. The USAF and surrounding communities continue to monitor their water supply systems for PFAS contamination; data from the local water supplier are made publicly available.



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Murray, WA			
REVISED	9/16/2020	GIS BY	MS	9/16/2020
SCALE	1:63,360	CHK BY	MB	9/16/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	9/16/2020

Adjacent Sources

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\WA\Camp_Murray_Figures\PA_Figures\Fig_5-1_Camp_Murray_Adjacent_Sources.mxd

6. Preliminary Conceptual Site Model

Based on the PA findings from interviews with facility personnel, on-Post observations, and online research, no AOIs were identified at Camp Murray. A Conceptual Site Model (CSM) identifies three components necessary for potentially complete exposure pathways related to a site: (1) source, (2) pathway, and (3) receptor (**Appendix B.3**). If any of these elements are missing, the pathway is considered incomplete.

No PFAS sources (or exposure pathways) were identified to originate at Camp Murray or from PFAS-handling activities associated with the facility. As presented in **Section 3.1**, no ARNG operations occurred at the facility that are expected to have generated PFAS from materials disposed of in the landfill. As presented in **Section 5**, complete exposure pathways for PFAS in drinking water are attributed to off-site sources at JBLM that are not associated with Camp Murray.

7. Conclusions

This report presents a summary of available information gathered during the PA on the use and storage of AFFF and other PFAS-related activities at Camp Murray in Camp Murray, Washington. The PA findings are based on the information presented in **Appendices A** and **B**.

7.1 Findings

Based on information obtained during interviews conducted with facility personnel, on-Post observations, and reviewed documentation, no AOIs related to PFAS release(s) were identified at Camp Murray. While adjacent PFAS sources associated with JBLM FTAs were identified, evidence obtained during the PA does not support that current or former ARNG facility activities have contributed to PFAS contamination in soil, groundwater, surface water, or sediment for any receptor. A summary of PA findings is presented in **Figure 7-1**.

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. 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 was first used (1969 to present), and a reliance on personal recollection. 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.

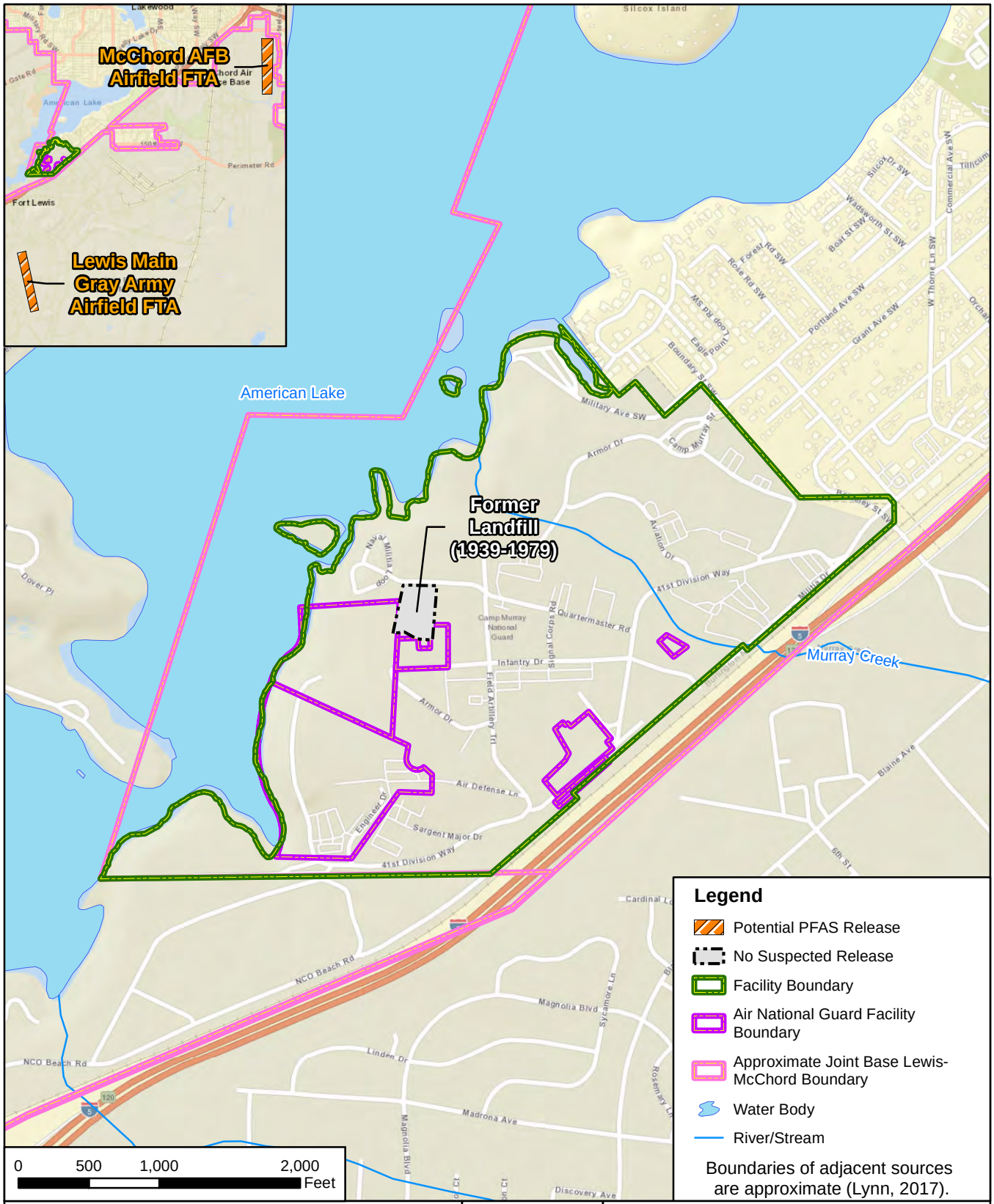
In order to minimize the level of uncertainty, readily available information regarding the use and storage of PFAS were reviewed, retired and current personnel were interviewed, multiple persons were interviewed for the same potential source area, and potential source areas were visually inspected. **Table 7-1** summarizes the uncertainties associated with the PA.

Table 7-1: Uncertainties

Area	Source of Uncertainty
Former Landfill	The WMD operated a landfill from 1939 to 1979, which also involved burning of the disposed materials. Limited uncertainty exists with regard to WMD's use of the landfill and the type of wastes disposed of.
JBLM – FTAs	JBLM has been in operation since 1917. AFFF was handled and released at several FTAs on-base from at least the mid-1960s to the 1990s. Limited uncertainty exists with regard to the exact location of the FTAs, the quantity and concentration of AFFF used, and frequency of AFFF release events. The USAF planned to perform a PA and/or SI in 2018; no information has been obtained as of the date of this report (Sullivan, 2018).

7.3 Potential Future Actions

Based on the documented absence of the WAARNG's storage, use or release of PFAS-containing materials at Camp Murray since WAARNG began operations at this facility in 1928, no AOIs were identified during the PA. Evidence does not indicate that current or former ARNG activities contributed PFAS contamination to soil, groundwater, surface water, or sediment at the facility or adjacent areas. Camp Murray will not move forward in the CERCLA process.



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Murray, WA			
REVISED	9/16/2020	GIS BY	MS	9/16/2020
SCALE	1:12,000	CHK BY	MB	9/16/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	9/16/2020

Summary of Findings

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 7-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\WA\Camp_Murray_Figures\PA_Figures\Fig_7-1_Camp_Murray_Summary.mxd

8. References

AECOM, 3 Square Blocks, and Transpo Group (AECOM, et al). 2015. *Joint Base Lewis-McChord (JBLM) Joint Land Use Study (JLUS) Land Use Compatibility Analysis Final*. October. 86 pp. Available at https://cms.cityoftacoma.org/Planning/JLUS%20APZ%20Overlay/JBLM%20JLUS%20Land%20Use%20Compatibility%20Analysis%20-%20final.pdf. Accessed July 2, 2020.

United States Army (Army). 2020a. Joint Base Lewis-McChord History. Available at https://home.army.mil/lewis-mcchord/index.php/about/history -:~:text=In%201938%2C%20the%20addition%20of,an%20aviation%20accident%20in%201937. Accessed July 2.

Army. 2020b. Joint Base Lewis-McChord Mission and Vision. Available at https://home.army.mil/lewis-mcchord/index.php/about/mission. Accessed July 2.

Earth Point (EP). 2019. Topo Maps – USGS Topographic Maps on Google Earth. Available at http://www.earthpoint.us/TopoMap.aspx.

Environmental Data Resources (EDR™). 2019a. EDR™ Aerial Photo Decade Package. Camp Murray Armory, 15508 Portland Ave SW, Camp Murray, WA 98430. Inquiry Number 5872021.12. November 18.

EDR™. 2010b. EDR™ Radius Map with Geocheck. Camp Murray Armory, 15508 Portland Ave SW, Camp Murray, WA 98430. Inquiry Number 5872021.9s. November 15.

Federal Emergency Management Agency (FEMA). 2019. FEMA Flood Map Service Center. Flood map number 53053C0530E, effective 3/7/2017. Available at https://msc.fema.gov/portal/home. Accessed February.

Google Earth. 2018. Google Earth Pro. Version 7.3.2.5495 (October 31). Available at https://www.Google.com/earth/.

Interstate Technology Regulatory Council (ITRC). 2017. *History and Use of Per-and Polyfluoroalkyl Substances (PFAS)*. November 13.

Joint Base Lewis-McChord (JBLM). 2020. JBLM Map. Available at https://jblm.armymwr.com/promos/jblm-map. Accessed July 2.

JBLM. 2019a. *2018 Water Quality Report, JBLM-Lewis (Main/North), Public Water System 26050*. July 1. 8 pp.

JBLM. 2019b. *2018 Water Quality Report, JBLM-McChord Field, Public Water System 52200*. July 1. 8 pp.

Lakewood Water District (LWD). 2020. Pumping and Water Treatment, Update on Water Sampling at JBLM and LWD. Available at https://www.lakewoodwater.org/pwt/page/update-water-sampling-jblm-and-lwd. Accessed January 22.

Leidos. 2017. *Submittal of Final No Further Response Action Planned Decision Document for Building 102 Oil/Water Separator (OW005) and Former Vehicle Wash Area/Catch Basin (RW003) at the Washington Air National Guard, 194th Wing, Camp Murray, Washington*. February 7. 48 pp.

Lynn, Adam. 2017. *JBLM Wells Shut After Unacceptable Levels of Chemicals Found in Water*. The News Tribune. March 3. Available at https://www.military.com/daily-news/2017/03/03/jblm-wells-shut-unacceptable-levels-chemicals-found-water.html. Accessed June 8, 2020.

National Guard Bureau (NGB). 2013. *Compliance Restoration Program – Western Region 1 Revised Final Site Investigation Report*, 194th Regional Support Wing, Washington Air

National Guard, Camp Murray Air National Guard Station, Tacoma, Washington. July. 948 pp.

National Oceanic Atmospheric Administration (NOAA). 2020. National Centers for Environmental Information (NCEI) GIS Map Portal. Climate Data Online, Daily Summaries Station Details, Record of Climatological Observations (Monthly), Station Tacoma Number 1, WA US, Station ID USC00458278. Available at https://www.ncdc.noaa.gov/cdo-web/. Accessed June 9.

Pierce County. 2019. *Comprehensive Plan*. August 1. Available at https://www.co.pierce.wa.us/950/Comprehensive-Plan. Accessed June 10, 2020.

Pierce County. 2020. Public GIS. Available at https://matterhornwab.co.pierce.wa.us/publicgis/. Accessed January 21.

Robinson Noble, Inc (Robinson Noble). 2014. *Washington State Military Department Combined Support Maintenance Shop (CSMS), Camp Murray, Washington (VCP ID# SW1252), Supplemental Remedial Investigation #1*. June. 299 pp.

SCS Engineers. 2011. *February 2011 Quarterly Groundwater Monitoring Report, Camp Murray Former Landfill, Camp Murray, Washington*. March 9. 64 pp.

SCS Engineers. 2012. *February 2012 Quarterly Groundwater Monitoring Report, Camp Murray Former Landfill, Camp Murray, Washington*. March 2. 67 pp

Sullivan, Maureen. 2018. Addressing Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA). March. Available at https://partner-mco-archive.s3.amazonaws.com/client_files/1524589484.pdf. Accessed November 2019.

United States Air Force (USAF). 2010. *Final Third Five-Year Review Report for Area D/American Lake Garden Tract, Joint Base Lewis McChord – McChord Field, Washington*. 59 pp.

USAF. 2017. Air Force Response to PFOS/PFOA Fact Sheet. Available at https://www.afcec.af.mil/Portals/17/documents/Environment/PFOS-PFOA_Fact_Sheet.pdf. Accessed December 2019.

United States Census (Census). 2020. QuickFacts Pierce County, Washington. Available at https://www.census.gov/quickfacts/piercecountywashington. Accessed June 10.

United States Department of Agriculture (USDA). 1979. *Soil Survey of Pierce County Area, Washington*. Available at https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/washington/WA653/0/wa653_text.pdf. 78 pp.

USDA. 2020. Natural Resources Conservation Service, Web Soil Survey. Available at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed June 9

United States Department of Interior (USDOI). 2019. National Park Service, Geologic Resources Division. Physiographic Provinces. Available at https://www.nps.gov/subjects/geology/physiographic-provinces.htm. Accessed December 4.

United States Environmental Protection Agency (USEPA). 1991. *Guidance for Performing Preliminary Assessments under CERCLA.* Publication No. EPA/540/G-91/013. September. 293 pp.

USEPA. 2016. *Fact Sheet PFOA & PFAS Drinking Water Health Advisories.* Publication No. EPA 800-F-16-003. November. 5 pp.

USEPA. 2017. Data Summary of the Third Unregulated Contaminant Monitoring Rule (UCMR3). Available at https://www.epa.gov/dwucmr/data-summary-third-unregulated-contaminant-monitoring-rule. Reference 815-S-17-001. January 2017. Accessed November 12, 2019.

USEPA. 2020a. Viewing WATERS data using Google Earth, WATERSKMZ Tool, version 1.10. Updated January 19 Available at https://www.epa.gov/waterdata/viewing-waters-data-using-Google-earth.

USEPA. 2020b. *National Priorities List and Superfund Alternative Approach Sites.* Available at https://www.epa.gov/superfund/search-superfund-sites-where-you-live. Accessed June 10.

USEPA. 2020c. NPL Site Narrative for McChord Air Force Base (Wash Rack/Treatment Area). Available at https://semspub.epa.gov/work/10/501000157.pdf. Accessed June 10.

USEPA. 2020d. NPL Site Narrative for American Lake Gardens/McChord AFB. Available at http https://semspub.epa.gov/work/10/501000147.pdf. Accessed June 10.

USEPA. 2020e. NPL Site Narrative for Fort Lewis Logistics Center Available at https://semspub.epa.gov/work/10/501000188.pdf. Accessed June 10.

USEPA. 2020f. NPL Site Narrative for Lakewood. Available at https://semspub.epa.gov/work/10/501000244.pdf. Accessed June 10.

United States Fish and Wildlife Service (USFWS). 2018. National Wetlands Inventory Wetlands Inventory. View Wetlands Data with a KML File. Available at https://www.fws.gov/wetlands/data/google-earth.html. Last modified February 27. Accessed December 30, 2019.

United States Geological Survey (USGS). 1994. Ground Water Atlas of the United States: Idaho, Oregon, Washington, HA 730-H, Unconsolidated-Deposit Aquifers. Available at https://pubs.usgs.gov/ha/ha730/ch_h/. Accessed January 6, 2020.

USGS. 2010. *Hydrogeologic Framework, Groundwater Movement, and Water Budget in the Chambers-Clover Creek Watershed and Vicinity, Pierce County, Washington*. Scientific Instigations Report 2010-5055. 58 pp.

USGS. 2019. Washington Geologic Map Data. Available at https://mrdata.usgs.gov/geology/state/state.php?state=WA. Accessed December 4.

University of Washington (UW). 2018. Water Resource Inventory Areas in Puget Sound. Encyclopedia of Puget Sound. Available at https://www.eopugetsound.org/articles/water-resource-inventory-areas-puget-sound. Accessed January 22, 2020.

Valencia, Rowena. 2018. *Integrated Cultural Resources Management Plan Update for Sites and Training Installations of the Washington Army National Guard, Fiscal Years 2014-2018.* Washington Military Department, Camp Murray, WA. 218 p.

Washington Department of Ecology (Ecology). 2020a. Washington State Well Report Viewer. Available at https://fortress.wa.gov/ecy/wellconstruction/map/WCLSWebMap/WellConstructionMapSearch.aspx. Accessed January 10.

Washington Department of Ecology (Ecology). 2020b. What's in My Neighborhood. Available at https://apps.ecology.wa.gov/neighborhood/. Accessed June 10.

Washington State Department of Health (WDOH). 2020a. Office of Drinking Water, Source Water Assessment Program (SWAP) Mapping Application. Available at https://fortress.wa.gov/doh/swap/index.html. Accessed January 22.

WDOH. 2020b. Division of Environmental Health, Office of Drinking Water. Sentry Internet Database (Find Water System). Available at

https://fortress.wa.gov/doh/eh/portal/odw/si/FindWaterSystem.aspx. Accessed January 22.

WDOH. 2020c. Office of Drinking Water, Source Water Assessment Program (SWAP) Mapping Application. Available at https://fortress.wa.gov/doh/swap/index.html. Accessed January 13.

WDOH. 2019a. PFAS. Available at https://www.doh.wa.gov/CommunityandEnvironment/Contaminants/PFAS. Accessed November 15.

WDOH. 2019b. Office of Drinking Water Group A Public Water Supplies PFAS Chapter 246-290 WAC, Rulemaking Timeline. July. Available at https://www.doh.wa.gov/Portals/1/Documents/4200/PFAS%20Timeline%20for%20July%202019.pdf. Accessed November 27

Washington Military Department (WMD). 2017. *New Readiness Center Showcases Guard History and Future.* March 30. Available at https://mil.wa.gov/news/new-readiness-center-showcases-guard-history-and-future. Accessed June 10, 2020.

WMD. 2019a. *Stormwater Management Program Plan 2019 Update*. Available at https://mil.wa.gov/asset/5c95327f82e8d. Accessed June 10, 2020.

WMD. 2019b. Camp Murray Campus Map. IT Division, CFMO GIS Section. August 9.

Appendix A
Data Resources

Data Resources will be provided separately on CD. Data Resources for Camp Murray include:

Camp Murray Installation Maps

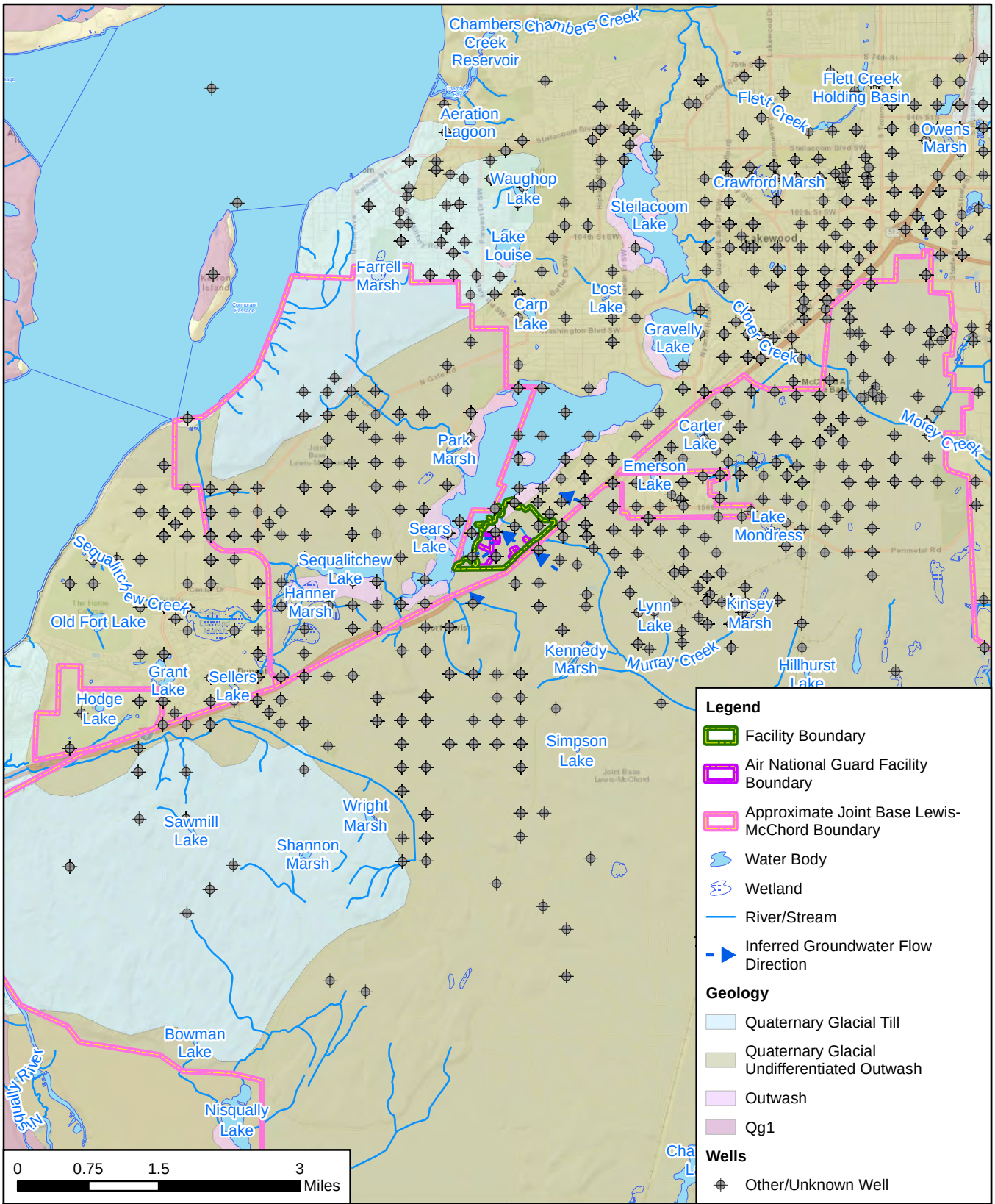
- 2019, Camp Murray Installation Map, August 9th, 2019

Environmental Data Resources, Inc.™ Report

- 2019 Camp Murray EDR™ Report

Previous Investigations Completed at Camp Murray

- 2011, SCS Engineers. *February 2011 Quarterly Groundwater Monitoring Report, Camp Murray Former Landfill, Camp Murray, Washington*. March 9. 64 pp.
- 2012, SCS Engineers. *February 2012 Quarterly Groundwater Monitoring Report, Camp Murray Former Landfill, Camp Murray, Washington*. March 2. 67 pp.
- 2013, National Guard Bureau (NGB). *Compliance Restoration Program – Western Region 1 Revised Final Site Investigation Report*, 194th Regional Support Wing, Washington Air National Guard, Camp Murray Air National Guard Station, Tacoma, Washington. July. 948 pp.
- 2014, Robinson Noble, Inc (Robinson Noble). *Washington State Military Department Combined Support Maintenance Shop (CSMS), Camp Murray, Washington (VCP ID# SW1252), Supplemental Remedial Investigation #1*. June. 299 pp.
- 2017, Leidos. *Submittal of Final No Further Response Action Planned Decision Document for Building 102 Oil/Water Separator (OW005) and Former Vehicle Wash Area/Catch Basin (RW003) at the Washington Air National Guard, 194th Wing, Camp Murray, Washington*. February 7. 48 pp.
- 2018 *Integrated Cultural Resources Management Plan Update for Sites and Training Installations of the Washington Army National Guard, Fiscal Years 2014-2018*



CLIENT	ARNG			
NOTES	Preliminary Assessment for PFAS at Camp Murray, WA			
REVISED	9/16/2020	GIS BY	MS	9/16/2020
SCALE	1:95,040	CHK BY	MB	9/16/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	9/16/2020

State Database Wells

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure A-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\WA\Camp_Murray_Figures\PA_Figures\Fig_A-1_Camp_Murray_State_Well_Database.mxd

Appendix B
Preliminary Assessment Documentation

Appendix B.1
Interview Records

PA Interview Questionnaire - Environmental Manager

Facility: Camp Murray (Tacoma, WA)
Interviewer: [redacted]
Date/Time: 10/31/2019

Interviewee: [redacted] **Title:** Environmental Program Supervisor **Phone Number:** [redacted] **Email:** [redacted]	Can your name/role be used in the PA Report? Y or N Can you recommend anyone we can interview? Y or N

1. **Roles or activities with the Facility/years working at the Facility.**

Acting supervisor of the Environmental Program at the Washington Military Department, since beginning of October 2019

2. **Where can I find previous facility ownership information?**

Not aware of documents available pertaining to environmental for the facility. There could be documents regarding the landfill and groundwater monitoring. Discussions with onsite facility personnel are best.

3. **What can you tell us about the history of PFAS including aqueous film forming foam (AFFF) at the Facility? Was it used for any of the following activities, circle all that apply and indicate years of active use, if known? Identify these locations on a facility map.**

Maintenance
Fire Training Areas
Firefighting (Active Fire)
Crash
Fire Suppression Systems (Hangers/Dining Facilities)
Fire Protection at Fueling Stations
Non-Technical/Recreational/ Pest Management
Metals Plating Facility
Waterproofing Uniforms (Laundry Facilities)
Other

Not aware of past AFFF uses onsite. Not aware of any currently – definitely no fire training onsite. None of these listed activities were historically or are currently onsite, with exception for minor maintenance.

4. Fill out CSM Information worksheet with the Environmental Manager.

5. **Are any current buildings constructed with AFFF dispensing systems or fire suppression systems? What are the AFFF/suppression system test requirements? What is the frequency of testing the AFFF/suppression system? Do you have "As Built" drawings for the buildings?**

Not aware of AFFF dispensing systems/fire suppression systems in buildings onsite.
No As-built drawings available.

6. **Are fire suppression systems currently charged with AFFF or have they been retrofitted for use of high expansion foam? If retrofitted, when was that done?**

Not aware if fire suppression systems are present, and if currently charged with AFFF.

7. **How is AFFF procured? Do you have an inventory/procurement system that tracks use?**

Unaware – recommend interviewing USPFO manager (Major [redacted]).

8. **What type of AFFF has been/is being used (3%, 6%, Mil Spec Mil-F-24385, High Expansion)? Manufacturer (3M, Dupont, Ansul, National Foam, Angus, Chemguard, Buckeye, Fire Service Plus)?**

Unaware – recommend interviewing USPFO manager (Major [redacted]).

9. **Where is the AFFF stored? How is it stored (tanks, 55-gallon drums, 5-gallon buckets)? What size are the storage tanks? Is the AFFF stored as a mixed solution (3% or 6%) or concentrated material?**

Unaware – recommend interviewing USPFO manager (Major [redacted]).

10. **How many FTAs are/were on this facility and where are they? Locate on a map. How many FTAs are active and inactive? For inactive FTAs, when was the last time that fire training using AFFF was conducted at them?**

No fire training onsite.

11. **When a release of AFFF occurs during a fire training exercise, now and in the past, how is the AFFF cleaned and disposed of? Were retention ponds built to store discharged AFFF? Was the AFFF trickled to the sanitary sewer or left in the pond to infiltrate?**

Not applicable – no fire training, no retention ponds onsite.

12. **Can you recall specific times when city, county, and/or state personnel came on-post for training? If so, please state which state/county agency or military entity? Do you have any records, including photographs to share with us?**

Not aware.

13. **Did military routinely or occasionally fire train off-post? List the units that you can recall used/trained at various areas.**

Not aware.

14. **Did individual units come with their own safety personnel, did they also bring their own AFFF? Was training with AFFF part of these exercises? How were emergencies handled under these circumstances?**

Not aware.

15. **Are there specific emergency response incident reports (i.e., aircraft or vehicle crash sites and fires)? If so, may we please copy these reports? Who (entity) was the responder?**

Not aware. No aircraft onsite.

16. **Do you have records of fuel spill logs? Was it common practice to wash away fuel spills with AFFF? Is/was AFFF used as a precaution in response to fuel releases or emergency runway landings to prevent fires?**

No fuel spill logs.
Not aware regarding AFFF use.

17. **Was AFFF used for forest fires or fire management on-post/off-post? If so, please describe what happened and who was involved?**

Not aware.

18. **Are there mutual aid/use agreements between county, city, and local fire department? Please list, even if informal. If formalized, may we have a copy of the agreement?**

Agreement between JBLM Fire and local fire departments – when there is a fire, call 911 and it is routed to JBLM for immediate help.

19. **Can you provide any other locations where AFFF has been stored, released, or used (i.e. hangars, buildings, fire stations, firefighting equipment testing and maintenance areas, emergency response sites, storm water/surface water, waste treatment plants, and AFFF ponds)?**

Not aware.

20. **Are you aware of any other creative uses of AFFF? If so, how was AFFF used? What entities were involved?**

Not aware.

21. **Are there past studies you are aware of with environmental information on plants/animals/ groundwater/soil types, etc., such as Integrated Cultural Resources Management Plans or Integrated Natural Resources Management Plans?**

There is an *Integrated Cultural Resources Management Plan* available for the entire state.

22. **What other records might be helpful to us (environmental compliance, investigation records, admin record) and where can we find them?**

Currently not familiar with other environmental reports available for the site.

23. **Do you have or did you have a chrome plating shop on base? What were/are the years of operation of that chrome plating shop?**

Not aware.

24. **Do you know whether the shop has/had a foam blanket mist suppression system or used a fume hood for emissions control? If foam blanket mist suppression was used, where was the foam stored, mixed, applied, etc.?**

N/A

25. **How is off-spec AFFF disposed (used for training, turned in, or given to a local Fire Station)? If applicable, do you know the name of the vendor that removes off-spec AFFF? Do you have copies of the manifest or B/L?**

Unaware – recommend interviewing USPFO manager (Major [redacted]).

26. **Do you recommend anyone else we can interview? If so, do you have contact information for them?**

[redacted] – Installation Status Reporter (4 years)
Chief [redacted] – USPFO Warehouse Manager (5 years)
[redacted] – Facilities Service Coordinator (4 months)
[redacted] – WA Air National Guard Environmental Engineer (August 2018)
[redacted] – Staff Architect (~30 years)
Chief [redacted] – Maintenance Officer (at Building 26)

PA Interview Questionnaire - Other

Facility: Camp Murray (Tacoma, WA)
Interviewer: [redacted]
Date/Time: 10/31/19

Interviewee: [redacted] **Title:** Air National Guard Environmental Engineer (WA) **Phone Number:** see below **Email:** connect through [redacted] ([redacted])	Can your name/role be used in the PA Report? Y or N Can you recommend anyone we can interview? Y or N _____

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

Environmental Engineer for the WA Air National Guard at Camp Murray since 2018.

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?

No AFFF use/storage and no fire training at the Air National Guard property at Camp Murray. There are no aircraft, hangars, or flight line at the WA Air National Guard property at Camp Murray.

Buildings at the Air National Guard property have standard Purple K and/or ABC fire extinguishers.

A wash rack is located near the entrance of the Air National Guard property (at the south/central area of Camp Murray) that was used in the past for washing vehicles but that has been discontinued since a few months. All washing of vehicles occurs at JBLM to the east.

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

PA Interview Questionnaire - Other

Facility: Camp Murray (Tacoma, WA)
Interviewer: [redacted]
Date/Time: 10/31/19

Interviewee: Chief [redacted] **Title:** USPFO Warehouse Manager **Phone Number:** see below **Email:** connect through [redacted]	Can your name/role be used in the PA Report? Y or N Can you recommend anyone we can interview? Y or N _____

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

Manager of the USPFO Warehouse at Camp Murray since 2014.

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?

No AFFF storage at the warehouse (not historically or currently).

The warehouse serves as the central collection point for hazardous waste and other materials for use throughout the installation. Materials/products are ordered through the USPFO.

No fire suppression systems in the warehouse building. Standard ABC fire extinguishers are located throughout the warehouse building.

No knowledge of AFFF use currently.

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

PA Interview Questionnaire - Other

Facility: Camp Murray (Tacoma, WA)
Interviewer: [redacted]
Date/Time: 10/31/19

Interviewee: [redacted] **Title:** Staff Architect **Phone Number:** see below **Email:** connect through [redacted] ([redacted])	Can your name/role be used in the PA Report? Y or N Can you recommend anyone we can interview? Y or N _____

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

Construction Program Manager (i.e., Staff Architect) since approximately 30 years.

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?

No AFFF use/storage/handling at the installation.

No fire suppression systems in any of the buildings at the installation. Purple K and ABC fire extinguishers are located throughout the buildings. Purple K extinguishers are located specifically in the kitchens of the dining facilities (Buildings 53, 46, 80, 34, 101 [WA Air National Guard]).

A wash rack is located near the WA Air National Guard Property, not currently used for washing vehicles anymore (actively used approx. 1990-2000). All vehicles are now washed at JBLM to the east. The wash rack wastewater discharged in the vegetated land separating the WA Air National Guard property and the main Camp Murray army installation (between Buildings 104 [Air] and 6 [Army]).

A landfill was historically used onsite from 1939-1979. Disposal of general trash from the installation and general public (neighborhoods surrounding the installation). Unknown if fire extinguishers were disposed of. Material was also burned at the landfill.

Some maintenance activities onsite – Building Pierce Readiness Center (Bldg 80), Building 5, WA Air National Guard. Vehicle maintenance onsite ~55-60 years, demolished building in 2013. All major maintenance conducted at JBLM.

Historic septic system on the installation; no longer present.

Historic fuel pumps on the installation (approx. 1954-2013) on south side of current Building 84; no longer present.

An oil water separator is located on the south side of the Pierce County Readiness Center (Building 80).

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

PA Interview Questionnaire - Other

Facility: Camp Murray (Tacoma, WA)
Interviewer: [redacted]
Date/Time: 10/31/19

Interviewee: [redacted] **Title:** Facilities Service Coordinator **Phone Number:** see below **Email:** connect through [redacted]	Can your name/role be used in the PA Report? Y or N Can you recommend anyone we can interview? Y or N _____

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

Facilities Service Coordinator at Camp Murray since approx. four months. Manages and coordinates servicing/replacement of fire extinguishers.

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?

No AFFF use/storage at the installation. No fire extinguishers with PFAS-containing AFFF.

No fire suppression systems in any of the buildings at the installation. Purple K and ABC fire extinguishers are located throughout the buildings, in addition to CO2 in the battery room. Purple K extinguishers are located specifically in the kitchens of the dining facilities (Buildings 53, 46, 80, 34, 101 [WA Air National Guard]).

The only fire suppression system of the WA Guard is at the Air Guard Hangar (AASF #1) at JBLM to the east (Ansulite C6 3%). JBLM maintains/manages chemicals/fire suppression system at JBLM.

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: 10/31/2019

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

Source/Release Information

Site Name / Area Name / Unique ID: Camp Murray (Tacoma, WA)

Site / Area Acreage: 205

Historic Site Use (Brief Description): Camp Murray army installation. Headquarters of the WA National Guard and Emergency Management Division. Active operations include administrative, logistics, and classroom training. WA Air National Guard onsite, active in administrative/engineering training.

Current Site Use (Brief Description): Same as above.

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

Site is located in a commercial/residential area of Tacoma, WA, adjacent to the west of I-5. Onsite, there is a campground used by the public and army personnel. Offsite, there is: JBLM (joint air force base/army installation – located to the east and northwest), a medical center (at JBLM to the east), residential (north, south, east), elementary school (south, west [west of American Lake], and northeast), American Lake (adjacent west/north), golf course (northeast).

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

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

There is a fligh line to the east used by the USAF, at Joint Base Lewis McChord.

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:

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

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

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

Transport / Pathway Information

Migration Potential:

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

1a. If so, note observation and location:

The topography of the site various throughout. The site is bordered by American Lake to the west/north, residential properties to the north, undeveloped land to the southwest, and I-5 to the west.

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:

Yes, several groundwater monitoring wells are located onsite at the former landfill (in the western portion).

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.

Possibly from NOAA.

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

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

At Joint Base Lewis McChord to the east (east of I-5) - at the Air Force property. Historical use of AFFF - fire training, fire suppression systems, etc. Documented PFAS contamination in groundwater.

6b. Will off-site reconnaissance be conducted? **(Y) / N** Currenlty being conducted by USAF.

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):

Development over time of buildings.

2. Is the site/area vegetated? **Y / N**

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

Vegetated areas and paved areas throughout the installation.

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

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

No areas in particular observed.

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:

No areas in particular observed - weather was dry during site visit.

Receptor Information

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

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

There's a guard at the main gate.

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:

Immediately adjacent to the north/northeast (along the north/northeast boundary).

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

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

To the northeast, east (at JBLM), and northwest (across American Lake)

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

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

To the east across I-5 on JBLM associated with Murray Creek, which flows through the installation and discharges into American Lake to the west.

Visual Survey Inspection Log

Additional Notes

Photographic Log

Photo ID/Name	Date & Location	Photograph Description

Appendix B.3
Conceptual Site Model Information

Preliminary Assessment – Conceptual Site Model Information

Site Name: Camp Murray (Camp Murray/Tacoma, WA) – 10/31/2019

Why has this location been identified as a site?

Potential historical use/storage of AFFF

Are there any other activities nearby that could also impact this location?

Joint Base Lewis McChord (JBLM) is located to the east and south (east/south of I-5) with known PFAS contamination in groundwater from historical AFFF use/release (USAF is currently investigating).

Training Events

Have any training events with AFFF occurred at this site? No

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?

Direct pathways exist to American Lake to the northwest

Surface Water:

Surface water flow direction? Varies depending on location

Average rainfall? 45 inches annually

Any flooding during rainy season? Not documented to have historically occurred

Direct or indirect pathway to ditches? Yes

Direct or indirect pathway to larger bodies of water? Yes – American Lake located adjacent to the west/northwest of site

Does surface water pond any place on site? Potentially in vegetated areas

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 – no flight line present

Preliminary Assessment – Conceptual Site Model Information

Groundwater:

Groundwater flow direction? Northwest

Depth to groundwater? 10 to 40 feet bgs

Uses (agricultural, drinking water, irrigation)? None

Any groundwater treatment systems? No

Any groundwater monitoring well locations near the site? Yes, at the former landfill in the western area of the site (outside entrance to the campground)

Is groundwater used for drinking water? No

Are there drinking water supply wells on installation? no

Do they serve off-post populations? No

Are there off-post drinking water wells downgradient No

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 conducted at the site (no fire station/fire equipment at the site)

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?

n/a

Preliminary Assessment – Conceptual Site Model Information

Identify Potential Receptors:

Site Worker yes

Construction Worker yes

Recreational User yes

Residential yes

Child yes

Ecological yes

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

Site is located in a commercial/residential area of Tacoma, WA, adjacent to the west of I-5. Onsite, there is a campground used by the public and army personnel. Offsite, there is: JBLM (joint air force base/army installation – located to the east and northwest), a medical center (at JBLM to the east), residential (north, south, east), elementary school (south, west [west of American Lake], and northeast), American Lake (adjacent west/north), golf course (northeast).

Documentation

Ask for Engineering drawings (if applicable).

Has there been a reconstruction or changes to the drainage system? When did that occur? Not known

Appendix C
Photographic Log

APPENDIX C – Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Camp Murray	Camp Murray, Washington

Photograph No. 1

Description:

View looking west at the former landfill, from the intersection of Armor Dr. and 41st Division Road, in the central-western portion of the installation. Photo taken east of the entrance to the Camp Murray Campground adjacent to American Lake (to the right, not in picture).

Photograph No. 2

Description:

View looking east at a groundwater monitoring well (surrounding by yellow bollards) within the former landfill, in the central-western portion of the installation.

APPENDIX C – Photographic Log

Army National Guard, Preliminary Assessment for PFAS	Camp Murray	Camp Murray, Washington

Photograph No. 3

Description:

View of the northeast corner of the former landfill, in the central-western portion of the installation. A groundwater monitoring well is visible in the vegetation, in the center-right (yellow piping).