Naval Facilities Engineering Systems Command Northwest
Silverdale, Washington

Final

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS)

Manchester Fuel Depot
Kitsap County, Washington

May 2021

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Acronyms and Abbreviations

AST	aboveground storage tanks
AFFF	aqueous film forming foam
bgs	below ground surface
CH2M	CH2M HILL, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DASN	Deputy Assistant Secretary of the Navy
DoD	Department of Defense
DOE	Washington State Department of Ecology
DOH	Department of Health
ESA	Environmental Site Assessment
ESV	ecological screening value
FTA	firefighter training area
FY	fiscal year
GIS	geographic information system
MFD	Fleet Logistics Center Puget Sound Manchester Fuel Depot
MWD	Manchester Water District
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NBK	Naval Base Kitsap
NIRIS	Naval Installation Restoration Information Solution
NOAA	National Oceanic and Atmospheric Administration
OEL	Other Environmental Liabilities
OWTP	Oily Waste Treatment Plant
OWS	Oil/Water Separator
PA	Preliminary Assessment
PCB	polychlorinated biphenyl
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonate
PFHxS	perfluorohexane sulfonate
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
ppt	parts per trillion
PWS	public water system
RfD	reference dose
RI	Remedial Investigation
RPM	Remedial Project Manager
SI	Site Inspection
UCMR3	third Unregulated Contaminant Monitoring Rule
UCMR4	fourth Unregulated Contaminant Monitoring Rule
USEPA	United States Environmental Protection Agency
UST	underground storage tanks

VSI	visual site inspection
VWR	vehicle wash rack

SECTION 1

Introduction

This Preliminary Assessment (PA) report discusses potential sources of per- and polyfluoroalkyl substances (PFAS) at Manchester Fuel Depot (MFD), a current Department of the Navy (Navy) property associated with the Fleet Logistics Center Puget Sound (**Figure 1-1**). The PA was prepared by Comprehensive Long-term Environmental Action—Navy for the Navy under Contract N62470-16-D-9000, Contract Task Order 4117. The MFD does not include any special areas or annex areas requiring investigation as part of the PA.

1.1 Preliminary Assessment Objectives

This installation facility-specific PA for PFAS is part of the Navy-wide installations assessment of potential historical sources of PFAS use (Navy, 2018). The objectives of this PFAS PA of MFD are to:

- Identify and catalog potential or actual PFAS sources (see list provided herein).
- Eliminate from further consideration those areas where there is no evidence of a PFAS release or suspected release and document the rationale for their elimination.
- Identify areas requiring further PFAS investigation.
- Identify receptors and migration pathways (both on and off the installation).
- Determine whether an expedited response effort is warranted because of current complete exposure pathways (for example, on-Installation or off-Installation drinking water source within 1 mile downgradient of potential source area).
- Set priorities for a base-wide Site Inspection (SI)

To accomplish these objectives, the following activities were completed:

- A review of existing information to identify and characterize potential PFAS releases.
- A review of existing information to identify potential off-Base receptors within 1 mile of the installation boundary.
- Interviews conducted with relevant site personnel to validate and verify data collected during the data review, and to provide supplemental information.
- A site reconnaissance of the installation to identify any evidence of PFAS releases and potential receptors and migration pathways, to identify areas of concern, and to fill data gaps identified in the data review and interviews.
- Identified any need for initiation of a rapid response drinking water investigation in accordance with Navy policy (DASN June 2016).

1.2 PFAS Background

PFAS have been identified by the United States Department of Defense (DoD) and USEPA as “emerging chemicals”[1]. PFAS are of environmental concern because of their persistence in the environment and in organisms, their migration potential in aqueous systems (for example, groundwater), their historically widespread use in commercial products, and their possible health effects at low levels of exposure. PFAS are anthropogenic compounds with multiple, strong carbon-fluorine bonds.

1 The most current version of DoDI 4715.18 (4 SEPT 2019) defines emerging chemicals as "Chemicals relevant to the DoD that are characterized by a perceived or real threat to human health or the environment and that have new or changing toxicity values or new or changing human health or environmental regulatory standards. Changes may be due to new science discoveries, detection capabilities, or exposure pathways.

1.2.1 General Uses of PFAS

The chemical properties of PFAS make them useful for many commercial products because they are heat resistant and can repel oil, grease, and water. PFAS have been manufactured for use in a wide variety of products including firefighting foam, nonstick cookware, fiber and fabric stain protection, food packaging, and personal care products. The pervasive use of PFAS in commercial and industrial products has led to the discovery of PFAS in soil, air, and groundwater worldwide.

1.2.2 Key PFAS Sources at Naval Installations

PFAS have been used in a variety of military applications, including as a component of aqueous film forming foam (AFFF), which was routinely used at firefighting training areas and firefighting equipment test areas.[2] In addition, current and historical AFFF storage and transfer areas are of potential concern for release to the environment. As such, identification of areas where AFFF was released to the environment, either as repeated small releases or as a significant one-time release, is key to determining potential PFAS sources to environmental media.

PFAS from AFFF used in firefighting, firefighting training, and fire suppression systems are considered to have the greatest potential for release of PFAS to the environment in terms of mass and concentration at Navy installations. Other potential sources of PFAS to the environment include operations wastes (for example, from chromium electroplating), historical onsite land disposal areas and landfills of PFAS-containing materials, and wastewater treatment sludges and effluents. Areas of interest for this PFAS PA include those where AFFF may have been applied, released, or stored. These include current and former fire-training areas, equipment test and cleanout areas, buildings with firefighting infrastructure (for example, hangars, AFFF storage and handling areas, and pump houses), unplanned release areas (such as crash sites), and fire suppression systems located at fuel storage area(s).

For these operational and waste areas, it is important to develop a conceptual site model (CSM) that considers the following to determine if a reasonable basis exists for PFAS use, and if there is potential for the PFAS to be released into the environment:

- Type of operations,
- Timeline of operational activity,
- Material/product development and usage,
- Material storage and management practices,
- Quantities of material used, and
- Historical information/data from similar operations in the assessment.

1.2.2.1 AFFF in Firefighting Training and Fire Suppression

AFFF containing PFAS was developed in the 1960s for use on Class B fires (that is, fires in flammable liquids or vapors) and was put into routine use by the early 1970s. In November 1969, a military specification (MIL-SPEC) was issued that described characteristics that AFFF needed to demonstrate to be used by the military, including a requirement for formulations containing PFAS. Most AFFF used at military installations after the 1970s likely included some combination of PFAS.

Typically, AFFF concentrate was proportionally mixed into water lines using in-line eductors or other proportioning devices to create the necessary foam solution ranging from 3 to 6 percent of the concentrate. Class A firefighting foams were used to extinguish wood and grass fires, and do not contain PFAS. Therefore, Class A firefighting foams are not a concern for this PA.

[2] AFFF is a type of Class B fire-fighting foam but is not the only type of Class B fire-fighting foam available. While AFFF contains PFAS, not all Class B foams do (ITRC, 2020). Consequently, use of foam to extinguish a Class B fire is not a reliable indicator PFAS were released to the environment

1.2.2.2 Electroplating

Electroplating, specifically hard chromium plating, is an industrial activity where PFAS-containing mist suppressants may have been used. Electroplating consists of creating an electrolytic cell that enables a thin layer of metal to be deposited onto an electrically conductive metal surface. PFAS were sometimes used during the chromium electroplating process as a surfactant in chromic acid baths. As a surfactant, PFAS lowered the surface tension (adhesion of materials) by creating a thin, foamy layer on the surface of the chrome bath for mist-suppression. This mist-suppressant reduced the formation of airborne chromium aerosols during the plating process, which are known to be carcinogenic and allergenic. Areas where non-chromium electroplating operations were carried out would not be expected to have used PFAS-containing mist suppressants. Although fluorinated mist suppressants were available as early as the 1950s, they were not commonly used due to problems with porosity and cracking during the plating process. Technical improvements to fluorinated mist suppressants were made in the 1980s and 1990s which made their use more common; therefore, operations that ceased before this time likely would not have included PFAS materials in plating bath solutions (USEPA, 1998).

1.2.2.3 Landfill Operations, Waste Disposal Areas, and Wastewater Treatment Plants

Historically, landfills received wastes generated from military installations, including waste streams from operational areas (such as machine shops and electroplating operations), housing areas, etc. These waste streams may contain industrial and/or consumer products that were either manufactured with PFAS or contain PFAS constituents. Additionally, for wastewater treatment plants (WWTPs) that received materials containing PFAS, waste material biosolids and sludge from WWTPs can contain PFAS.

1.2.2.4 Other Potential Sources

Because of the widespread use of PFAS, there may be activities other than the ones mentioned previously, where PFAS were used. PFAS have been included in some anti-fouling and stain-resistant paint formulations. It is possible that in significant amounts, these could be sources of PFAS to the environment.

1.2.3 PFAS in the Environment

PFAS are a class of anthropogenic compounds characterized by carbon chains of varying lengths containing carbon-fluorine bonds. The strong electronegative force of the carbon-fluorine bond requires a large amount of energy to break, which makes PFAS extremely resistant to biodegradation, photo-oxidation, direct photolysis, and hydrolysis. In addition to their environmental persistence, PFAS are readily soluble in aqueous solution and therefore, have potential for migration to groundwater from soil and with groundwater flow to offsite locations. Because of their persistence and mobility, releases of PFAS to the environment present a unique set of challenges and concerns.

1.2.4 PFAS Potential Health Effects

Additional research is needed to more clearly understand the potential health effects that may be caused by exposure to PFAS compounds. To date, there is limited information on only a few of the thousands of PFAS. Currently, there are no Tier 1 toxicity values for any PFAS. Tier 1 toxicity values are the preferred source for toxicity factors in Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act human health risk assessments.

The United States Environmental Protection Agency (USEPA) Office of Research and Development released "Human Health Toxicity Values for Perfluorobutane Sulfonic Acid (CASRN 375-73-5) and Related Compound Potassium Perfluorobutane Sulfonate (CASRN 29420-49-3)," in April 2021 (USEPA, 2021). This toxicity assessment provides chronic and subchronic oral reference doses (RfDs) for perfluorobutane sulfonate (PFBS) that are considered Tier 2 noncarcinogenic toxicity values for use in CERCLA investigations. The PFBS oral RfDs are based on thyroid effects (decreased thyroid hormone levels). Due to a lack of information in the current literature on PFBS inhalation toxicity or carcinogenicity, toxicity values for inhalation exposure and cancer endpoints could not be estimated for PFBS (USEPA, 2021).

The USEPA Office of Water developed an RfD for perfluorooctanoic acid (PFOA) that is based on a developmental toxicity study using mice. The critical effects included reduced ossification in parts of the hands and feet and accelerated puberty in male pups following exposure during gestation and lactation (USEPA, 2016a). The USEPA Office of Water also determined that PFOA should be classified as "suggestive evidence of carcinogenic potential" and estimated an oral cancer slope factor based on tumor development in rat testes.

The USEPA Office of Water estimated an RfD for perfluorooctane sulfonate (PFOS) based on a developmental toxicity study in rats; the critical effect was decreased pup body weight following exposure during gestation and lactation (USEPA, 2016b).

PFOA and PFOS are known to be transmitted to the fetus in cord blood and to the newborn in breast milk. Because the developing fetus and newborn seem particularly sensitive to PFOA- and PFOS-induced toxicity, the RfDs based on developmental effects also are protective of adverse effects in adults.

1.3 Regulatory Background and History

1.3.1 PFOA Stewardship Program

In 2006, USEPA initiated the 2010/2015 PFOA Stewardship Program in which eight major companies in the United States committed to reduce facility emissions and product contents of PFOA and related chemicals on a global basis by 95 percent no later than 2010, and to work toward eliminating emissions and product content of these chemicals by 2015. All companies have met the program goals. To meet the program goals, most companies stopped the manufacture and import of long-chained PFAS, and then transitioned to alternative chemicals. On January 21, 2015, USEPA proposed a Significant New Use Rule under the Toxics Substances Control Act, to require manufacturers (including importers) of PFOA- and PFOA-related chemicals to notify USEPA at least 90 days before starting or resuming new uses of these chemicals in any process.

1.3.2 Unregulated Contaminant Monitoring Rule

USEPA issued the Third Unregulated Contaminant Monitoring Rule (UCMR3)[3] in May 2012. The UCMR3 required monitoring, between 2013 and 2015, for 30 substances at all large public water systems (PWSs) serving more than 10,000 people and 800 representative PWSs serving 10,000 or fewer people. Six PFAS compounds were included in the UCMR3 contaminant list. Of these six PFAS, USEPA issued provisional health advisory levels for only two, PFOA and PFOS. The UCMR3 results found each of these two chemicals was present above the reference concentration of 70 parts per trillion (ppt) in less than 1 percent of the nearly 5,000 public water systems that sampled under UCMR3 (USEPA, 2017).

In December 2016, USEPA issued the Fourth Unregulated Contaminant Monitoring Rule (UCMR4). UCMR4 requires all large PWSs serving more than 10,000 people and 800 representative PWSs serving 10,000 or fewer people to sample for 30 chemicals between 2018 and 2020. There are no PFAS included on the UCMR4 list of contaminants that require sampling and analysis.

USEPA is currently proposing development of a fifth UCMR (UCMR5), it is anticipated that a proposal for the rule will be developed in summer 2020 and the final rule is expected to be released in late 2021. It is currently unknown whether PFAS will be included as part of UCMR5; however, several PFAS have been proposed for inclusion (USEPA, 2019a).

1.3.3 USEPA Lifetime Health Advisories

In May 2016, the USEPA Office of Water issued a drinking water lifetime health advisory for PFOA and PFOS. Health advisories are not enforceable, regulatory levels; rather, they are levels that would provide Americans,

3 The 1996 Safe Drinking Water Act amendments require that once every 5 years, USEPA issue a new list of no more than 30 unregulated contaminants to be monitored by PWSs.

including the most sensitive populations, with a margin of protection from a lifetime of exposure to PFOA and PFOS from drinking water. The health advisory is 70 ppt for PFOA and 70 ppt for PFOS. When both PFOA and PFOS are found in drinking water, the combined concentrations of PFOA and PFOS should be compared with the 70 ppt health advisory level.

1.3.4 USEPA Action Plan

In February 2019, the USEPA issued an action plan outlining the steps the agency is taking to address PFAS and to protect public health (USEPA, 2019b). The action plan identifies USEPA-led short-term actions, longer-term research, and potential regulatory approaches designed to reduce the risks associated with PFAS in the environment. The action plan notes that USEPA plans to propose a national drinking water regulatory determination for PFOA and PFOS and include PFAS analysis in the next UCMR monitoring cycle. Other steps include further research into improving analytical methods, understanding remediation options, and obtaining more information about the potential toxicity of a broader set of PFAS, along with numerous additional actions. An update to the Action Plan was issued by USEPA in February 2020.

1.3.5 USEPA Guidance, December 20, 2019

In December 2019, the USEPA issued Interim Recommendations for Addressing Groundwater Contaminated with PFOA and PFOS under federal cleanup programs. The guidance recommends using a screening level of 40 ppt to determine if PFOA and/or PFOS is present at a site and may warrant further attention. The guidance also recommends using EPA's PFOA and PFOS Lifetime Drinking Water Health Advisory level of 70 ppt as the preliminary remediation goal for contaminated groundwater that is a current or potential source of drinking water, where no state or tribal MCL or other applicable or relevant and appropriate requirements are available or sufficiently protective.

1.3.6 State-specific Action Levels

As of April 2021, no specific PFAS action levels have been established by the State of Washington; however, several state agencies (Washington State Department of Ecology [DOE], Board of Health, and Washington State Department of Health [DOH]) have conducted research on the health effects related to PFAS exposure. The State Board of Health is currently drafting state action levels (SALs) for five PFAS in public drinking water supplies: PFOA, PFOS, perfluorohexane sulfonate (PFHxS), perfluorononanoic acid (PFNA), and PFBS (DOH, 2020).

1.3.7 State of Washington Draft PFAS Chemical Action Plan

In October 2020, DOE released a Draft PFAS Chemical Action Plan (CAP) (DOE, 2020a). The purpose of the Draft PFAS CAP is to identify, characterize, and evaluate the uses and releases of PFAS and to develop recommendations to protect human health and the environment. Based on the findings of literature and data reviews, several recommendations for the State of Washington are presented. The recommendations are associated with the following sub-efforts: ensure drinking water is safe, manage environmental PFAS contamination, reduce PFAS in products, and understand and manage PFAS in waste. An errata sheet to the Draft PFAS CAP was added on October 20, 2020 to provide updated information to some recommendations (DOE, 2020b), and the public comment period closed on January 22, 2021 (DOE, 2020c). The final plan is expected to be complete in 2021 (DOE, 2020a).

1.4 Navy Policy

1.4.1 DASN (EI&E) Policy Memo, October 21, 2014

Because of Navy releases impacting PWSs tested under UCMR3, the Navy issued a policy in October 2014 requiring on-Base drinking water sampling for PFOA and PFOS for bases where groundwater was used as drinking water and PFAS could have been released nearby in the past. Installations that were not required to sample finished drinking water under UCMR3 that produce drinking water from on-installation groundwater sources and

have an identified or suspected PFAS release within approximately 1-mile upgradient to the drinking water source were required to sample their finished drinking water by December 2015.

Drinking water at MFD is supplied by the Manchester Water District (MWD) which obtains its potable water supply from multiple groundwater wells located to the south of MFD. Drinking water was sampled and analyzed by MWD under the UCMR3 program; PFAS were not detected.

1.4.2 Chief of Naval Operations Policy Memo, September 14, 2015

This policy memorandum largely echoed the requirements laid out in the October 2014 DASN (E) policy memo. However, this memo specified that if levels of PFOS and/or PFOA in drinking water exceeded the current-at-the-time USEPA health advisory (that is, the 2009 provisional short-term health advisories), then alternative drinking water must be supplied until the PFOA and/or PFOS levels were reduced to below the USEPA health advisory.

1.4.3 DASN (E) Policy Memo, June 14, 2016

This policy expanded the sampling PFOA and PFOS at all Navy installations, where such sampling was not previously completed under USEPA's UCMR3 or the Navy's October 2014 policy. This memo also specified that, for instance, where drinking water from an installation is purchased from a public water system, but was not tested under UCMR3, that the installation must sample the finished drinking water to comply with this policy. Additionally, this policy included reporting requirements to the DASN (E) office for all PFOA and/or PFOS drinking water results.

1.4.4 DASN (E) Policy Memo, June 17, 2016

This policy defines the Navy's intention to remove, dispose, and replace legacy AFFF that contains PFOS and/or PFOA once environmentally suitable substitutes are identified and certified to meet MIL-SPEC requirements. This policy directs the following actions be taken until suitable replacements are certified:

- Immediately cease the uncontrolled environmental release of AFFF for shoreside installations, with the exception of emergency responses.
- Update and implement Navy and Marine Corps firefighting system requirements, as needed, to ensure fire and emergency service vehicles and equipment at Navy installations and facilities are tested and certified in a manner that does not allow the release of AFFF to the environment.
- By the end of Fiscal Year 2017 (FY17), remove and dispose of uninstalled PFOS-containing AFFF in drums and cans from local stored supplies for shore installations and ships to prevent future environmental releases.

1.4.5 DASN (E) Policy Memo, June 20, 2016

This policy required the Navy to identify and prioritize sites for investigation if drinking water resources, on- or off-installation, are thought to be vulnerable to PFAS contamination from past Navy or Marine Corps PFAS releases. Sites with drinking water sources within 1-mile downgradient from known or potential releases of PFAS were assigned the highest priority. This policy directed the sampling of off-Base drinking water at these high priority (Priority 1) sites within FY17.

The primary mechanism to identify potential PFAS release sites and areas of concern, was review of Environmental Restoration (ER), Navy records. To ensure that all potential PFAS release mechanisms were identified, installations were directed to review installations to identify areas that are not already part of the ER, Navy program. The Navy has completed the sampling for all off-base potentially impacted drinking water sources that were identified as a result of this policy and currently known exposures have been addressed.

A fire training area was identified as part of this process as a potential PFAS source. Although municipal water supply wells are located in the surrounding area beyond the facility boundary (to the south and upgradient),

based on a review of groundwater flow direction, no complete exposure pathway was identified, and this site was determined not to meet Priority 1 criteria.

The Navy has completed the sampling for all off-base potentially impacted drinking water sources that were identified as a result of the June 2016 policy and currently known exposures have been addressed.

1.4.6 Chief of Naval Operations Policy Memo, April 6, 2020

This policy clarifies that operational ranges on Navy and Marine Corps bases will not be included in basewide PFAS PAs but be investigated for PFAS releases separately.

1.5 Department of Defense (DoD) Policy

1.5.1 Secretary of Defense Memo, July 23, 2019

This memo established a PFAS task force to ensure a coordinated, aggressive, and holistic approach to DoD-wide efforts to proactively address PFAS. The goals of the task force are mitigating and eliminating the use of the current AFFF, understanding the impacts of PFAS on human health, and fulfilling cleanup responsibility related to PFAS. The task force is coordinating and collaborating with other federal agencies to achieve these goals.

1.5.2 ASD Guidance Memo, October 15, 2019

This guidance memo provided clarification of toxicity values for PFOA and PFOS that can be used to estimate screening levels used in the CERCLA program to determine if further investigation is warranted or if a site can proceed to site closeout.

1.5.3 ASD Guidance Memo, October 23, 2019

This memo revised quarterly progress reporting requirements for installations with known or suspected PFAS releases.

1.5.4 ASD Guidance Memo, November 22, 2019

This memo established requirements for installation commanders to conduct community engagement with respect to PFAS issues, report on their progress in so doing, and to provide feedback on community questions and concerns.

1.5.5 ASD Guidance Memo, November 22, 2019

This memo established a consistent methodology for analysis of PFAS in media other than drinking water and requires DoD Components to use analytical methods meeting the DoD/Department of Energy Quality Systems Manual for Environmental Laboratories, Appendix B, Table B-15.

1.5.6 ASD Guidance Memo, March 2, 2020

This memo identifies requirements for PFAS drinking water sampling on DoD installations where DoD is the drinking water purveyor. The requirements include initial and routine monitoring, actions necessary if results exceed the lifetime health advisory, laboratory analysis and record keeping requirements, and notification of results.

1.6 Report Organization

The PFAS PA report for Navy installations is organized in the following sections:

1. Introduction
2. Facility Description
3. Assessment Methodology

4. Findings and Recommendations
5. Conclusions
6. References

The following appendixes are included:

A Records Reviewed, Interview Contacts, and Area Coordinates
B Interview Record
C Site Reconnaissance Photo Log

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LEGEND

- City
- Hydrology
- Secondary Road
- Local Connecting Road
- Important Local Road
- Installation Boundary
- 1 Mile Installation Boundary Buffer

NOTE:
MFD = Manchester Fuel Depot

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Imagery, 2017

0 0.5 1 Miles

1 inch = 1 mile

N

Figure 1-1
Location Map: MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington

SECTION 2

Facility Description

MFD is located on a small peninsula on the eastern edge of the larger Kitsap Peninsula (**Figure 1-1**) which is located within Kitsap County, and adjacent to Puget Sound to the east and Clam Bay to the north. MFD is a fuel storage facility whose primary mission is to provide bulk fuel support to area Navy activities. The 234-acre facility encompasses underground and aboveground petroleum storage tanks, associated pipelines, and a fuel pier (**Figures 2-1**). MFD is approximately 4.5 miles northeast of the town of Port Orchard, and less than one mile north of the census-designated area of Manchester. The facility is divided into an eastern side and a western side by Little Clam Bay. The eastern and western sides are connected by a 100-foot-wide causeway (**Figure 2-1**). MFD obtains its drinking water from the local public utility district.

2.1 Facility Background

The MFD property was conveyed by the Territory of Washington to the United States War Department in 1898 and subsequently conveyed by the United States War Department to the Navy in 1923 (Perry, 1998). MFD has been a fuel depot for the Navy since the early 1940s (beginning of World War II). Most of the facility is currently used for fuel storage, including underground storage tanks (USTs) (numbers 16 through 43, 48 through 50, 141, and 142), aboveground storage tanks (ASTs) used for fuel and other various purposes (primary large fuel tanks consist of numbers 145 through 149), associated pipelines, and a fuel pier (**Figure 2-1**). Fuel products that have been or are currently stored at the fuel depot include Navy Special Fuel (No. 6 fuel oil [also referred to as Bunker C oil]), marine diesel fuel, jet fuel (JP-4, JP-5, JP-8, and F-76), lubricant oil, and aviation gasoline (Regional Fuel Manager/Deputy Director, pers. comm, 2018). MFD is the largest single-site fuel depot in the continental United States, holding the operating stock of fuel for all of Navy activities near Puget Sound as well as an emergency stock, if needed.

Starting in 1960, the Navy transferred property in the northwest quadrant of the historical boundary of MFD to the General Services Administration as shown on **Figure 2-1** and as follows:

- Former Navy firefighter training area (FTA) (operated as a Navy-specific Fireman School from World War II until 1969) was transferred to National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (Disposal Property ID N68436-MAD1).
- Former Navy Landfill and Net Depot Area was transferred to USEPA, which currently operates as the USEPA Manchester Laboratory (Disposal Property ID N68436-MAD2).
- Remaining portion of the surplus property (encompassing approximately 105 acres) was sold to Manchester State Park in 1970 (Disposal Property ID N68436-MAD3).

The Navy does not maintain environmental liability for these disposed properties. A parcel of the Former FTA within the MFD facility boundary, located immediately south of Disposed Property N68436-MAD1 (**Figure 2-1)**, was leased to NOAA March 1, 1968 (Perry, 1998). Currently the parcel is part of the NOAA facility to the north of MFD.

A Phase I Environmental Site Assessment (ESA) to support the Military Construction Project Area and Decommissioning Area located on the eastern portion of the MFD was conducted in 2017 (Battelle, 2017). The scope encompassed a combined 30 acres of MFD but did not include the entire facility. At the time of this investigation the primary focus was researching known environmental records and historic known site contamination. Based on the results of the Phase I ESA, a Phase II ESA was conducted by CH2M HILL, Inc. (CH2M, 2018). The Phase II ESA focused on the investigation of hydrocarbon contamination at MFD and did not include PFAS. To date there have been no PFAS investigations at MFD.

2.1.1 Active Permits

Several state and federal environmental permits are associated with MFD (USEPA, 2019a). These include the following categories:

- National Pollutant Discharge Elimination System stormwater industrial permit WA0002780
- Transfer, Storage and Disposal Facility Resource Conservation and Recovery Act permit WA2170023426
- Ecology Toxics Cleanup Program permit 3641 for underground storage tanks and leaking storage tanks

2.2 Environmental Setting

2.2.1 Climate

The climate in Kitsap County is characterized by warm, dry summers and wet, cool winters (Weatherbase, 2019). Average high temperatures during the summer months range from 57 to 62 degrees Fahrenheit**,** while winter highs are typically in the 40 degrees Fahrenheit range (Weatherbase, 2019). Average annual precipitation is approximately 42 inches, approximately three-fourths of which falls between October and March (Weatherbase, 2019). The Manchester area receives approximately 4 inches of snowfall annually.

2.2.2 Geologic Setting

MFD is located in the Puget Lowland Physiographic Province of western Puget Sound (Battelle, 2017). Bedrock in this part of the Puget Lowland is the Blakely Formation, which is a sequence of marine sedimentary rocks, including sandstone, siltstone, claystone, and conglomerate, and igneous rock with thickness in some portions of the region exceeding 8,000 feet (Garling and Molenaar, 1965). Marine sedimentary bedrock that underlies the glacial deposits and is exposed at the surface at several locations around the base, notably in the northern portion of the eastern side of MFD . The predominant deposit at MFD is glacial till which generally consists of a basal fill covered by a thin, discontinuous layer of ablation till. Surface soils in the area are characterized by well drained gravelly sandy and gravelly loam (NAVSUP, 2008).

The west side of MFD is composed mostly of a very dense, poorly sorted mixture of silt, sand, and gravel with layers of better sorted, less compact ablation till characteristic of the Vashon Till geologic unit, and remnants of the Blakely Formation (Hart Crowser, 1988). The Vashon Till is considered to have relatively low permeability and as such, acts and an aquitard that impedes downward groundwater flow where saturated recessional deposits overlie this unit (Hart Crowser, 1988). The eastern portion of the western side of MFD is characterized by the Vashon Advance Outwash geologic unit, characterized by dense, well stratified, gray to brown sand with scattered lenses of silt and gravel (Hart Crowser, 1988). The Vashon Advance Outwash comprises an unconfined to partially confined water-bearing zone which is referred to as the Shallow or Vashon Advance Outwash aquifer.

The southern portion of the eastern side of MFD is composed largely of unconsolidated glacial till of the Vashon Advance Outwash underlain by the Blakely Formation (Hart Crowser, 1988; URS Team, 1993). Based on resource protection well reports, the glacial till extends a minimum of approximately 35 to 55 feet below ground surface (bgs) (Battelle, 2017). The northern portion of the eastern side of MFD is characterized by the tertiary bedrock geologic unit, which is comprised of a thick sequence of marine sedimentary rocks that comprise the Blakely Formation (Hart Crowser, 1988).

2.2.3 Hydrogeologic Setting

In the Puget Lowland, the primary source for recharge to the aquifers is local precipitation. Kitsap County receives approximately 42 inches per year, and the majority of the groundwater recharge occurs during the winter and spring seasons and with more intermittent recharge in the summer and fall (Weatherbase, 2019). The precipitation and subsequent infiltration directly recharges the Vashon Advance Outwash aquifer.

Groundwater flow direction is generally radial outward from the central portion of the peninsula toward the surface water bodies located to the north, west, and east (Hart Crowser, 1988) (**Figure 2-1**). As such, the groundwater flow direction on the west side of MFD is generally to the northeast towards Clam Bay. On the east side of MFD, there is no evidence of hydraulically connected sequence of unconsolidated deposits, but more likely perched zones within the Vashon Advance Outwash deposits. In the northern portion of the east side of MFD, groundwater movement in the tertiary bedrock is primarily through fracture zones (Hart Crowser, 1988). Groundwater on the east side of MFD is considered to follow topography and flow in a radial direction to either Little Clam Bay to the west or to Puget Sound to the east.

To the extent that perched groundwater is present, this groundwater is likely to flow radially towards receiving waters to the east, northwest, northeast and west/southwest direction (that is, Puget Sound and Clam Bay, respectively) (**Figure 2-2**). A recent Phase II ESA conducted in the central portion of facility (around USTs 23, 24, 26, 31, 32, 33, 34, and 35) provided additional data on the perched aquifer. Based on observations collected during the investigation, the approximate depth to groundwater in the perched aquifer is 30 feet bgs (CH2M, 2018).

2.2.4 Hydrologic Setting

As discussed previously, MFD is bordered by receiving waters to the north, east, and southeast (i.e., Clam Bay, Puget Sound, and Little Clam Bay). As such, surface hydrology on the west side of the facility flows northeast toward Clam Bay. The surface hydrology on the east side of the facility is similar to an island, where surface water is discharged radially to these receiving waters. Approximately 20 to 50 percent of the annual precipitation is available for surface runoff (Hart Crowser, 1988). A perennial stream, Beaver Creek, flows northward through a post-glacial ravine located west of MFD before discharging into Clam Bay through a broad valley located just north of the facility (**Figure 2-2**). Wetlands were identified in the area of the tidal pool and along the borders of the surface water bodies (Franco Pond, Little Clam Bay, Clam Bay, and Puget Sound) per Kitsap County (EDR, 2019a) (**Figure 2-2**).

2.3 Migration Pathways and Potential Receptors

This section discusses hypothetical exposure scenarios (that is, environment media, receptors, and exposure routes) if a PFAS release occurred.

2.3.1 Migration Pathways

Through the historical use of materials containing PFAS, those substances may have been released to the environment. Because of their chemical structure, PFAS are chemically and biologically stable and resist typical degradation processes. As a result, PFAS persist in the environment. Additionally, PFAS are water-soluble and migrate readily from soil to groundwater where they can be transported long distances (USEPA, 2014).

Potential PFAS migration pathways include the following:

- Direct release of PFAS to surface and/or subsurface soil
- Transport via advection in groundwater
- Discharge of groundwater to surface water and/or sediment
- Direct release to surface water
- Direct release of PFAS to drainage ditches
- Migration of storm water containing PFAS (through overland flow and/or releases from stormwater collection systems) to downgradient areas including soil, drainage ditches, and surface water
- Leaching of PFAS from soil to groundwater
- Partitioning of PFAS from groundwater or surface water to sediment

- Uptake and bioaccumulation in terrestrial and aquatic media

2.3.2 Human Receptors

Current receptors (including residents, maintenance and industrial workers, visitors, tribal harvesters, and trespassers) as well as potential future receptors (residents, maintenance and industrial workers, trespassers, visitors, tribal harvesters, and construction workers) could potentially be exposed to PFAS in soil, air, sediment, surface water, and local seafood. Potential future receptors (residents and industrial workers) could potentially also be exposed to PFAS in groundwater if groundwater is used as a future drinking water or industrial water supply.

Access to MFD is restricted to active military personnel, government employees, and government contractors. MFD is divided by Little Clam Bay into eastern and western side, with a 100-foot causeway connecting the two sides. A barbed-wire perimeter fence separates the MFD facility from the surrounding civilian population, with the exception of the shoreline from the pier to the old housing area and around Orchard Point (NAVSUP, 2018) (**Figures 2-1**). Puget Sound to the east and Clam Bay to the north acts as natural boundaries separating the facility from surrounding civilian populations.

The area surrounding MFD is primarily zoned as residential to the south in the census-designated area of Manchester and zoned rural residential to the west (Kitsap County, 2019). As of 2010, the population of the census-designated area of Manchester was 5,413 (CensusViewer, 2019), while the total population within a 1-mile radius of MFD was estimated at 2,287 (EDR, 2019b). One high-use receptor site, a medical facility, is within a 1-mile radius of the site (**Figure 2-2**). No other high-use receptor sites, including day care centers, nursing homes, schools, colleges, arenas, or prisons, are located within a 1-mile radius of MFD (EDR, 2019b).

Sinclair Inlet is an exclusive portion of the Suquamish Tribe's adjudicated usual and accustomed fishing area that is reserved under the 1855 Treaty of Point Elliott. Hunting and fishing are important aspects of life for many native residents in the Puget Sound region.

2.3.2.1 Groundwater

In areas where groundwater is within the potential depth of construction activities (within about 10 to 30 feet bgs), construction workers could be exposed to PFAS in groundwater through dermal contact during excavation activities, if a perched or the Vashon Advance Outwash aquifer is encountered. There are no regulatory screening levels or other criteria for dermal contact with PFAS in groundwater.

Public Drinking Water Sources - Drinking water at MFD is currently supplied by the MWD which also supplies potable water for the towns of Port Orchard and Manchester.

The MWD obtains its potable water supply from multiple groundwater wells including deep wells located to the south and upgradient of MFD (Hart Crowser, 1988; MWD, 2008) (**Figure 2-2**). The wells located nearest to MFD, Wells 10 and 11, are approximately 500 feet to the south of the MFD boundary and are the northernmost wells of the MWD water supply. According to the well logs, Well 11 is 277 feet deep and screened at 253.9 to 264.1 feet bgs, with an indicated confining layer of clay from 61 to 125 ft bgs. Well 10 is 359 feet deep and screened from 329.3 feet to 350.4 feet bgs, with an indicated confining layer of clay from 58 to 140 ft bgs (DOE, 2019). The two other MWD wells within a 1-mile radius of MFD are approximately 3,850 feet south of MFD. Well 1 is 139 feet deep and screened from 114 to 130 feet bgs with an indicated confining layer of clay from 13 to 45 ft bgs and noted layers of clay lenses at varying depths (DOE, 2019). No well logs were available for Well 2.

As part of UCMR3, untreated drinking water was tested for PFAS at MWD wells within 1-mile of MFD, including Wells 1, 2, 10, and 11 (**Figure 2-2**) (USEPA, 2017). MWD wells outside of the 1-mile radius of MFD that were tested include wells 5, 6, 7, 8, and the distribution center. Drinking water was also tested at the point on MFD where it ties-in to MWD. No PFAS were detected in any of the samples.

Private Drinking Water Sources – A review of well records from DOE and DOH indicated that there are private wells within 1 mile of MFD (DOE, 2019). However, the exact number of private wells and their locations, current operational status (active or abandoned), depth, and usage are not well documented.

Private drinking water wells would be upgradient of MFD based on the location of the MFD, topography, and the overall groundwater flow direction of the peninsula. Based upon limited records available, some of these wells are suspected to be monitoring wells because of depth, location, and Navy contractor affiliation; or abandoned, as multiple public well records confirmed (DOE, 2019).

Historically, MFD supplied its own drinking water. The DOH lists three wells owned by MFD, all inactive since the 1990s. A former drinking water well (WS ID# 58585Y), also referred to as water well, No. 5/Pump House/Building 210, was once used for drinking water, but is now only used for emergency firefighting and is considered inactive by DOH (DOH, 2019). The well is located north of AST 149 (**Figure 2-1**). One additional well noted during the site reconnaissance was observed near the Fuel Pump House. A review of the records from the Phase I ESA indicates that this well was abandoned. MFD personnel has confirmed that drinking water for the base is supplied by a tie-in to the municipal water supply.

2.3.2.2 Soil

Workers, visitors, trespassers, and residents at and within 1 mile of PFAS source areas could potentially be exposed to PFAS in soil through incidental ingestion of and dermal contact with surface and subsurface soil or respiration of soil dust in the air. Screening levels are available for dermal contact with and ingestion of PFAS in soil. There are no screening levels or other criteria for inhalation of PFAS in dust.

2.3.2.3 Sediment

Workers, visitors, trespassers, and residents at and within 1 mile of PFAS source areas could be exposed to PFAS in sediment through incidental ingestion of and dermal contact with sediment. Screening levels are available for dermal contact with and ingestion of PFAS in sediment.

2.3.2.4 Surface Water

Surface water is not used as a drinking water source at MFD or the surrounding area. However, workers, visitors, trespassers, and residents within 1 mile of PFAS source areas could be exposed to PFAS in surface water through incidental ingestion of and dermal contact with surface water. Potential exposure to PFAS could occur from the discharge of contaminated groundwater to surface water. Screening levels are available for ingestion of PFAS in water. There are no screening levels or other criteria for dermal contact with PFAS in water.

2.3.2.5 Ingestion

In addition to direct exposure to potentially impacted groundwater, soil, air, surface water, and sediment, human receptors may be indirectly exposed to PFAS through the consumption of locally caught meat, shellfish, and fish. Some PFAS may or are known to bioaccumulate in terrestrial and aquatic organisms (National Ground Water Association, 2018).

2.3.3 Ecological Receptors

A wide variety of terrestrial and wetland/aquatic ecological receptors may reside at MFD. In terrestrial habitats, these receptors include terrestrial plants, soil invertebrates, reptiles, birds, and mammals. In wetland and aquatic habitats, receptors include aquatic and wetland plants, aquatic and benthic invertebrates, reptiles, amphibians, fish, birds, and mammals. Marsh areas may also exhibit estuarine characteristics because of tidal influence; these areas include salt-tolerant plant species.

Lower trophic level terrestrial ecological receptors (such as terrestrial plants and soil invertebrates) could be exposed to PFAS compounds released to surface soil through root uptake, direct contact, and/or direct ingestion. Because there is some evidence that PFAS compounds may bioaccumulate in terrestrial food items (such as plants), there is the potential that upper trophic level receptors (such as birds and mammals) could be exposed to

these compounds via the food web, as well as through incidental ingestion of soil and direct ingestion of drinking water (if PFAS compounds are released to water sources).

Lower trophic level wetland/aquatic ecological receptors (such as wetland/aquatic plants, aquatic and benthic invertebrates, fish, reptiles, and amphibians) could be exposed to PFAS compounds released to surface water and/or sediment (either directly, or indirectly via surface runoff from terrestrial areas or through groundwater discharge) through root uptake, direct contact, and/or direct ingestion. Because there is evidence that PFAS compounds may bioaccumulate in aquatic food items (such as fish), there is the potential that upper trophic level receptors (such as birds and mammals) could be exposed to these compounds via the food web, as well as through incidental ingestion of sediment and direct ingestion of drinking water.

Currently, no formal regulatory-based ecological screening values (ESVs) are available for PFAS compounds. However, there are literature-based ecotoxicology data for some PFAS compounds (such as PFOA and PFOS) available for soil and water exposures. Little ecotoxicology data are currently available for sediment exposures, although this is a very active field of research and additional data are likely to become available in the relatively near future.

2.3.3.1 Endangered and Threatened Species

The following federally and state-listed endangered and threatened (or proposed threatened) species are known to or are believed to occur in the Puget Sound region of Washington and may occur within a 1-mile radius of MFD (USFWS, 2019a; EDR, 2019a; WDFW, 2019a):

- Birds: Federally listed species – marbled murrelet (*Brachyramphus marmoratus*, threatened), northern spotted owl (*Strix occidentalis caurina*, threatened), streaked horned lark (*Eremphila alpestris strigata*, threatened), yellow-billed cuckoo (*Coccyzus americanus*, threatened). Additional state-listed species – little yellow flycatcher (*Empidonax traillii brewsteri* – species of concern), black tern (*Chilidonias niger* – species of concern), tufted puffin (*Fratercula cirrhata)*.
- Mammals: Federally listed species – killer whale (*Orcinus orca*, endangered), humpback whale (*Megaptera novaeangliae*, endangered). Additional state-listed species – potholes meadow vole (*Microtus pennsylvanicus kincaidi* – species of concern), Pacific Townsend's big-eared bat (*Plecotus townsendii* – species of concern), destruction island shrew (*Sorex townbridgii destruction* – species of concern).
- Fish: Federally listed species – bull trout (*Salvelinus confluentus*, threatened), Dolly varden (*Salvelinus malma*, proposed similarity of appearance – threatened). Additional state-listed species – chum salmon (*Oncorhynchus keta* – threatened), sockeye salmon (*Oncorhynchus [=Salmo] nerka* – threatened), chinook salmon (*Oncorhynchus [=Salmo] tshawytscha* – threatened), steelhead (*Oncorhynchus [=Salmo] mykiss* – threatened).
- Amphibians: Federally listed species – Oregon spotted frog (*Rana pretiosa*, threatened). Additional state-listed species – Northern red-legged frog (*Rana aurora* – species of concern), Cascades frog (*Rana cascadae* – under review), tailed frog (*Ascaphus truei* – species of concern).
- Plants: State-listed species - Yellow cedar (*Calliptropsis nootkatensis* – under review), Thurber's reedgrass (Calamagrostis crassiglumis – species of concern), Larkspur (*Delphinium leucophaeum* – species of concern), *Astragalus diaphanus diurnus* (species of concern), *Pyrrocoma liatriformis* (species of concern), Howell's fleabane (*Erigeron howellii* – species of concern), Mountain blue-eyed grass (*Sisyrinchium sarmentosum* – under review), Blue Mountain onion (*Allium dictuon*– species of concern), *Calochortus nitidus* (species of concern), Queen-of-the-forest (*Filipendula occidentalis* – species of concern), Hoover's tauschia (*Tauschia hooveri* – species of concern), Curtus aster (*Sericocarpus rigidus* – species of concern), *Penstemon barrettiae* – species of concern, Suksdorf's desert-parsley (*Lomatium suksdorfii* – species of concern), *Sullivantia oregana* (species of concern), Howell's montia (*Montia howellii* – species of concern), *Oxytropis campestris wanapum* (species of concern), *Corydalis aquae-gelidae* (species of concern), Tundra shootingstar (*Dodecatheon austrofrigidum* – species of concern), Gorge fleabane (*Erigeron oreganus* – species of concern), Cotton's milk-

vetch (*Astragalus cottonii* – species of concern), Jessica's aster (*Symphyotrichum jessicae* – species of concern), Tall bugbane (Cimicifuga elata – species of concern), Rose-purple sand-verbena (*Abronia umbellata acutalata* – species of concern), Washington monkey-flower (*Mimulus washingtonensis* – species of concern), Stalk-leaved monkey-flower (*Mimulus patulus* – species of concern).

- Arthropods: State-listed species – Monarch butterfly (*Danaus plexippus* – under review), Beller's ground beetle (*Agonum belleri* – species of concern), Lynn's clubtail (*Gomphus lynnae* – species of concern), Fender's soliperlan stonefly (*Soliperla fender* – species of concern), Hatch's click beetle (*Eanus hatchi* – species of concern), Newcomb's littorine snail (*Algamorda newcombiana* – species of concern), Evening fieldslug (*Deroceras hesperium* – under review)

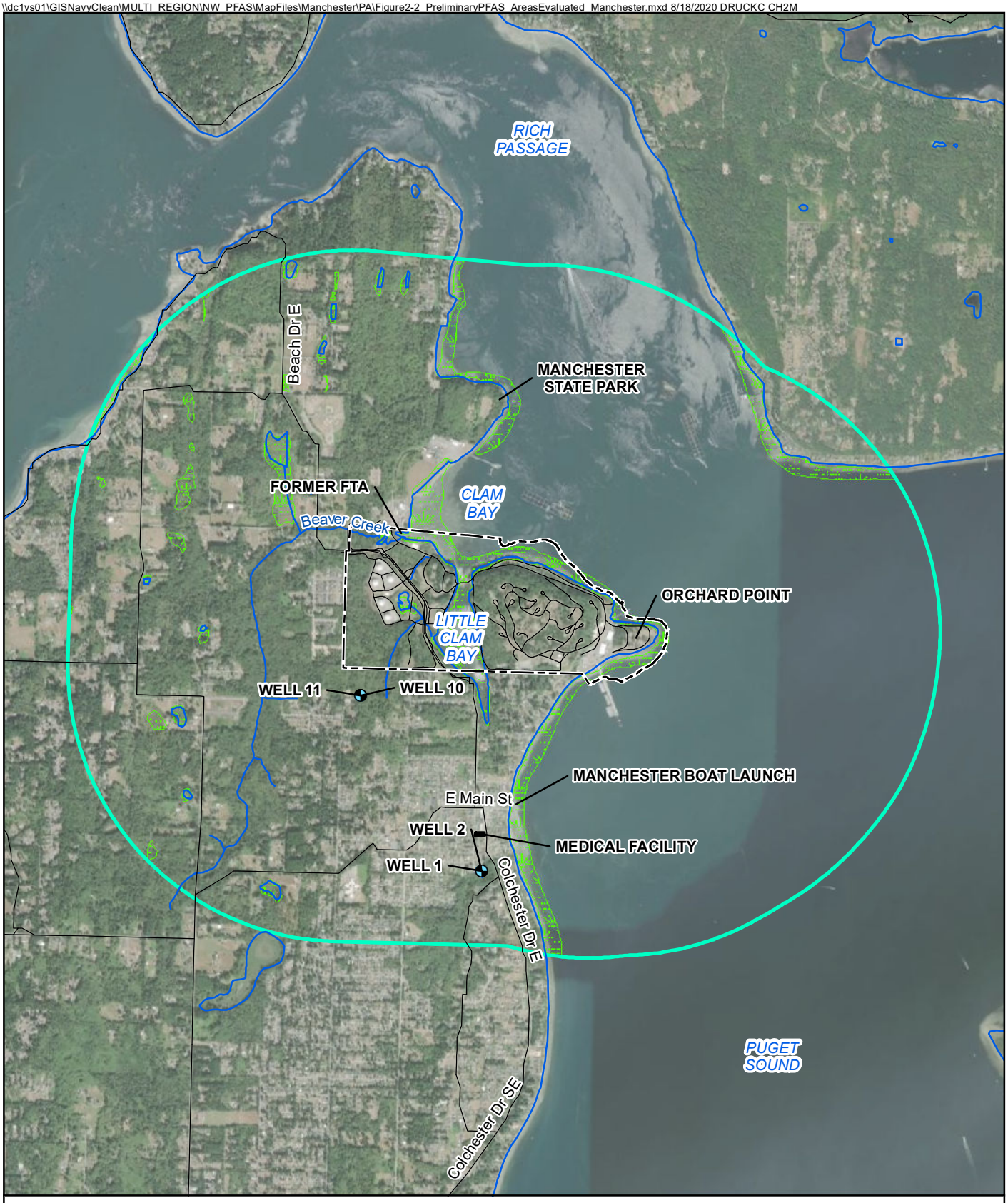
LEGEND

- Manchester Water District Supply Well
- Roads
- 20' Topographic Contour
- Hydrology
- Tunnel
- Building
- Anticipated Groundwater Flow Direction
- Aboveground Storage Tank
- Underground Storage Tank
- Historical Installation Boundary
- Installation Boundary

Figure 2-1
Facility Layout: MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington

0 0.1 0.2 Miles
1 inch = 0.2 mile
N

\\dc1vs01\GISNavyClean\MULTI_REGION\NW_PFAS\MapFiles\Manchester\PA\Figure2-2_PreliminaryPFAS_AreasEvaluated_Manchester.mxd 8/18/2020 DRUCKC CH2M



LEGEND

- Manchester Water District Supply Well
- Roads
- Hydrology
- Wetlands
- 1 Mile Installation Boundary Buffer
- Medical Facility
- Installation Boundary

NOTE:
1. MFD = Manchester Fuel Depot
2. Wetlands Source: Kitsap County 2006

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2018

0 0.25 0.5 Miles
1 inch = 0.5 mile

N

Figure 2-2
Environmental Setting and Offsite Receptors: MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington

SECTION 3

Assessment Methodology

As described in **Section 1**, the following activities were performed in support of this PA:

- Reviewed existing information to identify and characterize potential PFAS releases and potential off-Base receptors
- Conducted interviews with relevant site personnel to validate and verify data collected during the data review and provide supplemental information
- Conducted a site reconnaissance of the facility to identify any evidence of PFAS releases and potential receptors and migration pathways, identify all areas of concern, and fill data gaps identified in the data review and interviews

The following subsection describes each activity.

3.1 Review of Existing Information

Information was gathered and evaluated during the archive search to identify and characterize locations of potential PFAS use or disposal. The information was obtained from existing documents, as-builts, historical photographs, and interviews conducted with relevant individuals. A list of the resources reviewed is provided in **Appendix A-1**. Electronic versions of documents also are included in **Appendix A-2**. The following document types were evaluated during the preliminary review.

3.1.1 Naval Installation Restoration Information System Records

Naval Installation Restoration Information System (NIRIS) reports and correspondence from the Administrative Record were searched for key terms to identify potential PFAS release areas and obtain information on physical investigations and identification of potential pathways and receptors at those areas. Reports and correspondence were obtained digitally or viewed as hard copies at Naval Facilities Engineering Command (NAVFAC) Northwest, Bangor, Washington.

3.1.2 Internet Navy Facilities Asset Data Store and Other Environmental Liabilities Databases

The internet Navy Facilities Asset Data Store, which is the official record of the Navy's real property assets, was queried for facilities associated with MFD. In addition, separate queries were performed in the Other Environmental Liabilities (OEL) module to identify OEL units associated with MFD and associated special areas. The resulting lists of facilities and OEL units were reviewed for facility or unit types associated with PFAS release. If a facility or unit was identified as a potential PFAS source, additional documentation associated with these facilities or units was obtained as necessary and reviewed.

3.1.3 Internet Records

Internet search engines were used to find current and historical information on MFD and nearby receptors. Documents, websites, and internet databases reviewed during this PA are listed in **Appendix A-1**.

3.1.4 Facility Operations Records

Facility operations records, spill reports, inventories, and authorized use lists were reviewed for MFD. The resulting list of available documents was reviewed to identify those with the potential to contain information relevant to this PA.

3.1.5 National Archives Search

A search of documents curated by the National Archives and Records Administration was performed using various search terms associated with MFD. The resulting list of available documents was reviewed to identify those with the potential to contain information relevant to this PA. No relevant documents were identified.

3.1.6 Environmental Data Resources Reports

National Environmental Policy Act-Check and offsite receptor reports (EDR, 2019a and 2019b) were reviewed for MFD and the surrounding area.

3.1.7 Aerial Photographs

Recent and historical aerial photographs of each facility were reviewed. These photographs captured the following years:

- MFD: 1951, 1968, 1981, 1990, 1994, 2002, 2005 to 2007, and 2009 through 2018 (Battelle, 2017; Google Earth, 2019)

3.1.8 Geographic Information System and Map Data

Geographic information system (GIS) data and historical maps were reviewed to develop an understanding of current and historical facility boundaries, locations and boundaries of site features and areas of environmental concern, and environmental setting information. GIS records reviewed were curated by NAVFAC Northwest Asset Management. Additional information was gathered from Kitsap County, State of Washington, and scanned maps available in reports and permits. Sources are referenced in the body of this report and/or in **Appendix A-1**.

3.2 Interviews

CH2M conducted interviews on October 9, 10, 23, and 29, 2018 and January 17, 2019 with current and former personnel associated with past and present operations at MFD and NAVFAC Northwest personnel. The purpose of these interviews was to validate and verify data collected during document and record reviews and identify other information related to PFAS storage, use, or release not previously found in historical documents.

The interviews were conducted either in person or via phone. Each interview session was guided by a standard questionnaire. Some interviews were conducted jointly. Completed questionnaires are provided in **Appendix B**. The information from the interviews also was used to confirm and select additional locations to observe during visual site inspection (VSI) activities. This information is referenced throughout this report. Contact information for interviewees and personnel mentioned in interviews is provided in Appendix A3.

The following personnel were interviewed[4] (additional interviewee details are in **Appendix B**):

- Regional Fuel Manager/Deputy Director (2003 – present) – October 9, 2018
- Deputy Environmental Director (2001 – present) – October 9, 2018
- Environmental Engineer (2018 - present) – October 9, 2018
- Navy Region Northwest Fire Chief (2017-present) – October 10, 2018
- Navy Region Northwest Assistant Chief – Special Operations (2010-present) – October 10, 2018
- Former Fire Fighter # 1 – MFD (1989) – October 23, 2018
- Former Regional Fuel Manager (1985-2014) – October 29, 2018
- Former Fire Fighter # 2 – MFD (1991-1999) – January 17, 2019

[4] In addition to the interviewees listed here, CH2M requested interviews with representatives with ties to MFD. Potential interviewees were identified by CH2M staff or suggested by other interviewees. A reasonable attempt was made to contact each potential interviewee. In some cases, CH2M did not receive responses to email and voicemail requests for interviews.

3.3 Site Reconnaissance

VSIs were completed on October 9 and 10, 2018. During the VSI, accessible areas were visited to identify evidence of use and/or disposal of PFAS-containing materials to fill data gaps identified in the preliminary review. Physical site characteristics (for example, surface flow and drainage conditions) were documented for those areas identified during the preliminary review and interviews. Photographs were collected where permitted and are found in **Appendix C**. Information gathered during the VSIs is summarized in **Section 4**.

SECTION 4

Findings and Recommendations

Table 4-1 provides a list of typical PFAS source areas at Navy facilities, summarizes whether those areas are present at MFD, and for those that are present, identifies whether evidence suggests the area is a potential PFAS source area. Areas evaluated in this PA are shown on **Figure 4-1**. The areas identified in **Table 4-1** as potential PFAS source areas are further evaluated in **Section 4.3**.

4.1 Off-Base Drinking Water Exposure Assessment

An evaluation of off-Base drinking water was conducted to determine whether off-Base drinking water could have been impacted by any of the potential PFAS source areas identified in **Table 4-1**. As discussed in **Section 2.3.2.1**, groundwater is used as a drinking water source near and at MFD. Drinking water is provided by the MWD; four MWD supply wells are located to the south of MFD. Private wells were also identified within 1 mile of MFD; the use of these wells is unknown. Surficial groundwater flow is likely towards Little Clam Bay, Clam Bay, or Puget Sound. Groundwater flow on the western and eastern sides of MFD is generally to the northeast-east. Groundwater flow from the Vashon advance aquifer on the western side likely follows a predominantly northeastward to eastward path towards Little Clam Bay or Clam Bay. Groundwater flow from perched aquifers or saturated zones on the eastern side follows a predominately radial path towards Puget Sound, Clam Bay, or Little Clam Bay. Based on the location of MFD and the overall groundwater flow direction on the peninsula, the MWD supply wells, as well as the private wells, are upgradient of MFD. While there are confirmed releases of AFFF at MFD, no complete exposure pathway has been identified for off-base drinking water, and no emergency response action is warranted at this time.

4.2 Summary of Areas Evaluated

Areas identified as potential PFAS source areas are further evaluated in **Section 4.3**. Areas not identified as potential PFAS source areas are recommended for no further action and are not further evaluated. Areas identified as potential PFAS source areas are shown on Figures 4-2 to 4-7 in more detail.

Table 4-1. Areas Evaluated for Potential PFAS Source Areas at MFD

Area	Potential PFAS Source Area (Y/N)	Rationale
Firefighting Training Areas		
Former Navy Firefighting Training Area	Y	The Navy operated an FTA in the area northwest of the current facility boundary from 1942 through 1967 (N68436-MAD1 on **Figure 4-2**)**.** Firefighter training activities are known to have occurred through the 1950s and intermittently through 1967 (Perry, 1998). See **Section 4.3.1** for additional information and **Section 5** for the recommended path forward.
Fire Stations		
Former Fire Station and Spill Response Warehouse (Building 85)	Y	A Former Fire Station and Spill Response Warehouse (Building 85) (**Figure 4-3**), built in the early 1940s, was in operation as a fire station through 2005. AFFF deployment equipment was stored in Building 85 and AFFF may have been stored and handled at this location. See **Section 4.3.2** for additional information and **Section 5** for the recommended path forward.
Hangars		
No hangars were identified at MFD	NA	NA

Table 4-1. Areas Evaluated for Potential PFAS Source Areas at MFD

Area	Potential PFAS Source Area (Y/N)	Rationale
Buildings with AFFF Suppression Systems		
No buildings with AFFF suppression systems were identified at MFD.	NA	NA
Emergency Response Areas		
No emergency response areas identified at MFD.	NA	NA
AFFF Spray Test Areas		
Test Spray Area (ASTs 145 to 149)	Y	Five ASTs in the western portion of MFD have been the location of AFFF test-sprays (**Figure 4-4**). Secondary containment basins were installed in the 1990s; prior to that time porous gravel fill was used in the area of the tanks. According to interviews with former firefighters, AFFF was test-sprayed in the gravel-lined secondary containment basins surrounding ASTs 145-149. See **Section 4.3.3** for additional information and **Section 5** for the recommended path forward.
JP-8 Truck Loading Facility (Building 185)	Y	According to former facility personnel firefighting simulations using AFFF were conducted at least once per year at the JP-8 Truck Loading Facility (Building 185) due to its proximity to UST 50 (which currently stores JP-8) (**Figure 4-4**). See **Section 4.3.4** for additional information and **Section 5** for the recommended path forward.
Fuel Pier	Y	Two fuel piers have existed at MFD, with approximately 250 feet from the current and former fuel piers. The existing fuel pier is shown on **Figure 4-5**. Based on an interview with Fire Fighter #2, firefighting training simulations were conducted at least once a year along the former and existing fuel piers using firefighting foam. See **Section 4.3.5** for additional information and **Section 5** for the recommended path forward.
Wastewater Treatment Plants and Associated Disposal Areas		
Oily Waste Treatment Plant (OWTP)	N	The OWTP has been operating since 1978 and processes off-specification petroleum products that require downgrading, blending, or reclaiming prior to use (only non-hazardous substances are processed) (NAVSUP, 2008) (**Figure 4-1**). The types of reclaimed petroleum products include kerosene-based fuels, lube oils, and sediment from water generated by fuel tank cleaning, ship bilge cleaning, and other oil wastewater generated by maintenance activities from Naval facilities. Bilge waste may contain PFAS as a result of AFFF use aboard ships during training or emergency response, as documented in a recent environmental readiness program manual distributed in 2014 (Navy, 2014); however, there is no documentation of PFAS-containing bilge waste being introduced to the OWTP. Treated water from the OWTP discharges to a single outfall (OF-001A, which discharges to the same point as OF-001B [NAVSUP, 2008]) west of the Fuel Pier (Building 213) approximately 150 feet from shore at a depth of approximately 30 ft mean lower low water (NAVSUP, 2008). There is no evidence of spills or leaks at the OWTP; therefore, no further action is recommended for soil and groundwater at this site. Potential impacts to sediment associated with Outfall 001A and Outfall 001B (which receives inputs from multiple areas) will be considered in the context of investigations at the Fuel Pier (listed separately in this table).
Landfills and Waste Disposal Areas		
No landfills were identified at MFD.	NA	NA

Table 4-1. Areas Evaluated for Potential PFAS Source Areas at MFD

Area	Potential PFAS Source Area (Y/N)	Rationale
Polychlorinated Biphenyl (PCB) Disposal Area (Site 302)	Y	Site 302 (PCB Disposal Area) was used as a dump for ship bilge waste, transformer oil, and other petroleum waste from MFD operations and Regional Naval facilities in the Puget Sound from 1955 through 1976 (**Figure 4-6**). Bilge waste disposed at this location may contain PFAS as a result of AFFF use aboard ships during training or emergency response (Navy, 2014). See **Section 4.3.6** for additional information and **Section 5** for the recommended path forward.
Specialty Paint, Cleaner, or Pesticide Use or Release		
No use or release of PFAS-containing specialty paints, cleaners, or pesticides was identified at MFD	NA	**NA**
Chrome Plating Shops		
No chromium plating shops were identified at MFD.	NA	NA
Potential PFAS Storage Areas		
Fuel Pump House (Building 12)	Y	Fuel Pump House (Building 12) houses the emergency generator for MFD, the pumps for transferring fuel between storage tanks, and the manifold equipment where all the piping contained in Tunnels B, C, and D and pipes from the USTs 16-21 converge (**Figure 4-3**). Building 12 is the current storage location of AFFF drums and may have been the historical storage location of AFFF. Additionally, AFFF may have been transferred to deployment equipment at this building. See **Section 4.3.7** for additional information and **Section 5** for the recommended path forward.
Other		
Vehicle Wash Rack	Y	The Vehicle Wash Rack (VWR) is located near the south-southeastern corner of Building 194 (**Figure 4-7**) and was constructed in 1996 to wash base vehicles and various equipment. According to the current Regional Fuel Manager/Deputy Director, staff are instructed to wash fire trucks and any other equipment at the VWR (Regional Fuel Manager/ Deputy Director, pers. comm., 2018); however, Former Fire Fighter #2, who worked at MFD from 1991 to 1999, reported that fire trucks were washed in front of the Fire Station and not at the VWR (Former Fire Fighter #2, 2019, pers. comm). In agreement with Former Fire Fighter #2, the Former Regional Fuel Manager, who worked at MFD from 1985 to 2014, it was reported that fire trucks were washed in front of the Fire Station (Former Regional Fuel Manager, pers. comm., 2018). If fire trucks were washed at the VWR, there is the potential for residual AFFF to have been present and released to the adjacent forested area or through cracks in the concrete or adjacent asphalt pavement. See **Section 4.3.8** for additional information and **Section 5** for the recommended path forward.
D Tunnel Tanks (Site 303)	N	Site 303 (D Tunnel Tanks) consists of eight 20,000 to 50,000-barrel (840,000 to 2,100,000 gallons) concrete USTs used to store marine diesel fuel. The USTs are located on the D-Tunnel line that extends from Tank 30 to Building 12 in the Industrial Area (**Figure 4-1**). Two significant fuel spills have been documented at Site 303 (NAVFAC, 2015). A spill occurred at Tank 30 in February 1990 that involved the release of approximately 38,000 to 40,000 gallons of diesel fuel. Another spill occurred at Tank 24 in March 1990 that involved the release of approximately 10,000 gallons of diesel fuel. There is no evidence to suggest that AFFF was used in the management of these spills, nor is there any record of AFFF being stored or transferred in association with these tanks. No further action is recommended for this area.

Table 4-1. Areas Evaluated for Potential PFAS Source Areas at MFD

Area	Potential PFAS Source Area (Y/N)	Rationale
Industrial Area (Site 304)	N	Site 304 (Industrial Area) is located in the eastern portion of MFD (**Figure 4-1**). It includes maintenance, administration, and fuel pumping buildings, including Building 12, previously discussed, and it is the central transfer point for most of the petroleum products stored at MFD. In 1989, a soil investigation was conducted as part of a construction project at the fuel pier. Jet fuel was found in one sample collected at the water table (Hart Crowser, 1988). This prompted a series of investigations between 1993 and 2000 to assess the presence and extent of petroleum hydrocarbons in soil and groundwater (NAVFAC, 2015). Based on historical records, interviews, and site reconnaissance there is no evidence to suggest that AFFF or other PFAS-containing materials have been associated with industrial activities at Site 304, with the exception of Building 12 as previously described. No further action is recommended for this area.

4.3 Potential PFAS Release Areas Identified for Further Evaluation

4.3.1 Former Navy Firefighting Training Area

4.3.1.1 Description and Operational History

The Former Navy FTA is located in the northwestern area of the facility boundary and can be accessed from Blackberry Loop Road (Disposal Property N68436-MAD1 on **Figure 4-1**). The approximate geographic coordinates of the Former Navy FTA are provided in Appendix A-4.

A majority of the property on which the Former Navy FTA was located was transferred to the General Services Administration and subsequently leased to NOAA on March 1, 1968 (Perry, 1998). A portion of the land on which the Former Navy FTA operated is still owned by the Navy and leased to NOAA (**Figure 4-2**).

4.3.1.2 Potential for PFAS Storage, Use, or Release

According to former Navy Region Northwest personnel, intermittent firefighting activities are known to have occurred from the 1950s through 1967. Training included simulated fuel firefighting. There is uncertainty on whether AFFF was deployed during this training based on the timeframe of documented training (Perry, 1998).

4.3.1.3 Migration Pathway and Exposure Assessment

Groundwater

Because of the history of the site it is possible that if used, AFFF could have infiltrated the subsurface and entered the underlying Vashon Advance Outwash aquifer. This aquifer is thought to be hydraulically connected to the recessional outwash channel in the northwestern portion of the base. Groundwater flow in the area generally is assumed to follow topography flow in a south and east direction into Beaver Creek and Clam Bay (**Figure 4-2**). The depth to groundwater at the former Navy firefighting training area is unknown. As there are no drinking water supply wells downgradient of this area, the potential for exposure to PFAS through municipal and/or private water supply wells is unlikely. Workers and visitors are present at the Former Navy FTA and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted groundwater at the Former Navy FTA, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF potentially released during firefighting training activities could potentially impact soil within unpaved areas to the south of the Former Navy FTA (**Figure 4-2**). Workers and visitors are present at the Former Navy FTA and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted soil at the Former Navy FTA, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors. Fugitive dust emissions may occur during dry periods. Construction or other ground-disturbing activities could result in worker exposure to potentially contaminated dust.

Sediment and Surface Water

The topography of the leased portion of the Former Navy FTA gently slopes toward Beaver Creek and Tidal Pool, an inlet of Clam Bay to the south of the site (**Figure 4-2**). AFFF potentially released during firefighting training activities that flowed toward Clam Bay provides a potential pathway to sediment, surface water, and aquatic organisms. Public shellfish beaches within 1 mile of MFD have been closed because of pollution, however, shellfish could potentially be harvested within a 1-mile radius of MFD on private beaches (WDFW, 2019b). Fishing potentially occurs in the waters surrounding MFD. Fishing from the shore near MFD potentially occurs at two locations within 1 mile of MFD, at the Manchester Boat Launch and the Manchester State Park (Explore Port Orchard, 2019) (**Figure 2-2**). Tribal members have retained the right to harvest within their usual and accustomed fishing area, which includes this site. Workers and visitors are present at the Former Navy FTA and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted surface water, fish, shellfish, or sediment, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Recommendation

Based on the history of the area as a Former Navy FTA and known use of AFFF in other areas at MFD, further investigation is recommended at the portion of the Former Navy FTA that is within the base boundary as part of an SI. The SI should evaluate human health risk for PFAS-impacted media where complete pathways exist. If formal regulatory-based ESVs are available for PFAS compounds in the future, evaluation of ecological risk as part of a future investigation is recommended.

4.3.2 Former Fire Station and Spill Response Warehouse (Building 85)

4.3.2.1 Description and Operational History

The Former Fire Station and Spill Response Warehouse (Building 85) is located off Cedar Avenue in the southwestern quadrant of the MFD facility footprint on the eastern side of MFD (**Figure 4-3**). The approximate geographic coordinates of Former Fire Station and Spill Response Warehouse (Building 85) are provided in Appendix A-4. Building 85 was constructed in the 1940s and operational as a fire station until 2005. After 2005, firefighting support was provided by the City of Manchester Fire Department, Kitsap County Fire Department, and the Navy Federal Fire Department stationed in Naval Base Kitsap (NBK) Bremerton. Currently the building is used to store oil spill response boats and associated equipment and used as a meeting and office space.

4.3.2.2 Potential for PFAS Storage, Use, or Release

AFFF was likely stored and handled at Building 85 when the building was used as a fire station. Firefighting trucks were reported to have been washed outside of this building prior to the construction of the Vehicle Wash Rack (VWR) (Former Regional Fuel Manager, pers. comm., 2018). Firefighting equipment known to have contained AFFF that was filled and stored at Building 85 included a large spray nozzle and fluid cannon referred to as the "Portable hose on a trailer" or the "hired gun," along with a 500-gallon tank mounted on a trailer that was used for AFFF deployment. This equipment was capable of projecting AFFF at a height greater than 40 feet, which was required to overcome the height of the ASTs on base (National Fire Protection Association, 1957; Former Regional Fuel Manager, pers. comm., 2018).

4.3.2.3 Migration Pathway and Exposure Assessment

Groundwater

Because of the history of the site use as a fire station it is possible that incidental release or spills of AFFF could have infiltrated the subsurface and entered perched aquifers characteristic of the eastern portion of MFD. Groundwater flow near Building 85 is generally assumed to mimic the topography and flow to the southeast toward Puget Sound (**Figure 4-3**). The depth to groundwater at this area is unknown; although groundwater was not encountered at a depth of 43 feet bgs in a soil boring located less than 50 feet southeast of Building 85. This soil boring was installed as part of a 2017 Phase II Environmental Site Investigation (CH2M, 2018). Previous investigations characterized the eastern portion of MFD as having perched saturated zones that are likely to flow towards Puget Sound (Battelle, 2017). As there are no known drinking water supply wells downgradient of Building 85, the potential for exposure to PFAS through municipal and/or private water supply wells is unlikely. Workers and visitors are present at Building 85 and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted groundwater at Building 85, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF potentially released during the building's operation as a fire station could have impacted unpaved areas to the west, south, and east of Building 85 (**Figure 4-3**). Workers and visitors are present at Building 85 and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted soil at Building 85, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors. Fugitive dust emissions may occur during dry periods. Construction or other ground-disturbing activities could result in worker exposure to potentially contaminated dust.

Sediment and Surface Water

The topography of the ground surface at Building 85, slopes down to the southeast-east towards Puget Sound (**Figure 4-3**). As the paved area in front of Building 85 slopes down to the north, AFFF potentially released during firefighting training activities and the washing of firefighting trucks would have flowed north into the adjacent grassy area and likely have been captured by an adjacent unpaved ditch to the west. This ditch, along Cedar Avenue, ultimately discharges to Puget Sound, which provides a potential pathway to sediment, surface water, and aquatic organisms. Public shellfish beaches within 1 mile of MFD have been closed because of pollution, however, shellfish could potentially be harvested within a 1-mile radius of MFD on private beaches (WDFW, 2019b). Fishing potentially occurs in the waters surrounding MFD. Fishing from the shore near MFD potentially occurs at two locations within 1 mile of MFD, at the Manchester Boat Launch and the Manchester State Park (Explore Port Orchard, 2019) (**Figure 2-2**). Tribal members have retained the right to harvest within their usual and accustomed fishing area, which includes this site. Workers and visitors are present at Building 85 and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted surface water, fish, shellfish, or sediment, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.2.4 Recommendation

Because of the operational history of this area as a former Fire Station, further investigation is recommended at Building 85 as part of an SI. The SI should evaluate human health risk for PFAS-impacted media where complete pathways exist. If formal regulatory-based ESVs are available for PFAS compounds in the future, evaluation of ecological risk as part of a future investigation is recommended.

4.3.3 Test Spray Area (ASTs 145 through 149)

4.3.3.1 Description and Operational History

The test spray area encompasses the containment basins of ASTs 145 through 149 (**Figure 4-4**). This area is located in the western portion of MFD off of Hemlock Road. The approximate geographic coordinates of the Test

Spray Area (ASTs 145 through 149) are provided in Appendix A-4. The five welded-steel ASTs in this area are constructed of a floating roof and were installed in 1953. Each AST in this area has a capacity of 3.36 million gallons and is currently used to store jet fuel (NAVSUP, 2018). The tanks rest on a concrete foundation on top of compacted soil. Between 1995 and 1998 each tank was lined with an epoxy coating. Porous gravel material was historically used as fill material around these ASTs until concrete basins were installed in the mid-1990s, according to the MFD Environmental and Engineering Supervisor (Environmental and Engineering Supervisor, pers. comm., 2018). The permeability of the concrete is estimated to be on the order of 10^{-8} centimeters per second (NAVSUP, 2018). It is unknown how the previous gravel material was disposed, if at all, during the facility of the replacement concrete liners.

4.3.3.2 Potential for PFAS Storage, Use, or Release

According to former Navy Region Northwest personnel AFFF was sprayed in the containment basins of ASTs (Former Fire Fighter #1, pers. comm., 2018; Former Fire Fighter #2, pers. comm., 2019). The gravel-lined secondary containment basins were rinsed out with non-potable water. The frequency of spray tests from 1991 to 1999 was semi-annual, and a large nozzle "Portable Monitor on a Trailer," also known as the "Hired Gun" would be used to spray foam along the ASTs to simulate how they would extinguish a large petroleum fire. The nozzle could spray AFFF at a rate of approximately 2,000 gallons per minute. According to the Former Regional Fuel Manager, JP-4 Fuel, which has a higher flash point compared to other fuels at MFD, was once stored in ASTs 147 through 149 (Former Regional Fuel Manager, pers. comm., 2018). Because of the potential for flash fires to erupt at these tanks, it is believed that the MFD fire fighters trained near these ASTs to ensure the fire battalion were familiar with the basins, to more effectively respond to a possible fire emergency.

4.3.3.3 Migration Pathway and Exposure Assessment

Groundwater

Based on the history of the site it is possible that an AFFF could have infiltrated the Vashon Recessional Outwash Deposits or Vashon Advance Outwash aquifer on the western portion of MFD. Groundwater flow near the Test Spray Area is assumed to mimic the topography and flows to the southeast to east direction towards Little Clam Bay or northeast direction towards Clam Bay (**Figure 4-4**).

Previous investigations characterized groundwater depth below the western portion of MFD at a depth of 30 to 50 feet bgs, however groundwater flow was not specifically evaluated (CH2M, 2018). As there are no known drinking water supply wells downgradient of the Test Spray Area, the potential for exposure to PFAS through municipal and/or private water supply wells is unlikely. Workers and visitors are present at the Test Spray Area and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted groundwater at the Test Spray Area, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF potentially released during firefighting training activities could have impacted unpaved areas prior to the facility of the concrete containment basins (**Figure 4-4**). After facility of the containment basins AFFF released during firefighting training activities could have infiltrated the surrounding ground through cracks in the concrete. Several cracks in the lines were observed during the field reconnaissance conducted on October 9 and 10, 2018. At the time of the field reconnaissance, contractors were in the process of sealing cracks because of intrusive vegetation.

Workers and visitors are present at the Test Spray Area and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted soil at the Test Spray Area, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors. Fugitive dust emissions may occur during dry periods. Construction or other ground-disturbing activities could result in worker exposure to potentially contaminated dust.

Sediment and Surface Water

The topography of the Test Spray Area slopes gradually to the northeast-east-southeast toward either Clam Bay or Little Clam Bay (**Figure 4-4**). The concrete containment systems of the ASTs have drainage systems that are interconnected, so that any basin can act as a backup to the other ASTs (NAVSUP, 2018). Surface flow captured in the containment basins would be routed to the oil water separator (OWS) 6A and discharged into Franco Pond (NAVSUP, 2018). Overland flow could enter Franco Pond from the stormwater drainage or be conveyed through a culvert under Beach Drive East leading to Little Clam Bay, providing a potential pathway to sediment, surface water, and aquatic organisms. Public shellfish beaches within 1 mile of MFD have been closed because of pollution; however, shellfish could potentially be harvested within a 1-mile radius of MFD on private beaches (WDFW, 2019b). Fishing potentially occurs in the waters surrounding MFD. Fishing from the shore near MFD potentially occurs at two locations within 1 mile of MFD, at the Manchester Boat Launch and the Manchester State Park (Explore Port Orchard, 2019) (**Figure 2-2**). Tribal members have retained the right to harvest within their usual and accustomed fishing area, which includes this site. Workers and visitors are present at the Test Spray Area and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted surface water, fish, shellfish, or sediment, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.3.4 Recommendation

Because of the reported use of AFFF during firefighting training in this area, further investigation is recommended at the Test Spray Area as part of an SI. The SI should evaluate human health risk for PFAS-impacted media where complete pathways exist. If formal regulatory-based ESVs are available for PFAS compounds in the future, evaluation of ecological risk as part of a future investigation is recommended.

4.3.4 JP-8 Truck Loading Facility (Building 185)

4.3.4.1 Description and Operational History

The JP-8 Truck Loading Facility (Building 185) is located off of Gasoline Drive on the western portion of MFD (**Figure 4-4**). The approximate geographic coordinates of the JP-8 Truck Loading Facility (Building 185) are provided in Appendix A-4. The facility currently consists of a roof, fuel pumps, filtration systems, concrete pad with secondary containment, two loading bays, and a spill drainage system. This area contains UST 50, which is located to the north of Building 185. JP-5 was periodically transferred from the loading rack to semi-tractor trailer fuel tanker trucks for delivery to other Naval facilities.

4.3.4.2 Potential for PFAS Storage, Use, or Release

According to former Navy Region Northwest personnel JP-5 fuel was historically stored in UST 50. During this time, firefighting simulations were conducted at least once per year at the Building 185, because of its proximity to UST 50. The firefighting simulations consisted of spraying AFFF along the perimeter of the truck loading rack (Former Fire Fighter #2, pers. comm. 2019). AFFF was mixed and filled into a 3,000 or 5,000-gallon fuel tank that was mounted on a trailer and mobilized to each training area such as the JP-8 Truck Loading Facility.

4.3.4.3 Migration Pathway and Exposure Assessment

Groundwater

Because of the history of the site, it is possible that AFFF used during the trainings could have infiltrated the subsurface and entered the Vashon Recessional Outwash Deposits or the Vashon Advance Outwash aquifer on the western portion of MFD **(Figure 4-4**). AFFF released within the facility would likely have been captured by the two 5,000-gallon concrete underground spill containment tanks, with one tank per bay (NAVSUP, 2018). Flow from the spill containment tanks is conveyed by gravity to the OWS 7. The depth to groundwater at this area is unknown. Previous investigations characterized the western portion of MFD as having a groundwater at a depth of 30 to 50 feet bgs (CH2M, 2018). As there are no known drinking water supply wells downgradient of Building 185, the potential for exposure to PFAS through municipal and/or private water supply wells is unlikely. Workers

and visitors are present at the JP-8 Truck Loading Facility and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted groundwater at the JP-8 Truck Loading Facility, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF released during the trainings could have had direct contact with the surrounding soil around Building 185 or could have impacted soil through cracks in the asphalt **(Figure 4-4**). Workers and visitors are present at the JP-8 Truck Loading Facility and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted soil at the JP-8 Truck Loading Facility, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors. Fugitive dust emissions may occur during dry periods. Construction or other ground-disturbing activities could result in worker exposure to potentially contaminated dust.

Sediment and Surface Water

The topography of the Building 185 area slopes down to the east towards Little Clam Bay (**Figure 4-4**). Overland flow could enter Little Clam Bay or be conveyed through drainage ditches located to the east of the truck rack and be contained in OWS 7. Overland flow to Little Clam Bay or capture of runoff by the stormwater system, which ultimately discharges into Puget Sound, provides a potential pathway to sediment, surface water, and aquatic organisms. Public shellfish beaches within 1 mile of MFD have been closed because of pollution, however, shellfish could potentially be harvested within a 1-mile radius of MFD on private beaches (WDFW, 2019b). Fishing potentially occurs in the waters surrounding MFD. Fishing from the shore near MFD potentially occurs at two locations within 1-mile of MFD, at the Manchester Boat Launch and the Manchester State Park (Explore Port Orchard, 2019) (**Figure 2-2**). Tribal members have retained the right to harvest within their usual and accustomed fishing area, which includes this site. Workers and visitors are present at the JP-8 Truck Loading Facility and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted surface water, fish, shellfish, or sediment, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.4.4 Recommendation

Because of the reported use of AFFF during firefighting trainings in this area, further investigation is recommended at JP-8 Truck Loading Facility (Building 185) as part of an SI. The SI should evaluate human health risk for PFAS-impacted media where complete pathways exist. If formal regulatory-based ESVs are available for PFAS compounds in the future, evaluation of ecological risk as part of a future investigation is recommended.

4.3.5 Fuel Pier

4.3.5.1 Description and Operational History

The 1,390-foot existing Fuel Pier is used for the receipt and issue of fuel to ships. It is located approximately 200 feet from the Fuel Pump House on Orchard Point in the eastern portion of MFD **(Figure 4-5)**. The approximate geographic coordinates of the Fuel Pier are provided in Appendix A-4. Stormwater on the fuel pier is collected and pumped to a sump that discharges to Outfall 001B (NAVSUP, 2008).

The first fuel pier at MFD was originally constructed during World War II as MFD was expanded into a fully functional Naval Base (Perry, 1988). The fuel pier visible in a 1951 aerial photograph was replaced by the existing Fuel Pier between 1990 and 1994 (Battelle, 2017). Based on the aerial photographs, the former Fuel Pier was located approximately 250 feet to the south of the existing Fuel Pier.

4.3.5.2 Potential for PFAS Storage, Use, or Release

Based on an interview with a former fire fighter, firefighting simulations were conducted at least once a year along the former and existing fuel piers **(Figure 4-5)**. Foam was sprayed on and along the fuel piers (Former Fire

Fighter #2, pers. comm., 2019). The number of years and total quantity of AFFF used during each spray test are unknown.

4.3.5.3 Migration Pathway and Exposure Assessment

Groundwater

The majority of the Fuel Pier is located over the Puget Sound **(Figure 4-5)**. As such, AFFF release during firefighting simulations would be washed out into Puget Sound and would not likely impact groundwater aquifers.

Soil and Air

AFFF released during the trainings could have direct contact with the surrounding soil at the point where the piers connected to the land **(Figure 4-5)**. Workers and visitors are present at the Fuel Pier and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted soil at the Fuel Pier, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors. Fugitive dust emissions may occur during dry periods. Construction or other ground-disturbing activities could result in worker exposure to potentially contaminated dust.

Sediment and Surface Water

Surface water and sediment in this area would have had direct contact with the AFFF that was sprayed there during the simulated fire trainings **(Figure 4-5)**. As the Fuel Pier is above water, any release would have had a direct impact on the nearby sediment, surface water, and aquatic organisms. The depth of surface water along the pier ranged from 0 feet at the shore to about 70 feet at the end of the 1,390-foot pier. The depth of water along the pier is about 20 feet at 300 feet from the shore (NOAA, 2014).

Public shellfish beaches within 1 mile of MFD have been closed because of pollution, however, shellfish could potentially be harvested within a 1-mile radius of MFD on private beaches (WDFW, 2019b). Fishing potentially occurs in the waters surrounding MFD. Fishing from the shore near MFD potentially occurs at two locations within 1 mile of MFD, at the Manchester Boat Launch and the Manchester State Park (Explore Port Orchard, 2019) (**Figure 2-2**). Tribal members have retained the right to harvest within their usual and accustomed fishing area, which includes this site. Workers and visitors are present at the Fuel Pier and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted surface water or sediment, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.5.4 Recommendation

Because of the reported use of AFFF during firefighting trainings at the existing and former fuel pier locations and the potential impact to adjacent and underlying sediment, further investigation is recommended for sediment and surface water at the Fuel Pier as part of an SI[5]. The SI should evaluate human health risk for PFAS-impacted media where complete pathways exist. If formal regulatory-based ESVs are available for PFAS compounds in the future, evaluation of ecological risk as part of a future investigation is recommended.

4.3.6 PCB Disposal Area (Site 302)

4.3.6.1 Description and Operational History

The PCB disposal area (Site 302) is located in the western portion of MFD (**Figure 4-6**). The southern end of the site is along the perimeter fence line. The approximate geographic coordinates of the PCB Disposal Area (Site 302) are provided in Appendix A-4. Site 302 was used as a landfill for ship bilge waste, transformer oil, and other petroleum waste from operations within MFD and from other Regional Naval facilities in the Puget Sound between 1955 and 1976. The volume of waste deposited at this site is during this timeframe is unknown. This

5 The Navy is currently developing guidance regarding management of pierside releases of AFFF. Upon issuance of this guidance, this pierside release will be re-evaluated and may be investigated as part of an SI, if warranted.

area is also the site of "practice burns," where wood and other dunnage material would be burned (Hart Crowser, 1988).

Site 302 was classified as a CERCLA site in the early 1990s. As part of the remediation effort in the late 1990s, an excavation was conducted to remove impacted soils, and clean fill was imported to use as clean cover. PFAS impacts were not evaluated at the time of this remediation effort (NAVFAC, 2015). The site was given closure by the DOE and USEPA in September 2000 (DOE, 2000).

4.3.6.2 Potential for PFAS Storage, Use, or Release

Bilge waste may contain PFAS because of use of AFFF use aboard ships during training or emergency response, as documented in a recent environmental readiness program manual distributed in 2014 (Navy, 2014). From 1955 through 1976, any residuals from an onboard fire or training exercise may have drained to the ship's bilge system and subsequently been deposited as waste at Site 302. As a result of this activity, waste containing PFAS could have potentially been deposited at Site 302.

4.3.6.3 Migration Pathway and Exposure Assessment

Groundwater

Groundwater flow near Site 302 is assumed to mimic topography and flow to either the north, northeast, and east (depending on location within Site 302) toward Little Clam Bay located to the east of Site 302 (**Figure 4-6**). During a previous investigation of Site 302 groundwater flow was evaluated for the entire peninsula using well log data and well groundwater levels (Hart Crowser, 1988). As part of the Hart Crowser investigation of Site 302 in 1986 three borings, up to 24 feet bgs, were advanced through the fill material and into the underlying silt. No groundwater was encountered in any of the three borings. A limited quantity of water may be available in seasonally perched aquifers, between 0 to 10 feet bgs, above the silt aquitard layer (NAVFAC, 1993).

Previous investigations of Site 302 have suggested that the underlying silt layer acts as an aquitard that impedes downward flow into underlying aquifers (Hart Crowser, 1988). PFAS-containing materials deposited at Site 302 are unlikely to have impacted groundwater, based on the known depth to groundwater and the confining properties of the underlying silt layer.

The nearest municipal water wells, Wells 10 and 11, are approximately 890 feet to the southeast of Site 302 **(Figure 2-1)**. Based on known groundwater flow direction of both the Vashon Advance Outwash aquifer and sea level aquifers as well as topography, these and any private wells to the south of the base would be upgradient of Site 302 (Hart Crowser, 1988; MWD, 2018). As there are no drinking water supply wells downgradient of this area, the potential for exposure to PFAS through municipal and/or private water supply wells is unlikely. Workers and visitors are present at Site 302 and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted groundwater at Site 302, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

PFAS-containing materials used as fill at Site 302 would have been in direct contact with the subsurface, potentially impacting adjacent soil (**Figure 4-6**). Workers and visitors are present at Site 302 and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted soil at Site 302, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors. Fugitive dust emissions may occur during dry periods. Construction or other ground-disturbing activities could result in worker exposure to potentially contaminated dust.

Sediment and Surface Water

Site 302 is located on a topographic high spot with the surrounding area sloping downward radially from the west to the north and east (**Figure 4-6**). Flow is conveyed through ditches and streams on or adjacent to Site 302, and the main flow channels are two ditches along both sides of Montecito Road (Hart Crowser, 1988). Surface from the main flow channels enters Little Clam Bay located to the east-northeast of Site 302, which provides a potential pathway to sediment, surface water, and aquatic organisms. Public shellfish beaches within 1 mile of MFD have

been closed because of pollution, however, shellfish could potentially be harvested within a 1-mile radius of MFD on private beaches (WDFW, 2019b). Fishing potentially occurs in the waters surrounding MFD. Fishing from the shore near MFD potentially occurs at two locations within 1 mile of MFD, at the Manchester Boat Launch and the Manchester State Park (Explore Port Orchard, 2019) (**Figure 2-2**). Tribal members have retained the right to harvest within their usual and accustomed fishing area, which includes this site. Workers and visitors are present at Site 302 and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted surface water, fish, shellfish, or sediment, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.6.4 Recommendation

Because of the history of Site 302 as a landfill that received bilge waste and the uncertainty whether potential PFAS impacts were addressed during prior remediation effort, further investigation is recommended at Site 302 as part of an SI. The SI should evaluate human health risk for PFAS-impacted media where complete pathways exist. If formal regulatory-based ESVs are available for PFAS compounds in the future, evaluation of ecological risk as part of a future investigation is recommended.

4.3.7 Fuel Pump House (Building 12)

4.3.7.1 Description and Operational History

The Fuel Pump House (Building 12) was constructed in the 1940s. Building 12 is located approximately 200 feet from the Fuel Pier on Orchard Point in the eastern portion of MFD (**Figure 4-3**). The approximate geographic coordinates of the Fuel Pump House (Building 12) are provided in Appendix A-4. Building 12 is used as a warehouse, and houses the emergency generator for MFD, the pumps for transferring fuel between storage tanks, and the manifold equipment where all the piping contained in Tunnels B, C, and D and pipes from the USTs 16-21 converge (**Figure 2-1**) (NAVSUP, 2018). Additionally, two lube oil tanker trucks are parked in the building during the cold months.

4.3.7.2 Potential for PFAS Storage, Use, or Release

The base engineering staff, in coordination with the Navy Federal Fire Department based at NBK Bremerton, currently and have historically stored and staged AFFF since the mid-1980s, to fight JP-4 fuel fires (Assistance Fire Chief Navy Region Northwest, pers. comm., 2018). Quantities of AFFF stored in Building 12 have ranged from 10 to 40 drums. The November 2008 Stormwater Pollution Prevention Plan documents that twelve 55-gallon drums of AFFF were stored in Building 12 (NAVSUP, 2008). At the time of the site reconnaissance 44 55-gallon drums of C6 formula (3 percent AFFF concentrate) were observed to be stored in Building 12. Based on interviews it is suspected that AFFF may have been transferred inside Building 12 to support the Test Spray training conducted within the secondary containment basins at ASTs 147 through 149 (NAVSUP, 2018; Former Regional Fuel Manager, pers. comm., 2018).

4.3.7.3 Migration Pathway and Exposure Assessment

Groundwater

Because of the history of the Fuel Pump House it is possible that AFFF from spills over the years could have infiltrated the subsurface through cracks in the pavement and unpaved areas to the west and north of Building 12 and infiltrated perched aquifers characteristic of the eastern portion of MFD (**Figure 4-3**). The depth to groundwater at the Fuel Pump House is unknown. Previous investigations characterized the eastern portion of MFD as having perched saturated zones within the glacial till overlaying the bedrock that are likely to flow towards Clam Bay or Puget Sound. Additionally, there is no evidence that they are hydraulically connected (Battelle, 2017). As there are no known drinking water supply wells downgradient of Building 12 the potential for exposure to PFAS through municipal and/or private water supply wells is unlikely. Workers and visitors are present at Building 12 and workers, visitors, and residents are present within a 1-mile radius of the area. If

additional evaluation identifies PFAS-impacted groundwater at Building 12, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF potentially released during the building's use as a storage site could have impacted unpaved areas to the north and west of Building 12 (**Figure 4-3**). Workers and visitors are present at Building 12 and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted soil at Building 12, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors. Fugitive dust emissions may occur during dry periods. Construction or other ground-disturbing activities could result in potential worker exposure to dust.

Sediment and Surface Water

The topography of the ground surface at the Fuel Pump House slopes down to the east-southeast towards Puget Sound (**Figure 4-3**). Overland surface flow is generally considered to be captured by the storm drain system or follow topography and be conveyed to Puget Sound, which provides a potential pathway to sediment, surface water, and aquatic organisms. As AFFF is presumed to be stored inside the Fuel Pump House it is unlikely that PFAS was conveyed through surface flow and subsequently impacted sediments. Workers and visitors are present at Building 12 and workers, visitors, and residents are present within a 1-mile radius of the area. If additional evaluation identifies PFAS-impacted surface water or sediment, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.7.4 Recommendation

Because of the historical and current use of this area as a storage area and likely transfer area for AFFF, further investigation is recommended at the Fuel Pump House as part of an SI. The SI should evaluate human health risk for PFAS-impacted media where complete pathways exist. If formal regulatory-based ESVs are available for PFAS compounds in the future, evaluation of ecological risk as part of a future investigation is recommended.

4.3.8 Vehicle Wash Rack

4.3.8.1 Description and Operational History

The Vehicle Wash Rack (VWR) is located near the south-southeastern corner of Building 194 **(Figure 4-7**) and was constructed in 1996 to wash base vehicles and equipment. The approximate geographic coordinates of the VWR are provided in Appendix A-4.

4.3.8.2 Potential for PFAS Storage, Use, or Release

The wash waters are treated in an OWS that is adjacent to OWS 2 and then discharged to the sanitary sewer, which is operated by the Manchester Water District. According to the current Regional Fuel Manager and Deputy Director, fire station staff were instructed to wash fire trucks and any other equipment at the VWR (Regional Fuel Manager/Deputy Director, 2018, pers. comm). There is uncertainty; however, regarding whether fire trucks were washed at the VWR or in front of the fire station because Former Fire Fighter #2 and the Former Regional Fuel Manager reported that fire trucks were washed in front of the fire station (Former Fire Fighter #2, 2019, pers. Comm; Former Regional Fuel Manager, pers. comm., 2018). If fire trucks were washed at the racks, there is the potential for residual AFFF to have been present and released.

4.3.8.3 Migration Pathway and Exposure Assessment

Groundwater

AFFF residual from washing vehicles is likely to have flowed into the stormwater drains that lead to an OWS, which discharges to the sanitary sewer. The VWR is paved, as is most of the surrounding area, with the exception of a forested area approximately 15 feet to the east **(Figure 4-7)**. Spray from the washing of vehicles could have potentially infiltrated the ground east of the VWR or through cracks in the surrounding pavement and entered perched aquifers characteristic of the eastern portion of MFD. The depth to water at the VWR is unknown.

Previous investigations characterized the eastern portion of MFD as having perched saturated zones within the glacial till overlaying the bedrock that are likely to flow towards Clam Bay. Additionally, there is no evidence that they are hydraulically connected (Battelle, 2017). As there are no known drinking water supply wells downgradient of the VWR the potential for exposure to PFAS through municipal and/or private water supply wells is unlikely.

Soil and Air

AFFF released during the washing of vehicles could have impacted the soil of the grassy area to the east of the VWR or through cracks in paved surfaces **(Figure 4-4)**. Workers, visitors, trespassers, and residents are present within a 1-mile radius of the area and could be potentially exposed to impacted soil. Fugitive dust emissions may occur during dry periods. Construction or other ground-disturbing activities could result in worker exposure to potentially contaminated dust. Site fauna, including resident deer, could potentially be exposed to impacted soil.

Sediment and Surface Water

The topography of the ground surface at the VWR slopes gradually down to the east and then to Puget Sound (**Figure 4-7**). Overland surface flow is generally considered to be captured by the inlets to the storm drain system or follow topography and be conveyed to Puget Sound, which provides a potential pathway to sediment, surface water, and aquatic organisms. Public shellfish beaches within 1-mile of MFD have been closed due to pollution; however, shellfish could potentially be harvested within a 1-mile radius of MFD on private beaches (WDFW, 2019). Fishing potentially occurs in the waters surrounding MFD. Fishing from the shore near MFD potentially occurs at two locations within 1-mile of MFD, at the Manchester Boat Launch and the Manchester State Park (Explore Port Orchard, 2019) (**Figure 2-2**). Tribal members have retained the right to harvest within their usual and accustomed fishing area, which includes this site. Workers, visitors, trespassers, and residents are present within a 1-mile radius of the area and potentially could be exposed to impacted surface water, shellfish, fish, and sediment.

4.3.8.4 Recommendation

Based on the uncertainty regarding whether this area was used to wash fire trucks with AFFF residue, further investigation is recommended at the VWR as part of an SI. The SI should evaluate human health risk for PFAS-impacted media where complete pathways exist. If formal regulatory-based ESVs are available for PFAS compounds in the future, evaluation of ecological risk as part of a future investigation is recommended.

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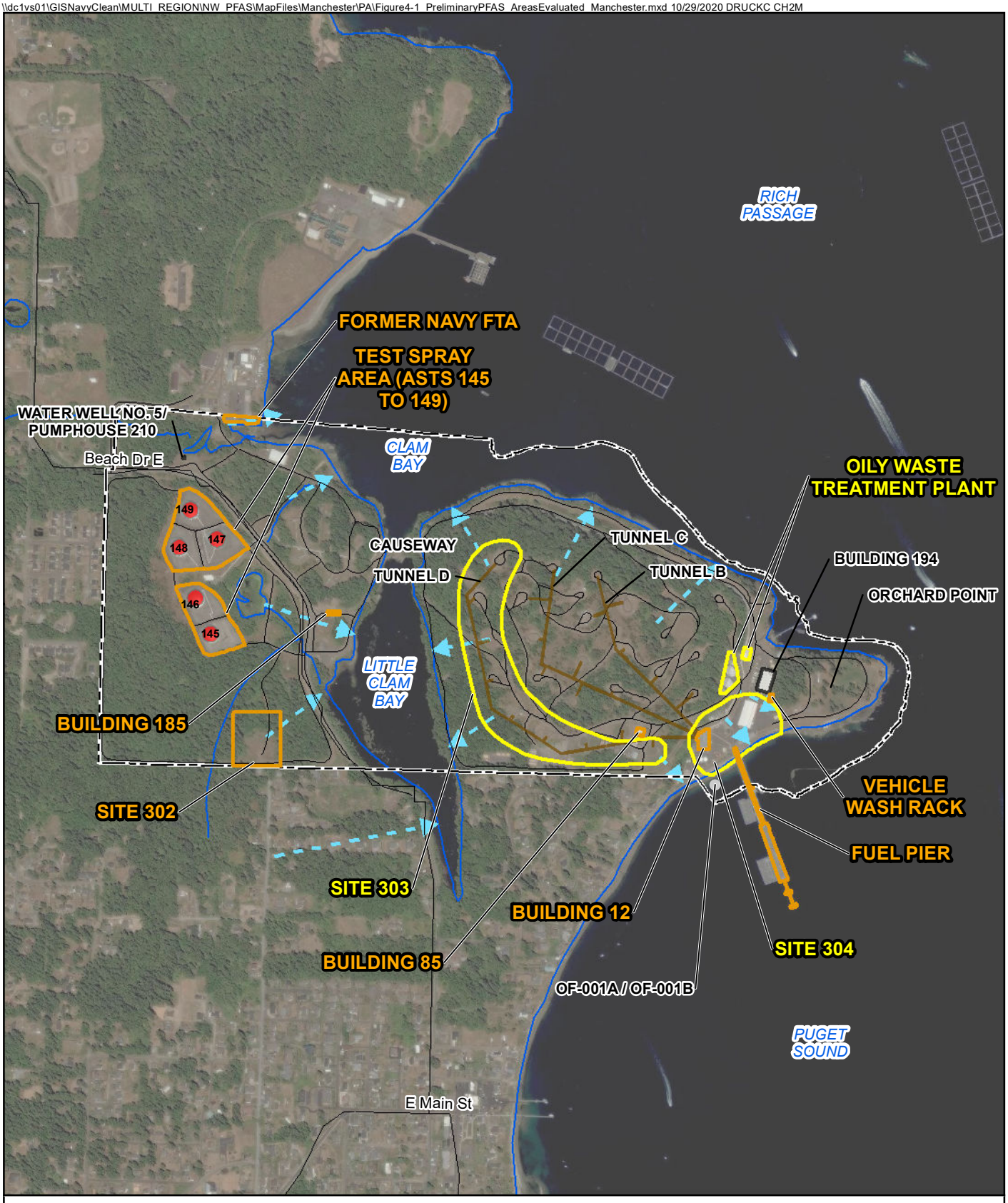


LEGEND

- Discharge
- Roads
- Hydrology
- Aboveground Storage Tank
- No Further Action Areas
- Potential PFAS Source Area
- Installation Boundary
- Anticipated Groundwater Flow Direction
- Tunnel
- Building

NOTE:
MFD = Manchester Fuel Depot

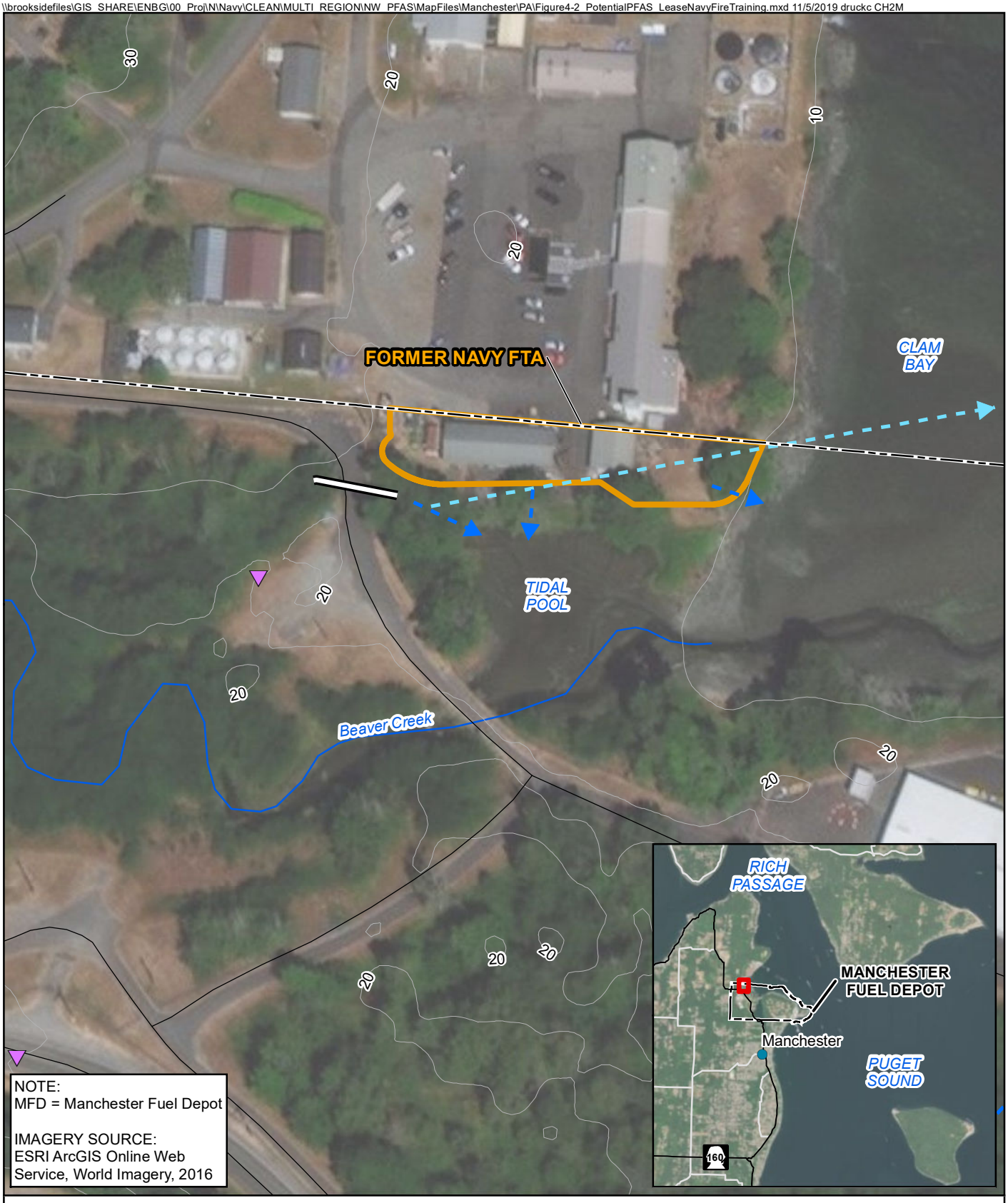
IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2018

0 0.1 0.2 Miles

1 inch = 0.2 mile

N

Figure 4-1
Areas Evaluated: MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington



LEGEND

- Inlet
- Culvert Pipe
- Road
- Hydrology
- 10' Topographic Contour
- Potential PFAS Source Area
- Anticipated Surface Water Drainage Direction
- Anticipated Groundwater Flow Direction
- Installation Boundary

Figure 4-2
Potential PFAS Source Area:
Former Navy Firefighting Training Area, MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington

0 50 100 Feet
1 inch = 100 feet
N

LEGEND

- Inlet
- Discharge
- O/W Separator
- Unpaved Ditch
- Culvert Pipe
- Road
- 10' Topographic Contour
- Anticipated Surface Water Drainage Direction
- Anticipated Groundwater Flow Direction
- Potential PFAS Source Area
- Installation Boundary

Figure 4-3
Potential PFAS Source Area: Fuel Pump House (Building 12) and Former Fire Station (Building 85), MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington

NOTE:
MFD = Manchester Fuel Depot

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2018

0 50 100 Feet
1 inch = 100 feet

N

LEGEND

- Inlet
- Discharge
- O/W Separator
- Unpaved Ditch
- Culvert Pipe
- Road
- Hydrology
- 10' Topographic Contour
- Anticipated Surface Water Drainage Direction
- Anticipated Groundwater Flow Direction
- Aboveground Storage Tank
- Potential PFAS Source Area
- Installation Boundary

Figure 4-4
Potential PFAS Source Area: Test Spray Area and JP-8 Truck Loading Facility (Building 185), MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington

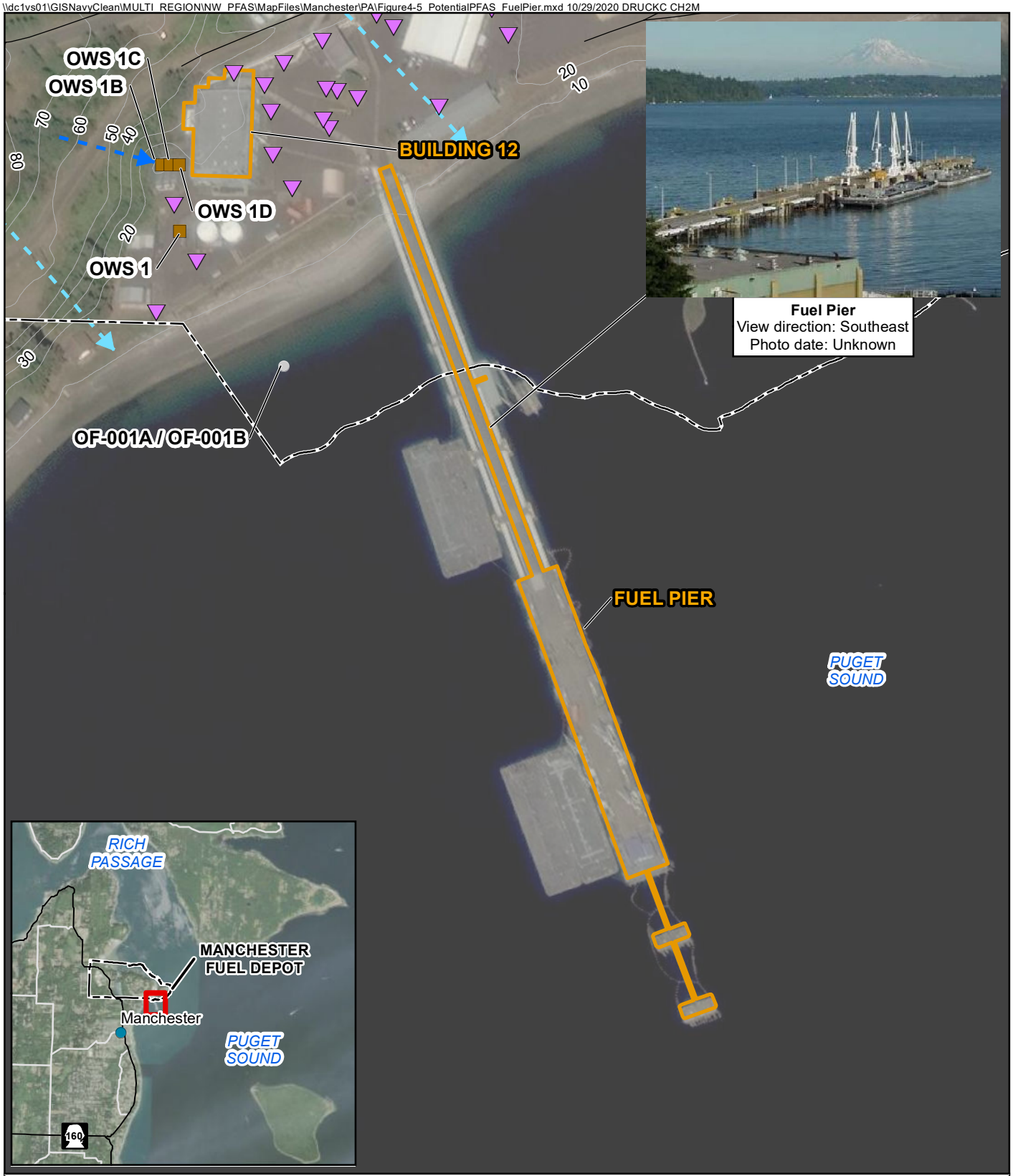
NOTE:
MFD = Manchester Fuel Depot

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2017

0 125 250 Feet
1 inch = 250 feet

N

\\dc1vs01\GISNavyClean\MULTI_REGION\NW_PFAS\MapFiles\Manchester\PA\Figure4-5_PotentialPFAS_FuelPier.mxd 10/29/2020 DRUCKC CH2M



LEGEND

- Inlet
- Discharge
- O/W Separator
- Road
- 10' Topographic Contour
- Potential PFAS Source Area
- Installation Boundary
- Anticipated Surface Water Drainage Direction
- Anticipated Groundwater Flow Direction

Figure 4-5
Potential PFAS Source Area: Fuel Pier, MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington

NOTE:
MFD = Manchester Fuel Depot

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2018

0 100 200 Feet
1 inch = 200 feet

N

PCB Disposal Area (Site 302)
View direction: North
Photo date: October 2018

LEGEND

- Discharge
- Unpaved Ditch
- Culvert Pipe
- Road
- Hydrology
- 10' Topographic Contour
- Potential PFAS Source Area
- Landfill Boundary
- Installation Boundary
- Anticipated Surface Water Drainage Direction
- Anticipated Groundwater Flow Direction

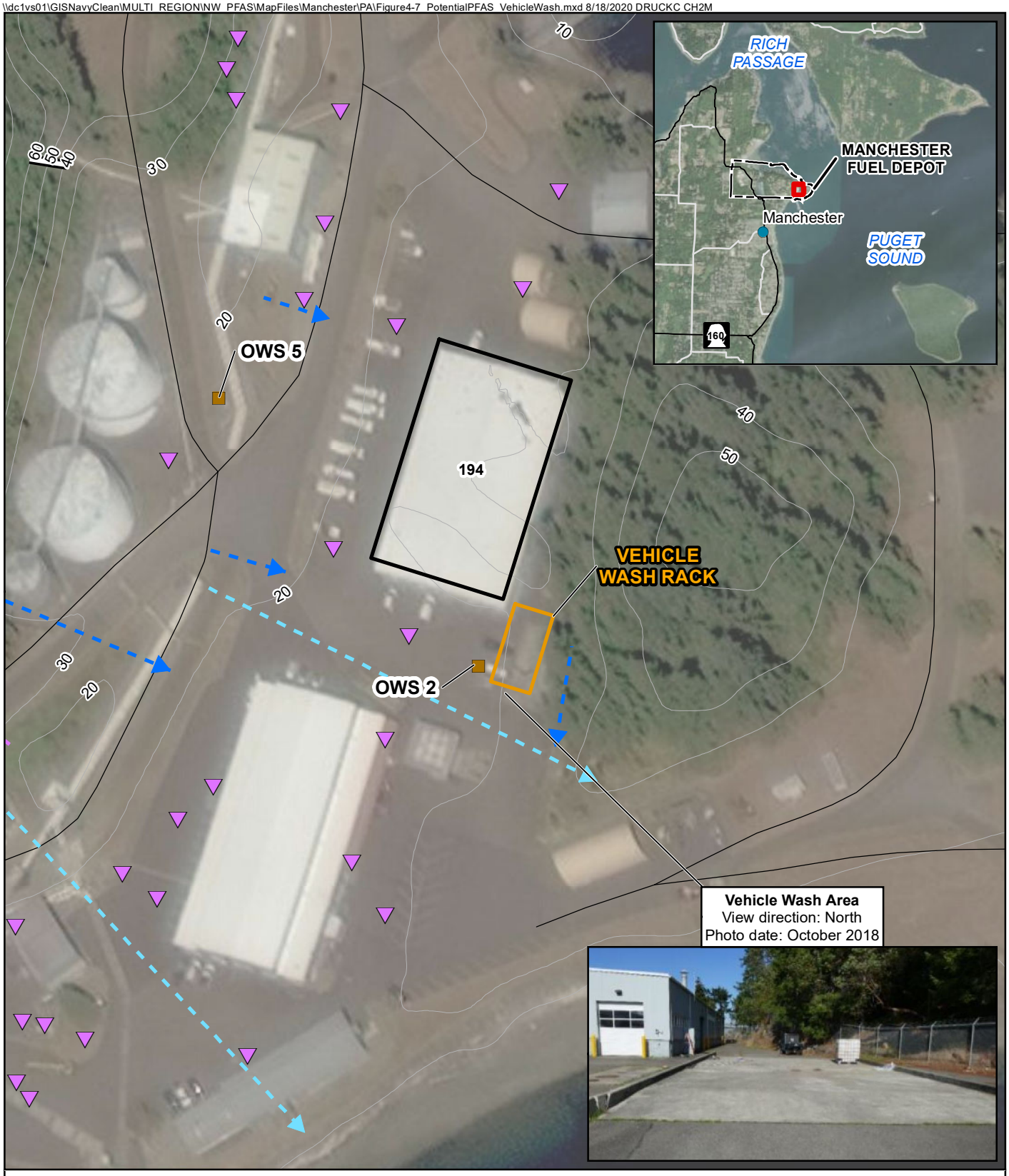
Figure 4-6
Potential PFAS Source Area:
PCB Disposal Area (Site 302), MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington

NOTE:
MFD = Manchester Fuel Depot

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2018

0 75 150 Feet
1 inch = 150 feet

N



LEGEND

- Inlet
- O/W Separator
- Unpaved Ditch
- Culvert Pipe
- Road
- 10' Topographic Contour
- Potential PFAS Source Area
- Building
- Anticipated Surface Water Drainage Direction
- Anticipated Groundwater Flow Direction

NOTE:
MFD = Manchester Fuel Depot

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2018

0 50 100 Feet
1 inch = 100 feet

N

Figure 4-7
Potential PFAS Source Area:
Vehicle Wash Rack, MFD
Preliminary Assessment for PFAS
Manchester Fuel Depot, Kitsap County, Washington

SECTION 5

Conclusions

This PA evaluated the potential for PFAS sources at eleven areas within MFD. **Table 4-1** identifies potential PFAS source areas as well as other areas evaluated that were determined not to be a potential PFAS source area. No further action is recommended for 4 areas where there was no evidence of a PFAS release or suspected release. Seven areas were identified as likely sources of PFAS-containing materials; these areas and the rationale for each of those areas are provided in **Table 5-1.** Potential receptors and migration pathways for the sites with potential PFAS releases are discussed in **Section 4.3**. No drinking water wells are located downgradient of the MFD facility.

In accordance with DoD Instruction 4715.18, *Emerging Contaminants* (June 2009, certified through June 2016 [DoD, 2009]), DoD policy requires that "Risks to people, the environment, and DoD missions, programs, and resources shall be assessed and, when appropriate, actions shall be taken to reduce risks related to ECs [emerging contaminants] development, use, or release." Additionally, Navy *Interim Per- and Polyfluoroalkyl Substances (PFAS) Site Guidance for NAVFAC Remedial Project Managers (RPMs)/September 2017 Update* (Navy, 2017) recommends:

> "RPMs should consider investigating ER sites for PFAS when the conceptual site model indicates:
>
> a. Historical release or use of aqueous film forming foam (AFFF), or
>
> b. Historical use of an area for other industrial activities (for example, plating operations) that may have released PFAS.
>
> Based on recent Navy experience, sites at Naval and Marine Corps Air Stations (NAS and MCAS, respectively), including outlying or auxiliary landing fields, or other applicable installations with potential repeated (for example, former firefighting training areas) or significant (for example, crashes) AFFF releases should be prioritized for investigation."

This PA has identified locations that meet the first criterion, triggering the need for further investigation to determine whether a release to the environment occurred that resulted in impacts to soil, sediment, surface water, or groundwater at levels that warrant remedial actions.

Table 5-1. Preliminary Assessment Report Summary and Findings

Areas Investigated	Rationale	Recommendation
Former FTA	• According to former Navy Region Northwest personnel, intermittent firefighting activities are known to have occurred through the 1950s and intermittently through 1967. • AFFF could have infiltrated the subsurface and entered the underlying Vashon advance outwash aquifer • AFFF released during firefighting training activities is likely to have impacted the soil of unpaved areas to the south of the Former FTA. • AFFF potentially released during firefighting training activities that flowed toward Clam Bay provides a potential pathway to sediment, surface water, and aquatic organisms.	Initiate SI
Former Fire Station and Spill Response Warehouse (Building 85)	• AFFF may have been stored and handled at Building 85 when the building was used as a fire station. Firefighting trucks were washed in front of the building prior to the construction of the VWR. Firefighting equipment known to have contained AFFF were filled and stored at Building 85. • AFFF potentially released during the building's operation could have infiltrated perched aquifers. • AFFF potentially released during the building's operation as a fire station could have impacted unpaved areas to the west, south, and east of Building 85.	Initiate SI

Table 5-1. Preliminary Assessment Report Summary and Findings

Areas Investigated	Rationale	Recommendation
	• AFFF potentially released during the building's operation as a fire station would have likely flowed into an unpaved ditch along Cedar Avenue or have been captured by the stormwater system. Both routes ultimately discharge into Puget Sound, which provides a potential pathway to sediment, surface water, and aquatic organisms.	
Test Spray Area (ASTs 145 to 149)	• According to former Navy Region Northwest personnel AFFF was sprayed in the containment basins of these ASTs on a semi-annual basis from 1991 to 1999 due to the potential for flash fires to erupt at these tanks. • AFFF could have infiltrated the Vashon Recessional Outwash Deposits or Vashon Advance Outwash aquifer on the western portion of MFD. • AFFF potentially released during firefighting training activities could have impacted unpaved areas prior to the installation of the concrete containment basins. After installation of the containment basins, AFFF released during firefighting training activities could have infiltrated the surrounding ground through cracks in the concrete. • Overland flow could enter Franco Pond from the stormwater drainage or be conveyed through a culvert under Beach Drive East leading to Little Clam Bay, providing a potential pathway to sediment, surface water, and aquatic organisms.	Initiate SI
JP-8 Truck Loading Facility (Building 185)	• When JP-5 was stored at UST 50, firefighting simulations were conducted at least once per year at the JP-8 Truck Loading Facility (Building 185) due to its proximity to UST 50. The firefighting simulations consisted of spraying AFFF along the perimeter of the Truck Loading Rack. • AFFF used during the trainings could have infiltrated the subsurface and entered the Vashon Recessional Outwash Deposits or Vashon Advance Outwash aquifer on the western portion of MFD. • AFFF released during the trainings could have had direct contact with the surrounding soil around Building 185 or could have impacted soil through cracks in the asphalt. • Overland flow to Little Clam Bay, or runoff captured by the stormwater system that is ultimately discharged into Puget Sound provides a potential pathway to sediment, surface water, and aquatic organisms.	Initiate SI
Fuel Pier	• According to interviews with former fire fighters, simulated firefighting was conducted at least once a year along the former and existing fuel piers. Foam was sprayed on and along the fuel piers. • Most of the Fuel Pier is located over the Puget Sound. As such, AFFF release during simulated fire trainings would be washed out into Puget Sound and is unlikely to have impacted groundwater aquifers. • AFFF released during the trainings could have had direct contact with the surrounding soil at the point where the piers connected to the land. • Surface water and sediment in this area could have had direct contact with the AFFF that was sprayed there during the simulated fire trainings.	Initiate SI
PCB Disposal Area (Site 302)	• Site 302 was used as a landfill for ship bilge waste, transformer oil, and other petroleum waste from operations within MFD and from other Regional Naval facilities in the Puget Sound between 1955 and 1976. The volume of waste deposited at this site is during this timeframe is unknown. This area is also the site of "practice burns," where wood and other dunnage material would be burned (Hart Crowser, 1988). • From 1955 through 1976, any residuals from a fire or training exercise containing AFFF may have drained to the ship's bilge system and subsequently been disposed as waste at Site 302. • PFAS-containing materials deposited at Site 302 are unlikely to have impacted groundwater based on the known depth to groundwater and the confining properties of the underlying silt layer.	Initiate SI

Table 5-1. Preliminary Assessment Report Summary and Findings

Areas Investigated	Rationale	Recommendation
	• PFAS-containing materials deposited at Site 302 could have had direct contact with the surrounding soil. • Surface from the main flow channels enters Little Clam Bay located to the east-northeast of Site 302, which provides a potential pathway to sediment, surface water, and aquatic organisms.	
Fuel Pump House (Building 12)	• The Fuel Pump House has historically stored AFFF. During the site reconnaissance the Fuel Pump House, drums of C6, which contains 3 percent AFFF, was observed. • AFFF from spills over the years could have infiltrated perched aquifers characteristic of the eastern portion of MFD. • As AFFF is presumed to be stored inside the Fuel Pump House it is unlikely that PFAS was conveyed through surface flow and subsequently impacted sediments.	Initiate SI
Vehicle Wash Rack	• According to the current Regional Fueling Director Fire Station, staff were instructed to wash fire trucks and any other equipment at the vehicle wash rack. • AFFF potentially released during the washing of vehicles could have impacted the soil of the grassy area to the west of the VWR or through cracks in paved surfaces. • Spray from the washing of vehicles could have potentially infiltrated the ground east of the VWR or through cracks in the surrounding pavement and entered perched aquifers characteristic of the eastern portion of MFD. • Overland surface flow is generally considered to be captured by the storm drain system or follow topography and be conveyed to Puget Sound, which provides a potential pathway to sediment, surface water, and aquatic organisms.	Initiate SI

SECTION 6

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Appendix A
Records Reviewed, Interview Contacts, and Area Coordinates

Appendix A1
Summary of Records Reviewed

Appendix A. Summary of Records Reviewed

Author	Document Date	Document Type	Document Title	NIRIS Record No.	Notes
Hart Crowser, Inc., Seattle, WA	4/26/1988	Site Investigation	*Current Situation Report, PCB and TEL Sites, Naval Supply Center Puget Sound Fuel Department, Manchester, WA*	000014	other-docs tracker
Dames and Moore	7/31/1989	Soil Contamination Report	Report of Soil Contamination Investigation Proposed Fuel Pier Manchester, Washington	000130	other-docs tracker
Naval Facilities Engineering Command Northwest	9/7/1989	Correspondence	Site 304 Gasoline Contamination Near Fuel Pier	000196	other-docs tracker
Unknown	NA	Report	Site 304: Project Plans - UST Soil, Groundwater & Vapor Sampling/Monitoring & Analysis At Aboveground Storage Tank Area	000144	other-docs tracker, NIRIS tracker
Hart Crowser, Inc., Seattle, WA	1994	Remediation Report	Meeting To Discuss Status Of Delivery Orders Remediation At Manchester Fuel Department PCB Site	000254	other-docs tracker
Unknown	NA	Correspondence	Letter Regarding Evaluation Of The Vapor Monitoring System, Twelve-X, Installed By URS At The Manchester Fuel Facility	000141	other-docs tracker, NIRIS tracker
URS Consultants, Inc.	9/26/1995	Site Investigation	Final, Subsurface Investigation Report For the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract, Northwest Area.	000129	other-docs tracker, NIRIS tracker
Hart Crowser, Inc., Seattle, WA	1998	Environmental summary	Summary of Environmental Conditions Site 303	000126	other-docs tracker
Unknown	10/16/1998	Report	Site 304: Summary Of Environmental Conditions At Industrial Area (Archived)	000159	other-docs tracker, NIRIS tracker
Hart Crowser, Inc., Seattle, WA	6/1/1999	Report	Site 302: Post Closure Monitoring Report	000227	other-docs tracker
NA	06/17/1999	Report	Project Plan For Sites 303 and 304 Groundwater And Sediment Characterization For Manchester	000123	other-docs tracker, NIRIS tracker
Hart Crowser, Inc., Seattle, WA	1/11/2000	Correspondence	Surface Water Runoff Monitoring Results	000232	other-docs tracker
Hart Crowser, Inc., Seattle, WA	8/24/2000	Correspondence	Semi-Annual Post-Closure Monitoring Event Results	000233	other-docs tracker
Hart Crowser, Inc., Seattle, WA	12/20/2000	Characterization Report	Groundwater and Sediment Characterization Report Sites 303 and 304 Fleet and Industrial Supply Center (FISC)	000086	other-docs tracker, NIRIS tracker
The Suquamish Tribe	8/19/2004	Correspondence	Letter to NAVFAC Indicating Suquamish Tribe is Interested in Site Management Decisions for MFD	000198	other-docs tracker
Hart Crowser, Inc., Seattle, WA	12/15/1998	Site Reconnaissance	Results of Site Reconnaissance, Manchester FISC Sites 303 and 304 J-4654-39	NA	other-docs tracker
Battelle, Columbus, Ohio	12/9/2016	Land Use Control	Final Land Use Control Plan for Sites 302, 303, 304, and Tank 50	NA	other-docs tracker
Hart Crowser, Inc., Seattle, WA	2/3/1988	Site Assessment	Draft Site Assessment Report, Corliss Lane Marsh, Manchester Fleet and Industrial Supply Center	000230	other-docs tracker
Naval Facilities Engineering Command Northwest	1/6/2015	Five Year Review	Five-Year Review Report	NA	other-docs tracker
Naval Facilities Engineering Command Northwest	10/23/1989	Correspondence	Letter To Acknowledge Receipt Of EPA Letter To Naval Supply Center, Manchester Dated October 18, 1989 For PA/SI	000009	NIRIS_tracker
Naval Supply Center Puget Sound	06/21/1990	Correspondence	Letter Regarding Receipt Of Letter Dated May 10, 1990, Requesting A Listing Site Inspection For NSC, Fuel Department Manchester	000010	NIRIS_tracker
Naval Facilities Engineering Command Northwest	01/01/1900	Correspondence	List Of Document Receivers Manchester IR Program.	000015	NIRIS_tracker
Naval Facilities Engineering Command Northwest	01/26/1990	Correspondence	Letter And Copy Of Hart Crowsers Response To NOAA Comments On Manchester's Draft Remedial Investigation/Feasibility Study (RI/FS) Asking For Concurrence With The Conclusions	000018	NIRIS_tracker
Hart-Crowser, Inc.	11/30/1986	Report	Confirmation Study, Verification/Characterization Study Plan Of Action Subbase Bangor & NSCPS Manchester	000022	NIRIS_tracker
Hart-Crowser, Inc.	12/22/1989	Correspondence	Letter Sending Hart Crowsers Response To NOAA Comments On Manchester's Draft Remedial Investigation/Feasibility Study (RI/FS)	000048	NIRIS_tracker
United States Environmental Protection Agency	06/14/1990	Correspondence	Faxed Letter Sending A Copy Of The Draft Preliminary Assessment Data Collection Form To That May Be Used As Framework To Provide Necessary Information	000081	NIRIS_tracker
Unknown	04/14/1997	Report	Report Work Plan Fuel Hydrocarbon Leak Assessment For Tank 50	000116	NIRIS_tracker
Unknown	07/21/1997	Report	Report Compilation Of Existing Information Corliss Lane Marsh Fuel Hydrocarbon Spill Assessment	000119	NIRIS_tracker
Unknown	06/19/1984	Correspondence	All: PA/SI Correspondence 1900 To Current	000125	NIRIS_tracker
Unknown	01/28/1999	Report	Site 303: Meeting Notes On Summary Of Environmental Conditions At D-Tunnel Tanks (Archived)	000134	NIRIS_tracker
Unknown	12/13/1990	Correspondence	Letter From Lloyd Trail Regarding Article In Port Orchard Independent Newspaper And His Concerns Regarding His Property At Southern Tip Of Little Clam Bay	000140	NIRIS_tracker
Unknown	12/15/1998	Report	Sites 303 & 304: Technical Memorandum - Results Of Fisc Manchester Site Reconnaissance(Archived)	000162	NIRIS_tracker
Unknown	12/07/1994	Correspondence	Letter Re: Contaminated Soils Analysis Results For Fisc Manchester (Archived)	000166	NIRIS_tracker
Unknown	08/08/1988	Report	NFS Manchester: Sediment Sample Results Report (Archived)	000167	NIRIS_tracker
Unknown	05/29/1991	Report	Statement Of Architect/Engineer Services For Phase II Site Characterization Study & Corrective Action Plan At Fuel Pier (Archived)	000169	NIRIS_tracker
Unknown	08/31/2001	Photo	Design Drawings Of Tank & Pipe Removal At Manchester Fuel Depot (Archived)	000173	NIRIS_tracker
Unknown	01/01/1900	Correspondence	Site 303/304: RI/FS Correspondence For 1900 To Current	000177	NIRIS_tracker
Unknown	10/08/1993	Correspondence	RI/FS Correspondence 1900 To Current For All Sites (Archived)	000178	NIRIS_tracker
URS Consultants, Inc.	6/2/1994	Correspondence	Letter and Response to Comments From URS for the Subsurface Investigation Work Plans	000174	NIRIS_tracker
Manchester Water District	6/7/2006	Other	Manchester Water District Comprehensive Water System Plan Existing System Hydraulic Profile	NA	Background Well Information/ City_of_Manchester
Manchester Water District	NA	Map	Manchester Water District Comprehensive Water System Plan Primary System Facilities	NA	Background Well Information/ City_of_Manchester

Appendix A. Summary of Records Reviewed

Author	Document Date	Document Type	Document Title	NIRIS Record No.	Notes
Manchester Water District	6/7/2006	Map	Manchester Water District Comprehensive Water System Plan Service Area and Adjacent Systems	NA	Background Well Information/ City_of_Manchester
Washington Department of Ecology	9/13/2018	Map	Well Report Map for Manchester, WA	NA	Background Well Information
Environmental Data Resources Inc.	2/1/2019	Report	EDR NEPASearch Map Report Manchester Fuel Depot	NA	EDR
Environmental Data Resources Inc.	2/1/2019	Report	EDR Offsite Receptor Report Manchester Fuel Depot One Mile Radius	NA	EDR
Environmental Data Resources Inc.	2/1/2019	Report	EDR Offsite Receptor Report Manchester Fuel Depot Five Mile Radius	NA	EDR
Naval Facilities Engineering Command Northwest	2/3/1993	Report	Potential Hazardous Waste Site: Preliminary Assessment	NA	IAS
Unknown	8/5/1992	Report	Environmental Pollution Report	NA	IAS
Naval Facilities Engineering Command Northwest	3/1/1988	Report	Preliminary Assessment Report Manchester TEL Site Naval Supply Center, Puget Sound	NA	IAS
Department of the Navy	4/15/2013	Map	Manchester Fuel Department Facilities Map	NA	MFD_CAD
Naval Facilities Engineering Command Northwest	9/5/2018	Database	Operational Equipment List Manchester Fuel Depot Facility Query	NA	OEL_Facilities_Database_Searches
Seattle National Archives	3/1/2019	Database	Seattle National Archives Real Property Database	NA	Seattle National Archive
Battelle, Columbus, Ohio	4/4/2017	Report	Phase I Environmental Site Assessment Report Proposed MILCON and Decommissioning Project, Fleet Logistics Center Puget Sound Manchester Fuel Depot, Manchester, Washington	NA	References
CH2M	3/1/2018	Report	Phase II Environmental Site Assessment Report in Support of MILCON P-856, Manchester Fuel Depot, Manchester, Washington	NA	References
CensusViewer	1/26/2019	Map	Manchester, Washington Population: Census 2010 and 2000 Interactive Map, Demographics, Statistics, Quick Facts. http://censusviewer.com/city/WA/Manchester	NA	References
Department of Defense	2009	Report	DoD Instruction 4715.18, *Emerging Contaminants.*	NA	References
Department of Navy	9/1/2009	Report	*Interim Per- and Polyfluoroalkyl Substances (PFAS) Site Guidance for NAVFAC Remedial Project Manages (RPMS)/September 2017 Update* . 5090 Ser EV/006	NA	References
Department of Navy	3/15/2018	Report	*Deputy Assistant Secretary of the Navy Statement of Work, Preliminary Assessments and Site Inspections for Basewide Investigation of Per- and Polyfluoroalkyl Substances at Various Navy Facilities Located in Alaska and Washington* .	NA	References
Deputy Assistant Secretary of the Navy	6/20/2016	Report	*Environmental Restoration Program Manual* . Process to efficiently identify, validate, and prioritize the inventory of Sites and Areas of Concern (AOCs) with known, or potential, PFC/PFAS releases.	NA	References
United States Geological Survey	1965	Map	Water Resources and Geology of the Kitsap Peninsula and Certain Adjacent Islands. United States Geological Survey (USGS) Water Supply, Bulletin 18.	NA	References
Hart Crowser, Inc., Seattle, WA	4/26/1988	Report	Current Situation Report, PCB and TEL Sites, Naval Supply Center Puget Sound Fuel Department, Manchester, Washington.	NA	References
Kitsap County	2/2/2019	Map	Kitsap County Zoning Map, Amended August 31, 2012. https://www.kitsapgov.com/dcd/DCD%20GIS%20Maps/Zoning_Color_Map_2012.pdf .	NA	References
Naval Supply Systems Command	11/1/2008	Report	Oil Spill Prevention, Control, and Countermeasure Plan, Manchester Fuel Department.	NA	References
National Ground Water Association	2018	Report	*Groundwater and PFAS: State of Knowledge and Practice* .	NA	References
National Oceanic and Atmospheric Administration	2014	Map	NOAA Nautical Chart 18449, Seattle to Bremerton. 20th Edition., Aug. 2014.	NA	References
Perry	1998	Report	Manchester: 100 Years of Stewardship, 1898-1998.	NA	References
United States Environmental Protection Agency	9/1/1991	Report	*Guidance for Performing Preliminary Assessments Under CERCLA* .	NA	References
United States Environmental Protection Agency	4/17/2014	Report	Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonate (CASRN 375-73-5) and Related Compound Potassium Perfluorobutane Sulfonate (CASRN 29420-49-3)	NA	References
United States Environmental Protection Agency	5/1/2016	Report	Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA). USEPA 822-R-16-005.	NA	References
United States Environmental Protection Agency	5/1/2016	Report	Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS). USEPA 822-R-16-004	NA	References
United States Environmental Protection Agency	2018	Website	Regional Screening Levels. https://www.epa.gov/risk/regional-screening-levels-rsls.	NA	References
United States Environmental Protection Agency	1/26/2019	Report	*Facility Registry Service Facility Detail Report* . https://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110045678352	NA	References
URS Consultants, Inc.	11/1/1993	Report	Project Plans, Underground Storage Tank Soil, Groundwater, and Vapor Sampling/Monitoring and Analysis, Fleet and Industrial Supply Center Puget Sound, Manchester Fuel Department, Manchester, Washington.	NA	References
United States Fish and Wildlife Services	2/1/2019	Report	ECOS Environmental Conservation Online System; Species By County Report; County: Kitsap, Washington. https://ecos.fws.gov/ecp/.	NA	References
Washington Department of Fish and Wildlife.	2/1/2019	Report	Species of Concern in Washington State.	NA	References
Washington State Department of Ecology (DOE) and State Department of Health (DOH).	2019	Report	*Interim Chemical Action Plan for Per- and Polyfluorinated Alkyl Substances.*	NA	References
Weatherbase	2019	Report	Manchester Weather Summary http://www.weatherbase.com/weather/weather-summary.	NA	References
Google Earth	2019	Map	"Manchester, WA" Google Earth Query	NA	References

Appendix A2
Records Reviewed

Resource Conservation and Recovery Act
Preliminary Assessment for
Per- and Polyfluoroalkyl Substances (PFAS)
Manchester Fuel Depot
Kitsap County, Washington

NOTIFICATION: APPENDIX A2 CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 5 (5 USC 552(b)(5))
Intra-agency memoranda and correspondence

TO REQUEST A COPY OF THE DOCUMENT

PLEASE CONTACT

Department of the Navy
Freedom of Information Act Office

http://www.secnav.navy.mil/foia/Pages/default.aspx

Distribute to U. S. Government Agencies Only

Appendix A3
Interview Contacts

Resource Conservation and Recovery Act
Preliminary Assessment for
Per- and Polyfluoroalkyl Substances
(PFAS) Manchester Fuel Depot
Kitsap County, Washington

NOTIFICATION: APPENDIX A3 CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 6 (5 USC 552(b)(6))
Personal Information Affecting an Individual's Privacy

TO REQUEST A COPY OF THE DOCUMENT

PLEASE CONTACT

Department of the Navy
Freedom of Information Act Office

http://www.secnav.navy.mil/foia/Pages/default.aspx

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Appendix A4
Area Coordinates

Resource Conservation and Recovery Act
Preliminary Assessment for
Per- and Polyfluoroalkyl Substances
(PFAS) Manchester Fuel Depot
Kitsap County, Washington

NOTIFICATION: APPENDIX A4 CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 5 (5 USC 552(b)(5))
Intra-agency memoranda and correspondence

TO REQUEST A COPY OF THE DOCUMENT

PLEASE CONTACT

Department of the Navy
Freedom of Information Act Office

http://www.secnav.navy.mil/foia/Pages/default.aspx

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Appendix B
Interview Record

Interview Record

The following people were interviewed in support of the preliminary assessment for per- and polyfluoroalkyl substances at Manchester Fuel Depot (referred to by title if no longer affiliated with the Navy):

- Deputy Environmental Director
- Environmental Engineer
- Regional Fuel Manager/Deputy Director Fleet Logistics Center Puget Sound
- Navy Region Northwest Fire Chief
- Navy Region Northwest Assistant Chief – Special Operations
- Former Fire Fighter #1
- Former Regional Fuel Manager, Fleet Logistics Center Puget Sound
- Former Fire Fighter #2

This appendix contains the notes from these interviews related to current Department of the Navy (Navy) property and usage areas. Interviewee names and contact information have been removed from the interview notes if they are no longer affiliated with the Navy and are presented on Appendix A-3.

PFAS Preliminary Assessment Questionnaire

Environmental Staff

Name:	**Deputy Environmental Director** (see Appendix A-3 for details)
Title:	Deputy Environmental Director (2001- current)
Date of Interview:	10/9/2018
Contact information (email/phone number):	(see Appendix A-3)

Note:
If you can recommend additional contacts that you feel may be able to provide additional information, please provide the name and as much contact information as you have. Thank you.

Base Information

1. Is there a Teflon-coating shop on base? Historically? Provide location and years of operation.

A: Deputy Director stated no.

2. Is there a chrome-plating shop on base? Historically? Provide years of operation.

A: Deputy Director stated not currently or historically.

   a. Was foam used to suppress vapors in the process?

A: Deputy Director stated no.

3. Where are the current or former locations of auto hobby shops and car/truck washes?

A: Deputy Director stated no hobby shop. They used a vehicle wash area near Building 226. Discharge to oil/water separator (OWS), then to the sanitary sewer, and finally to the City of Manchester Wastewater Treatment Plant (WWTP) (Kitsap Sewer District 7).

4. What is the current and historical source of the potable water supply for the base? Has the potable water been tested for PFAS? If so, please provide results.

A: Deputy Director stated that the Building 210 well used to be potable water until about 2000 and is currently used for fire suppression. Another well near laydown area was potentially potable water in the 1980s and another well is located near Building 255. The well near Building 255 may have been used for potable water, but not used since the early 1980s. All current potable water for the base is provided by the City of Manchester.

5. Are there supply wells of any kind on base (such as potable, irrigation, industrial) and if so, have they been tested for PFAS compounds?

A: Deputy Director stated no.

6. Where are the current and historical landfills/disposal sites on base? What were the estimated years of use for each location? Confirm locations of landfills/disposal areas on map.

A: Mr. Tailleur stated no. Only landfill is to the north between NOAA Fish Laboratories and the EPA Laboratory.

7. Are there monitoring wells located within the vicinity of any areas where AFFF or materials containing PFAS may have been stored/used/released? Provide map or coordinates.

A: Deputy Director stated that there are no active groundwater monitoring wells onsite. There were 24 to 30 temporary grab groundwater locations installed, but never showed anything. This was during the Phase II work.

Paints and Pesticide Use/Storage/Release

1. Do you know if specialty paints containing PFAS were used in large quantities on base? If so, please provide paint and pesticide storage warehouse and disposal locations.

A: Deputy Director stated that they used architectural paint. Building 1 was used for storage.

2. How are unused or waste pesticides managed?

A: Deputy Director stated that there was none that he was ever aware of. There is a Hazardous Materials storage in Building 1.

3. How are unused or waste paints managed?

A: Deputy Director states that paints were used over the years. In Building 194, they created a spray booth. It was originally in Building 12 and then moved it to Building 194. Paints are always disposed of by a separate waste contractor.

Firefighting Training Areas

1. As part of historical or current operational training, are any current or historical Firefighting Training Areas (FTAs) present on the facility? If yes, please show the location/s of the FTAs on the map provided.

A: Deputy Director stated that there is no historical documentation. They may have practiced control burns between Tanks 23 and 24.

2. To the best of your knowledge, what are/were the years of operation for each FTA you identified in your answer to Question #1 above?

A: Deputy Director stated no.

3. How many FTAs are currently active? Inactive (historical in nature)? To the extent possible, please specify which are active versus historical.

A: Interviewee had no knowledge of FTAs.

4. To the best of your knowledge, were fuels/flammables other than "typical" (such as JP-5, #2 Fuel Oil) used at the FTAs? If yes, what was used?

A: Deputy Director stated that F76 diesel was used to do control burns.

5. For inactive FTAs, to the best of your knowledge, when was the last time that fire training using AFFF was conducted at each one?

A: Interviewee had no knowledge of FTAs.

6. When AFFF was used during a fire training exercise, to the best of your knowledge, was the AFFF used contained and disposed, and if so, how was the AFFF cleaned up and disposed?

A: Interviewee had no knowledge of training areas.

7. To the best of your knowledge, are current and historical FTAs lined? If so, with anything other than concrete?

A: Interviewee had no knowledge of FTA's.

Records, Spill logs, Historical Information

1. To the best of your knowledge, are there any current or historical data/documents/records associated with AFFF that we may review/copy (such as reports/work plans, historical or operational records, incident reports, crash data, inspection reports, AFFF spill logs, documentation of AFFF releases, photo interpretation)?

A: Deputy Director stated no.

2. Do you have recollection or records of AFFF being used in response to the following:

    a. Fuel releases to prevent fires

A: Deputy Director stated no.

    b. Emergency response sites (such as plane, helicopter, vehicle crash sites and fires)

A: Interviewee had no knowledge of any emergency response crash sites.

    c. Emergency runway landings where foam might have been used as a precaution

A: Deputy Director stated there are no runways on site.

    d. Other (such as air show demonstrations, AFFF "salutes")

A: Interviewee had no knowledge of any other AFFF activities.

3. If yes to Question #2, please provide any information you have regarding how and if the releases were addressed and how any released material (including foam and contaminated soil) was disposed?

A: Interviewee had no knowledge of any AFFF releases.

4. In the potential absence of written records or incomplete written records, can you provide

anecdotal/verbal information and locations of spills or other emergency response incidents where AFFF was used that haven't already been previously discussed?

A: Deputy Director stated no.

5. What are the current and historical storage location(s) of the wreckage from emergency response incidents (if wreckage is stored outside)?

A: Deputy Director stated no.

Location Information

1. If not already covered in previous questions, please provide any information on releases of AFFF that may have been diverted to or could have impacted the following items/areas:

    a. Stormwater conveyances/outfalls that drain runways, taxiways, and aprons

A: Deputy Director stated that the NPDES Permit is currently being upgraded and they are currently operating under the 1990 permit; will send a pdf copy of NPDES and SWPPP.

    b. Stormwater management system (such as drainage swales, outfalls, retention/detention basins)

A: Deputy Director will send a pdf copy of NPDES and SWPPP.

    c. Industrial or sanitary wastewater treatment system (such as storm drain, sanitary sewer, OWS, building and plumbing drains)

A: Deputy Director will send a pdf copy of NPDES and SWPPP.

    d. Water supply wells (such as potable, agricultural, industrial)

A: Deputy Director stated that the current water supply is the Building 210 well. Another well is near laydown area and Building 255. The well near Building 255 may have been used for potable water, but not used since the early 1980s. All current potable water for the Base is provided by the City of Manchester.

    e. Large-scale disposal (such as landfilling, land application of WWTP sludge, washing, dumping)

A: Deputy Director stated no.

    f. Other

General Information

1. Is there anyone else or other base organization personnel that you would recommend we interview? Name, organization, position, phone number, e-mail.

A: The Former Regional Fuel Manager/Deputy Director.

2. Are there any other tenants/tenant organizations that currently (or historically) use/used AFFF?

A: Deputy Director stated that MFD works for Naval Supply and no other tenants on-Base.

PFAS Preliminary Assessment Questionnaire

Fire Chief or Designees

Name:	**Navy Region Northwest Fire Chief** and **Navy Region Northwest Assistant Chief** (see Appendix A-3 for details)
Title:	Navy Region Northwest Fire Chief (2017 to Present) and Navy Region Northwest Assistant Chief – Special Operations (2010 – present)
Date of Interview:	10/10/2018
Contact information (email/phone number):	(see Appendix A-3)

Note:

If you can recommend additional contacts that you feel may be able to provide additional information, please provide the name and as much contact information as you have. Thank you.

See contacts provided at the end of this document.

AFFF Purchasing, Handling, and Storage

1. Was perfluorinated AFFF historically or currently used on the base? If so, provide any information regarding where and when.

A: Not to his knowledge.

2. To the best of your knowledge, where has the AFFF solution been handled (currently and historically) (such as mixed, contained, released for calibration, transferred)?

A: No knowledge of the process. But he believes they would need to conduct "refract" tests in the truck. He was not aware of any tests documented.

3. Where is AFFF and AFFF equipment stored on base (currently and historically), and in what approximate quantities? (Please show locations on map provided or describe locations).

A: Building 12 was the storage facility. Current inventory is about 45 drums. Previously, they stored about 20 drums.

   a. Please describe procedures for how AFFF equipment is cleaned/decontaminated.

A: If they needed to, they would wash the trucks and let it wash on to the ground.

   b. To the best of your knowledge, where has the equipment currently or formerly been maintained?

A: Not at MFD.

   c. What was the rationale for staging AFFF at each facility?

A: Assistant Fire Chief said that he 3M foam was replaced with C6. The old 3M foam was to be disposed of. He goes around and conducts a physical inventory of the AFFF. He said he would send us copies of their inventory.

Firefighting Training Areas

1. As part historical or current operational training, are any current or historical Firefighting Training Areas (FTAs) present on the facility? If yes, please show the location/s of the FTAs on the map provided.

A: Assistant Fire Chief is not aware of designated FTA on the base.

2. To the best of your knowledge, what are/were the years of operation for each FTA you identified in your answer to Question #1 above?

A: He does not have historical knowledge.

3. How many FTAs are currently active? Inactive (historical in nature)? To the extent possible, please specify which are active versus historical.

A: He does not have historical knowledge.

4. To the best of your knowledge, were fuels/flammables other than "typical" (such as JP-5, #2 Fuel Oil) used at the FTAs? If yes, what was used?

A: He does not have historical knowledge.

5. For inactive FTAs, to the best of your knowledge, when was the last time that fire training using AFFF was conducted at each one?

A: He does not have historical knowledge.

6. When AFFF was used during a fire training exercise, to the best of your knowledge, was the AFFF used contained and disposed, and if so, how was the AFFF cleaned up and disposed?

A: Assistant Fire Chief was not aware of designated FTA on the Base.

7. To the best of your knowledge, are current and historical FTAs lined? If so, with anything other than concrete?

A: Assistant Fire Chief was not aware of designated FTA on the Base.

Hangars and Buildings

1. To the best of your knowledge, which areas (such as hangars, buildings, fuel or hazardous waste storage areas) historically had or currently have automated and/or manually-activated AFFF fire suppression systems?

A: No.

2. To the best of your knowledge, please describe the procedure on how the suppression systems are supplied with AFFF (that is, is system contained within the building, or are there separate buildings that serve to mix AFFF to supply one or more hangers with suppression systems).

A: Not to his knowledge.

3. Please describe the fire suppression system layout/activation process and if available, provide system plans or drawings.

A: Not to his knowledge.

4. When the fire suppression system engages/or engaged, what is the current, and if different, historical response process for addressing AFFF used (that is, was AFFF cleaned up after being used and how)?

A: Not to his knowledge.

5. To the best of your knowledge, have there been inadvertent releases of AFFF from hangar fire suppression systems (such as equipment failure)? If so, please provide additional details (such as when, in which hangars/buildings, could the release be quantified, was the release removed or cleaned up)?

A: Not to his knowledge.

6. To the best of your, knowledge, who was responsible for current or historical routine maintenance of the AFFF system/s? To the best of your knowledge, were maintenance records kept, and if so where are they located?

A: Not to his knowledge.

7. To the best of your knowledge, for any historical activation (accidental, testing, or in response to an emergency) of AFFF systems within hangars and/or buildings, provide any information regarding the fate of the release (that is, did releases occur near drainage swales; were they washed to a pervious surface; did they occur on poorly maintained pervious surfaces [cracked concrete, porous asphalt]; were they directed to a storm drain, trench drain, oil/water separator [OWS], wastewater treatment plant).

A: Not to his knowledge.

Trucks and Trailers

1. Provide a list of current and historical parking/storage areas for AFFF equipment.

A: Assistant Fire Chief referred to Former Fire Fighter 2, who was a former firefighter at the MFD. See contact information located at the end of the interview form.

2. To the best of your knowledge, were the trucks currently and historically tested for spray patterns to make sure equipment is working properly? If so, how often and where are/were these spray tests performed?

A: Assistant Fire Chief called Former Fire Fighter 2 during the interview. During the phone call, Former Fire Fighter 2 identified an approximate area near the aboveground storage tanks (ASTs), where they periodically "flowed foam" and let it run-off the hillside. Note, it is unclear if the foam was sprayed in the secondary containment areas of the ASTs or was it sprayed down vegetated hillsides.

3. To the best of your knowledge, what is the procedure on how trucks and trailers are/were supplied with AFFF?

A: They used 5-gallon buckets and poured the material into the trucks. It was implied that no secondary containment was used during filling the tanks.

   a. Where does/did this resupply occur?

A: Same as above for No. 3.

   b. Is/was there secondary containment in this area?

A: No.

   c. What happens to the empty AFFF containers?

A: Was not sure.

4. To the best of your knowledge, what is the procedure for how these vehicles are/were cleaned, and where is/was vehicle cleaning performed (currently as well as historically)?

A: Presumably in front of the station, which was normal practice.

Records, Spill logs, Historical Information

1. To the best of your knowledge, are there any current or historical data/documents/records associated with AFFF that we may review/copy (such as reports/work plans, historical or operational records, incident reports, crash data, inspection reports, AFFF spill logs, documentation of AFFF releases, photo interpretation)?

A: No.

2. Do you have recollection or records of AFFF being used in response to the following:

   a. Fuel releases to prevent fires

A: In the Navy FTA.

   b. Emergency response sites (such as plane, helicopter, or vehicle crash sites and fires)

A: No.

   c. Emergency runway landings where foam might have been used as a precaution

A: Not applicable (N/A)

   d. Other (such as air show demonstrations, AFFF "salutes")

A: N/A. No, not at MFD.

3. If yes to #2, please provide any information you have regarding how and if the releases were addressed and how any released material (including foam and contaminated soil) was disposed?

A: N/A.

4. In the potential absence of written records or incomplete written records, can you provide anecdotal/ verbal information and locations of spills or other emergency response incidents where AFFF was used that haven't already been previously discussed?

A: No.

5. What are the current and historical storage location(s) of the wreckage from emergency response incidents (if wreckage is stored outside)?

A: N/A

Location Information

1. If not already covered in previous questions, please provide any information on releases of AFFF that may have been diverted to or could have impacted the following items/areas:

    a. Stormwater conveyances/outfalls that drain runways, taxiways, and aprons

A: N/A

    b. Stormwater management system (such as drainage swales, outfalls, retention/detention basins)

A: N/A

    c. Industrial or sanitary wastewater treatment system (such as storm drain, sanitary sewer, OWS, building and plumbing drains)

A: N/A

    d. Water supply wells (such as potable, agricultural, industrial)

A: N/A

    e. Large-scale disposal (such as landfilling, land application of WWTP sludge, washing, dumping)

A: N/A

    f. Other

A: Firefighters treated foam like water.

General Information

1. Is there anyone else or other base organization personnel that you would recommend we interview? Name, organization, position, phone number, e-mail.

A: Assistant Fire Chief provided a list of previous fire fighters who worked at the MFD over the years:

1. *Former Fire Fighter 2. Worked as a firefighter at the MFD and started in 1989. Unclear how long he was there, but at least for 5 years or so. During the interview with Assistant Fire Chief, Assistant Fire Chief called Former Fire Fighter 2 on the phone. Former Fire Fighter 2 was not aware of a dedicated foam trailer. He did, however, indicate that the fire department would "flow" foam in an area near the ASTs. They would let the foam run down the hillside. It is unclear if they let it flow into the AST secondary containment units or along the hillside. Need to call Former Fire Fighter 2 and talk it through.*

2. *Former Fire Fighter 1.*

3. *Former Fire Captain.*

Assistant Fire Chief also mentioned to reach out to the former Operations Officer and former Fuel Officer.

2. Are there any other tenants/tenant organizations that currently (or historically) use/used AFFF?

A: No.

PFAS Preliminary Assessment Questionnaire

Fire Chief or Designees

Name:	**Former Fire Fighter 1** (see Appendix A-3 for details)
Title:	Former Fire Fighter, Manchester Fueling Depot (MFD)
Date of Interview:	10/23/2018
Contact information (email/phone number):	(see Appendix A-3)

Note:

If you can recommend additional contacts that you feel may be able to provide additional information, please provide the name and as much contact information as you have. Thank you.

Note, for the follow-on interview with Former Fire Fighter 1, only questions highlighted in yellow were asked. Other questions were not applicable and were discussed with the Fire Chief. Former Fire Fighter 1 served at the MFD as a firefighter from May 1989 through mid-August 1989. He was stationed at Fire Station Building No. 85.

AFFF Purchasing, Handling, and Storage

1. Was perfluorinated AFFF historically or currently used on the base? If so, provide any information regarding where and when.

A: Yes, during his 2-month stint at MFD, he said they would practice with the AFFF and test the equipment. As a firefighter, he clearly remembers "flowing foam" at least twice. They would park their fire truck and support equipment on the road located between above ground storage tanks (ASTs) 147 and 148 and spray into the secondary containment basins. He said they would spray at least a batch of foam that would use at least a 5-gallon bucket with the prescribed dilution percentage. They would then wash most of the foam with water afterwards. It is unclear if they would open the gates on the secondary containment basins to wash the AFFF and water through to the drainage gates and then down to Beach Drive or if the material stay in the basin and evaporate.

2. To the best of your knowledge, where has the AFFF solution been handled (currently and historically) (such as mixed, contained, released for calibration, transferred)?

A: They would "flow foam into the secondary containment basins for tanks 147 and 148. They used an apparatus referred to as the "Hired Gun", which was a large nozzle mounted on a tow behind trailer. They would mix the appropriate solution and then spray the foam with the nozzle. They would then use "hand lines" to wash the foam down into the basin.

3. Where is AFFF and AFFF equipment stored on base (currently and historically), and in what approximate quantities? (Please show locations on map provided or describe locations).

    a. Please describe procedures for how AFFF equipment is cleaned/decontaminated.

    b. To the best of your knowledge, where has the equipment currently or formerly been maintained?

Firefighting Training Areas

1. As part historical or current operational training, are any current or historical Firefighting Training Areas (FTAs) present on the facility? If yes, please show the location/s of the FTAs on the map provided.

A: No specified FTAs that he was aware of. He said they would not allow any controlled burns near the Fire Station.

2. To the best of your knowledge, what are/were the years of operation for each FTA you identified in your answer to Question #1 above?

A: Not applicable (N/A). See answer to No. 1 above.

3. How many FTAs are currently active? Inactive (historical in nature)? To the extent possible, please specify which are active versus historical.

4. To the best of your knowledge, were fuels/flammables other than "typical" (such as JP-5, #2 Fuel Oil) used at the FTAs? If yes, what was used?

A: N/A. See answer to No. 1 above.

5. For inactive FTAs, to the best of your knowledge, when was the last time that fire training using AFFF was conducted at each one?

6. When AFFF was used during a fire training exercise, to the best of your knowledge, was the AFFF used contained and disposed, and if so, how was the AFFF cleaned up and disposed?

A: Washed down the AFFF down to small "chunks" of foam using water hand lines. He had no idea what brand of foam it was.

7. To the best of your knowledge, are current and historical FTAs lined? If so, with anything other than concrete?

Hangars and Buildings

1. To the best of your knowledge, which areas (such as hangars, buildings, fuel or hazardous waste storage areas) historically had or currently have automated and/or manually-activated AFFF fire suppression systems?

2. To the best of your knowledge, please describe the procedure on how the suppression systems are supplied with AFFF (that is, is system contained within the building, or are there separate buildings that serve to mix AFFF to supply one or more hangers with suppression systems).

3. Please describe the fire suppression system layout/activation process and if available, provide system plans or drawings.

4. When the fire suppression system engages/or engaged, what is the current, and if different, historical response process for addressing AFFF used (that is, was AFFF cleaned up after being used and how)?

5. To the best of your knowledge, have there been inadvertent releases of AFFF from hangar fire suppression systems (such as equipment failure)? If so, please provide additional details (such as when, in which hangars/buildings, could the release be quantified, was the release removed or cleaned up)?

6. To the best of your, knowledge, who was responsible for current or historical routine maintenance of the AFFF system/s? To the best of your knowledge, were maintenance records kept, and if so where are they located?

7. To the best of your knowledge, for any historical activation (accidental, testing, or in response to an emergency) of AFFF systems within hangars and/or buildings, provide any information regarding the fate of the release (that is, did releases occur near drainage swales; were they washed to a pervious surface; did they occur on poorly maintained pervious surfaces [cracked concrete, porous asphalt]; were they directed to a storm drain, trench drain, oil/water separator [OWS], wastewater treatment plant).

Trucks and Trailers

1. Provide a list of current and historical parking/storage areas for AFFF equipment.

2. To the best of your knowledge, were the trucks currently and historically tested for spray patterns to make sure equipment is working properly? If so, how often and where are/were these spray tests performed?

A: Yes, see answer to No. 1 above under AFFF Purchasing, Handling, and Storage.

3. To the best of your knowledge, what is the procedure on how trucks and trailers are/were supplied with AFFF?

A: He said they just used 5-gallon buckets and used an "inductor" to mix the foam with the water. They used the "Hired Gun" that was supplied by a 5-inch hose. Nozzle of the "Hired Gun" was mounted on a trailer and it was relatively new at the time.

   a. Where does/did this resupply occur?

   b. Is/was there secondary containment in this area?

   c. What happens to the empty AFFF containers?

4. To the best of your knowledge, what is the procedure for how these vehicles are/were cleaned, and where is/was vehicle cleaning performed (currently as well as historically)?

A: He does not remember washing trucks after flowing the foam. Always parked the truck up wind so none of the foam would contact the truck.

Records, Spill logs, Historical Information

1. To the best of your knowledge, are there any current or historical data/documents/records associated with AFFF that we may review/copy (such as reports/work plans, historical or operational records, incident reports, crash data, inspection reports, AFFF spill logs, documentation of AFFF releases, photo interpretation)?

2. Do you have recollection or records of AFFF being used in response to the following:

    a. Fuel releases to prevent fires

    b. Emergency response sites (such as plane, helicopter, or vehicle crash sites and fires)

    c. Emergency runway landings where foam might have been used as a precaution

    d. Other (such as air show demonstrations, AFFF "salutes")

3. If yes to #2, please provide any information you have regarding how and if the releases were addressed and how any released material (including foam and contaminated soil) was disposed?

4. In the potential absence of written records or incomplete written records, can you provide anecdotal/ verbal information and locations of spills or other emergency response incidents where AFFF was used that haven't already been previously discussed?

A: None occurred while he was there.

5. What are the current and historical storage location(s) of the wreckage from emergency response incidents (if wreckage is stored outside)?

Location Information

1. If not already covered in previous questions, please provide any information on releases of AFFF that may have been diverted to or could have impacted the following items/areas:

    a. Stormwater conveyances/outfalls that drain runways, taxiways, and aprons

    b. Stormwater management system (such as drainage swales, outfalls, retention/detention basins)

    c. Industrial or sanitary wastewater treatment system (such as storm drain, sanitary sewer, OWS, building and plumbing drains)

    d. Water supply wells (such as potable, agricultural, industrial)

    e. Large-scale disposal (such as landfilling, land application of WWTP sludge, washing, dumping)

    f. Other

General Information

1. Is there anyone else or other base organization personnel that you would recommend we interview? Name, organization, position, phone number, e-mail.

A: Suggested to talk to the Former Fire Captain at the time of Former Firefighter 1's employment.

2. Are there any other tenants/tenant organizations that currently (or historically) use/used AFFF?

PFAS Preliminary Assessment Questionnaire

Fire Chief or Designees

Name:	**Former Fire Fighter 2** (see Appendix A-3 for details)
Title:	Former Fire Fighter, Manchester Fueling Depot (MFD)
Date of Interview:	1/17/2019 at 1530 to 1600
Contact information (email/phone number):	(see Appendix A-3)

Note:

If you can recommend additional contacts that you feel may be able to provide additional information, please provide the name and as much contact information as you have. Thank you.

Background

Former Fire Fighter 2 worked as a Fire Fighter at the MFD from 1991 through 1999. During the phone conversation, Former Fire Fighter 2 was clear in his recollection of the periodic usage of AFFF at MFD for fire training purposes.

AFFF Purchasing, Handling, and Storage

1. Was perfluorinated AFFF historically or currently used on the base? If so, provide any information regarding where and when.

A: Former Fire Fighter 2 indicated yes that the Fire Department used AFFF during simulated fire training drills at three specific areas at MFD. He confirmed what Former Fire Fighter 1 had conveyed that test sprays of the AFFF were conducted within the secondary containment basins at AST locations 147 through 149, but he expanded to say that they were conducted as simulated fire drills to practice putting out a large fuel fire at the tanks. He indicated they would conduct the fire drills at least twice per year at the AST locations and they were also done at ASTs 145 and 146. They would spray the AFFF through a Portable Monitor (previously referred to by Former Fire Fighter 1and Former Regional Fuel Manager/Deputy Director as the "Hired Gun") that had a higher spray velocity and distance capacity when compared to a normal fire truck water cannon. The nozzle could spray AFFF at a rate of approximately 2,000 gallons per minute. The simulated fire training drills were also conducted along the old and existing Fuel Piers and at Building 185 Fuel Loading Rack.

2. To the best of your knowledge, where has the AFFF solution been handled (currently and historically) (such as mixed, contained, released for calibration, transferred)?

A: Former Fire Fighter 2 indicated the AFFF was mixed and filled into an old 3,000 or 5,000-gallon fuel tank that was mounted on a trailer and mobilized to each training area. They would mix the tank to about 3/4 full and always keep it at that level to respond to an emergency if needed. They would fill the AFFF tank at Building 12. He did not observe any spills that may have occurred while filling the tank, but said it could have happened and would not have been documented. They did not think that it was necessary to record spills of the foam.

3. Where is AFFF and AFFF equipment stored on base (currently and historically), and in what approximate quantities? (Please show locations on map provided or describe locations).

A: Former Fire Fighter 2 said that AFFF containers were stored at Building 12, which is consistent with responses from Mr. Former Fire Fighter 1. He also indicated the AFFF mobile tank was stored at the Fire Station along with the portable monitor.

a. Please describe procedures for how AFFF equipment is cleaned/decontaminated.

A: Former Fire Fighter 2 responded with the same information as Former Fire Fighter 1, in that the trucks and other equipment would have been washed in front of the Fire Station and wash waters would run down into the normal storm drainage pathways. Former Fire Fighter 2 did not recall using the designated wash rack located near Building 194 when asked.

b. To the best of your knowledge, where has the equipment currently or formerly been maintained?

A: Former Fire Fighter 2 indicated the AFFF containers were stored at Building 12. The portable monitor was stored at the Fire Station along with the portable storage tank containing AFFF.

Firefighting Training Areas

1. As part historical or current operational training, are any current or historical Firefighting Training Areas (FTAs) present on the facility? If yes, please show the location/s of the FTAs on the map provided.

A: Former Fire Fighter 2 confirmed that operations were conducted to test spray the AFFF with the portable monitor (spray nozzle cannon) and simulate putting out a fire at ASTs 145 through 149. The drills were conducted at least twice a year between 1991 and 1999 during his time at MFD. Former Fire Fighter 2 also described two additional areas where simulated drills took place as follows:

a) Along the old Fuel Pier through the early to mid-1990s and at the new Fuel Pier

b) At the Tanker Truck Fuel Loading Rack located at Building 185 where JP-5 was periodically transferred to Semi-Tractor Trailer Fuel Tanker Trucks for delivery to other Naval facilities. According to Former Fire Fighter 2, JP-5 and/or a more flammable fuel material then JP-8 was once stored at UST 50.

A: Former Fire Fighter 2 indicated that the fire crews would practice at least once per year at the Fuel Pier and once per year at the Building 185 Fuel Loading Rack. At the Fuel Loading Rack, the crew would simulate fighting a fuel fire by spraying foam along the perimeter of the building.

2. To the best of your knowledge, what are/were the years of operation for each FTA you identified in your answer to Question #1 above?

A: Former Fire Fighter 2 indicated the fire drills at all three areas were conducted each year he was stationed as a Firefighter at MFD, which was 8 years. To his knowledge the drill simulations were conducted before he arrived and after until early 2000s. The Fire Station was closed in 2005.

3. How many FTAs are currently active? Inactive (historical in nature)? To the extent possible, please specify which are active versus historical.

A: See answer to No. 2 immediately above.

4. To the best of your knowledge, were fuels/flammables other than "typical" (such as JP-5, #2 Fuel Oil) used at the FTAs? If yes, what was used?

A: Former Fire Fighter 2 said no training was done with ignited fuel or fires with other materials.

5. For inactive FTAs, to the best of your knowledge, when was the last time that fire training using AFFF was

conducted at each one?

A: See answer to No. 2 above.

6. When AFFF was used during a fire training exercise, to the best of your knowledge, was the AFFF used contained and disposed, and if so, how was the AFFF cleaned up and disposed?

A: According to Former Fire Fighter 2, any excess AFFF left over from the training exercises was washed away into drainage ditches adjacent the area. The excess was not disposed of separately. Former Fire Fighter 2 indicated that the drainage pathways for any excess AFFF rinsed into the stormwater system would go through an oil/water separator (OWS).

7. To the best of your knowledge, are current and historical FTAs lined? If so, with anything other than concrete?

A: Did not discuss.

Hangars and Buildings

1. To the best of your knowledge, which areas (such as hangars, buildings, fuel or hazardous waste storage areas) historically had or currently have automated and/or manually-activated AFFF fire suppression systems?

A: Not applicable (N/A) – Did not discuss.

2. To the best of your knowledge, please describe the procedure on how the suppression systems are supplied with AFFF (that is, is system contained within the building, or are there separate buildings that serve to mix AFFF to supply one or more hangers with suppression systems).

A: N/A – Did not discuss.

3. Please describe the fire suppression system layout/activation process and if available, provide system plans or drawings.

A: N/A – Did not discuss.

4. When the fire suppression system engages/or engaged, what is the current, and if different, historical response process for addressing AFFF used (that is, was AFFF cleaned up after being used and how)?

A: N/A – Did not discuss.

5. To the best of your knowledge, have there been inadvertent releases of AFFF from hangar fire suppression systems (such as equipment failure)? If so, please provide additional details (such as when, in which hangars/buildings, could the release be quantified, was the release removed or cleaned up)?

A: N/A – Did not discuss.

6. To the best of your, knowledge, who was responsible for current or historical routine

maintenance of the AFFF system/s? To the best of your knowledge, were maintenance records kept, and if so where are they located?

A: N/A – Did not discuss.

7. To the best of your knowledge, for any historical activation (accidental, testing, or in response to an emergency) of AFFF systems within hangars and/or buildings, provide any information regarding the fate of the release (that is, did releases occur near drainage swales; were they washed to a pervious surface; did they occur on poorly maintained pervious surfaces [cracked concrete, porous asphalt]; were they directed to a storm drain, trench drain, oil/water separator (OWS), wastewater treatment plant).

A: N/A – Did not discuss.

Trucks and Trailers

1. Provide a list of current and historical parking/storage areas for AFFF equipment.

A: Former Fire Fighter 2 indicated, with the exception of AFFF drums, that all AFFF equipment was stored at the Fire Station.

2. To the best of your knowledge, were the trucks currently and historically tested for spray patterns to make sure equipment is working properly? If so, how often and where are/were these spray tests performed?

A: See answers in THE Fire Fighter Training Areas section.

3. To the best of your knowledge, what is the procedure on how trucks and trailers are/were supplied with AFFF?

A: According to Former Fire Fighter 2, the Fire Crews used a fork lift to hoist the AFFF drums above the 3,000 gallon mixing tank and would use a tap at the bottom of the drum to empty into the mixing tank. Former Fire Fighter 2 indicated that he did not observe any spills, but they could have occurred.

   a. Where does/did this resupply occur?

A: According to Former Fire Fighter 2, at Building 12.

   b. Is/was there secondary containment in this area?

A: Did not discuss.

   c. What happens to the empty AFFF containers?

A: Did not discuss.

4. To the best of your knowledge, what is the procedure for how these vehicles are/were cleaned, and where is/was vehicle cleaning performed (currently as well as historically)?

A: According to Former Fire Fighter 2, fire trucks were sprayed down with water at the training area.

Records, Spill logs, Historical Information

1. To the best of your knowledge, are there any current or historical data/documents/records associated with AFFF that we may review/copy (such as reports/work plans, historical or operational records, incident reports, crash data, inspection reports, AFFF spill logs, documentation of AFFF releases, photo interpretation)?

A: According to Former Fire Fighter 2, no.

2. Do you have recollection or records of AFFF being used in response to the following:

    a. Fuel releases to prevent fires

A: Did not discuss.

    b. Emergency response sites (such as plane, helicopter, or vehicle crash sites and fires)

A: Did not discuss.

    c. Emergency runway landings where foam might have been used as a precaution

A: Did not discuss.

    d. Other (such as air show demonstrations, AFFF "salutes")

A: Did not discuss.

3. If yes to #2, please provide any information you have regarding how and if the releases were addressed and how any released material (including foam and contaminated soil) was disposed?

A: Did not discuss.

4. In the potential absence of written records or incomplete written records, can you provide anecdotal/ verbal information and locations of spills or other emergency response incidents where AFFF was used that haven't already been previously discussed?

A: Former Fire Fighter 2 could not remember any spills.

5. What are the current and historical storage location(s) of the wreckage from emergency response incidents (if wreckage is stored outside)?

A: N/A – Did not discuss.

Location Information

1. If not already covered in previous questions, please provide any information on releases of AFFF that may have been diverted to or could have impacted the following items/areas:

    a. Stormwater conveyances/outfalls that drain runways, taxiways, and aprons

A: N/A – Did not discuss.

b. Stormwater management system (such as drainage swales, outfalls, retention/detention basins)

A: N/A – Did not discuss.

c. Industrial or sanitary wastewater treatment system (such as storm drain, sanitary sewer, OWS, building and plumbing drains)

A: N/A – Did not discuss.

d. Water supply wells (such as potable, agricultural, industrial)

A: N/A – Did not discuss.

e. Large-scale disposal (such as landfilling, land application of WWTP sludge, washing, dumping)

A: N/A – Did not discuss.

f. Other

A: N/A – Did not discuss.

General Information

1. Is there anyone else or other base organization personnel that you would recommend we interview? Name, organization, position, phone number, e-mail.

A: Former Fire Fighter 2 indicated no.

2. Are there any other tenants/tenant organizations that currently (or historically) use/used AFFF?

A: N/A – Did not discuss.

PFAS Preliminary Assessment Questionnaire

Environmental Staff

Name:	**Former Regional Fuel Manager** (see Appendix A-3 for details)
Title:	Former Regional Fuel Manager, Fleet Logistics Center Puget Sound (August 1985 – January 2014)
Date of Interview:	10/29/2018 at 10 am done by phone.
Contact information (email/phone number):	(see Appendix A-3)

Note:
If you can recommend additional contacts that you feel may be able to provide additional information, please provide the name and as much contact information as you have. Thank you.

Base Information

1. Is there a Teflon-coating shop on base? Historically? Provide location and years of operation.

A: No, not that he was aware of.

2. Is there a chrome-plating shop on base? Historically? Provide years of operation.

A: No.

   a. Was foam used to suppress vapors in the process?

A: Not applicable (N/A)

3. Where are the current or former locations of auto hobby shops and car/truck washes?

A: There was a paint booth set up in Building 1, but very minimal usage. And the MFD staff were permitting to work on vehicles from time to time. Nothing formal.

4. What is the current and historical source of the potable water supply for the base? Has the potable water been tested for PFAS? If so, please provide results.

A: Former Regional Fuel Manager said they would use Building 210. He said the well at Building 210 was re-drilled to build a new well in either 1985 or 1986. The old well was capped not abandoned. Near Tank 30, there was an old well, but I was also capped. No samples for PFAS were ever collected. The Base is on the City of Manchester water for potable use.

5. Are there supply wells of any kind on base (such as potable, irrigation, industrial) and if so, have they been tested for PFAS compounds?

A: See answer above.

6. Where are the current and historical landfills/disposal sites on base? What were the estimated years of use for each location? Confirm locations of landfills/disposal areas on map.

A: No designated landfills.

7. Are there monitoring wells located within the vicinity of any areas where Aqueous Film Forming Foam (AFFF) or materials containing PFAS may have been stored/used/released? Provide map or coordinates.

A: Wells were installed near Tank 29. Spill in 1985 near Tank 29. The problem with finding the wells is that they would usually succumb to damage from mowing/cutting activities. He said the wells were located approximately 4 feet from the outside of the concrete walls. They used to gauge the wells for LNAPL and collect samples for petroleum hydrocarbons. No PFAS samples collected. Records for groundwater monitoring are located in the Base historical records and the Deputy Environmental Director should have them.

Paints and Pesticide Use/Storage/Release

1. Do you know if specialty paints containing PFAS were used in large quantities on base? If so, please provide paint and pesticide storage warehouse and disposal locations.

A: No specialty paints that he is aware of.

2. How are unused or waste pesticides managed?

A: The Former Regional Fuel Manager hired landscaping companies to spray herbicides to control noxious weeds, such as the Tanzy Rag Wort. There is a report that provides inventory of herbicides and pesticides and Doug should have a copy.

3. How are unused or waste paints managed?

A: *The Former Regional Fuel Manager* said they yellow lockers where paints were stored. The lockers are in Building 194 located near the Fuels laboratory.

Firefighting Training Areas

1. As part of historical or current operational training, are any current or historical Firefighting Training Areas (FTAs) present on the facility? If yes, please show the location/s of the FTAs on the map provided.

A: The Former Regional Fuel Manager said there were no designated FTAs. He did mention that they purchased a spray nozzle large enough to deploy the AFFF for a fire of JP-4 when they stored JP-4 at the facility. He was not aware of test sprays with AFFF, but he said if it was done in 1989 within the secondary containment basins near Tanks 147 through 149, then it would have been on the gravel surface. He said the MFD Base staff should have records when the secondary containment basin was converted to concrete.

2. To the best of your knowledge, what are/were the years of operation for each FTA you identified in your answer to Question #1 above?

A: The Former Regional Fuel Manager said the Navy FTA school was closed in 1969. There was remnant of a pond south of the National Oceanic and Atmospheric Administration (NOAA) property line and he said AFFF may have been used on the NOAA property during the fire school days.

3. How many FTAs are currently active? Inactive (historical in nature)? To the extent possible, please specify which are active versus historical.

A: No FTAs on the Base or currently active. The Former Regional Fuel Manager indicated we may want to consider talking with the NOAA facility staff.

4. To the best of your knowledge, were fuels/flammables other than "typical" (such as JP-5, #2 Fuel Oil) used at the FTAs? If yes, what was used?

A: No for FTAs. But the Former Regional Fuel Manager was instrumental in procuring AFFF due to a high-profile fire that happened at Pearl Harbor, Hawaii where a large tank of JP-4 was caught on fire. He said large volumes of AFFF was used to extinguish this fire. This prompted MFD to purchase the AFFF.

5. For inactive FTAs, to the best of your knowledge, when was the last time that fire training using AFFF was conducted at each one?

A: Former Regional Fuel Manager is not aware of any FTAs on the MFD Base.

6. When AFFF was used during a fire training exercise, to the best of your knowledge, was the AFFF used contained and disposed, and if so, how was the AFFF cleaned up and disposed?

A: They kept the "hire gun" at the Fire Station. They purchased the nozzle because it would have to spray the AFFF high up to reach the tank height. Fire trucks were washed in front of the Fire Station and wash waters would run down the hill. The wash rack at MFD was not built until the 200 to 2005 timeframe.

7. To the best of your knowledge, are current and historical FTAs lined? If so, with anything other than concrete?

A: No designated FTAS. During test spray exercises, trucks were filled with AFFF in either the Fire Station building or at Building 12. The fire trucks did not have the capacity to mix the AFFF from the stock tanks, the "hired gun" nozzle apparatus did.

Records, Spill logs, Historical Information

1. To the best of your knowledge, are there any current or historical data/documents/records associated with AFFF that we may review/copy (such as reports/work plans, historical or operational records, incident reports, crash data, inspection reports, AFFF spill logs, documentation of AFFF releases, photo interpretation)?

A: He was not aware of any accidental spills of AFFF, but it may have occurred and he did not know about it. The Former Regional Fuel Manager said to check with Doug and the NAVFAC database for facility records.

2. Do you have recollection or records of AFFF being used in response to the following:

    a. Fuel releases to prevent fires

A: No. The Former Regional Fuel Manager referred to the Pearl City, Hawaii fire for the reason AFFF was purchased. The irony, however, was the on-Base Fire Department really did not have the equipment or capacity to fight larger scale fuel fires. He said there was a brush fire at one point, but the off-Base City of Manchester Department responded and extinguished it. The brush fire was located along Beach Drive directly north of Tank 149 along the hillside. He said the Base Fire Department most responded to First Aid incidents over the years.

    b. Emergency response sites (such as plane, helicopter, vehicle crash sites and fires)

A: No.

c. Emergency runway landings where foam might have been used as a precaution

N/A

d. Other (such as air show demonstrations, AFFF "salutes")

N/A

3. If yes to Question #2, please provide any information you have regarding how and if the releases were addressed and how any released material (including foam and contaminated soil) was disposed?

A: Former Regional Fuel Managerwas not aware of any releases or accidental spills.

4. In the potential absence of written records or incomplete written records, can you provide anecdotal/verbal information and locations of spills or other emergency response incidents where AFFF was used that haven't already been previously discussed?

A: Former Regional Fuel Managerwas not aware of any releases or accidental spills.

5. What are the current and historical storage location(s) of the wreckage from emergency response incidents (if wreckage is stored outside)?

N/A

Location Information

1. If not already covered in previous questions, please provide any information on releases of AFFF that may have been diverted to or could have impacted the following items/areas:

a. Stormwater conveyances/outfalls that drain runways, taxiways, and aprons

A: Not that he is aware of.

b. Stormwater management system (such as drainage swales, outfalls, retention/detention basins)

A: Former Regional Fuel Manager said the goal was to have any spills or stormwater runoff go through an OWS before it was discharged. By 2005, he said the vast majority of the OWSs were connected.

c. Industrial or sanitary wastewater treatment system (such as storm drain, sanitary sewer, OWS, building and plumbing drains)

A: They set up the oily waste treatment plant. In Building #1, they did not have a lot of industrial chemicals. He reiterated that MFD conducted basic functions.

d. Water supply wells (such as potable, agricultural, industrial)

A: Yes, through well located at Building 210, but now the Base is on the City of Manchester Public Water supply.

e. Large-scale disposal (such as landfilling, land application of wastewater treatment plant sludge,

washing, dumping)

A: Not a designated landfill on site. He mentioned the former PCB Site 302 where they did land farming for oily waste. Former Regional Fuel Manager initiated the cleanup. They did massive excavation and capped the area with clean fill and overburden.

f. Other

N/A

General Information

1. Is there anyone else or other base organization personnel that you would recommend we interview? Name, organization, position, phone number, email.

*A: S*ee Appendix A-3

2. Are there any other tenants/tenant organizations that currently (or historically) use/used AFFF?

Add on question: Did the MFD supply Navy Tankers with AFFF for the potential to fight fires?

A: No.

PFAS Preliminary Assessment Questionnaire

Environmental Staff

Name:	**Regional Fuel Manager/Deputy Director** (see Appendix A-3 for details)
Title:	Regional Fuel Manager/Deputy Director, Fleet Logistics Center Puget Sound
Date of Interview:	10/9/2018
Contact information (email/phone number):	(see Appendix A-3)

Note:

If you can recommend additional contacts that you feel may be able to provide additional information, please provide the name and as much contact information as you have. Thank you.

The Former Regional Fuel Manager worked at Manchester Fueling from approximately the early 1980s to 2014. The Regional Fuel Manager/Deputy Director became the Deputy Director in 2003 and took over as Regional Fuel Manager in 2014. The Regional Fuel Manager/Deputy Director provided contact information via email and the Former Regional Fuel Manager responded that he is available, but currently traveling and will be back on 10/11/18. Jacobs personnel will reach out to the Former Regional Fuel Manager via email to set up a short phone interview.

Base Information

1. Is there a Teflon-coating shop on base? Historically? Provide location and years of operation.

A: No

2. Is there a chrome-plating shop on base? Historically? Provide years of operation.

A: No

   a. Was foam used to suppress vapors in the process?

A: No. No applicable (N/A). On a side note, The Regional Fuel Manager/Deputy Director indicated vapors have been controlled with floating roofs for the Aboveground Storage Tanks (ASTs) 49 through 50, 141, 142, and 145 through 149. Did not comment on underground storage tanks (USTs) vapor control systems.

3. Where are the current or former locations of auto hobby shops and car/truck washes?

A: No hobby shop. The auto shop was located in Building (Bldg) No. 194. Adjacent to Bldg. 194 was the wash rack with a containment system. The discharge water would pass through a small OWS for treatment and then was discharged to the City of Manchester Waste Water Treatment Plant (WWTP).

4. What is the current and historical source of the potable water supply for the base? Has the potable water been tested for PFAS? If so, please provide results.

A: Potable water comes from the Manchester Water District. Before that, it was generated by "on base wells", such as the NOAA well house #6 and Water Well No. 5 and pumphouse. Neither has been tested. The Regional Fuel Manager/Deputy Director indicated the water from Well No. 5 is the supply water for fire hydrants and sprinkler systems in the UST tunnels.

5. Are there supply wells of any kind on base (such as potable, irrigation, industrial) and if so, have they been

tested for PFAS compounds?

A: Yes, see answer to question No. 4 above. None of the wells have been tested for PFAS.

6. Where are the current and historical landfills/disposal sites on base? What were the estimated years of use for each location? Confirm locations of landfills/disposal areas on map.

A: No former landfills within the current base boundary. The Regional Fuel Manager/Deputy Director mentioned the former PCB disposal site that was remediated many years ago.

7. Are there monitoring wells located within the vicinity of any areas where AFFF or materials containing PFAS may have been stored/used/released? Provide map or coordinates.

A: The Regional Fuel Manager/Deputy Director said he thought there were many monitoring wells located on the Base to monitor possible spills from the tanks. Note – Jacobs personnel subsequently investigated through speaking with site personnel and checked previous Phase I Site Assessment and no groundwater monitoring wells found.

Paints and Pesticide Use/Storage/Release

1. Do you know if specialty paints containing PFAS were used in large quantities on base? If so, please provide paint and pesticide storage warehouse and disposal locations.

A: Not to his knowledge. The Regional Fuel Manager/Deputy Director said paints that are used on-Base are epoxy based or water-based polyurethane. He is not aware of any storage of pesticides.

2. How are unused or waste pesticides managed?

A: No usage of pesticides to his knowledge. They may have used herbicides to control noxious non-invasive plants such as Scotch Burrow.

3. How are unused or waste paints managed?

A: Paints are managed as hazardous waste. They are profiled and disposed of off-site. They have a 90-day holding area, but it does not apply because MFD is a conditionally exempt small quantity generator.

Firefighting Training Areas

1. As part of historical or current operational training, are any current or historical Firefighting Training Areas (FTAs) present on the facility? If yes, please show the location/s of the FTAs on the map provided.

A: No, not in The Regional Fuel Manager/Deputy Director's experience.

2. To the best of your knowledge, what are/were the years of operation for each FTA you identified in your answer to Question #1 above?

A: The fire station was self-contained. The fire department was instructed to wash fire engines at the wash rack area adjacent Building 194.

3. How many FTAs are currently active? Inactive (historical in nature)? To the extent possible, please specify

which are active versus historical.

A: The Regional Fuel Manager/Deputy Director indicated the FTA area on the NOAA property that was used for Ship-born fire training. The Beaver Creek area was a lake/pond and they used that as a water supply. This area is now being converted to a Salmon run.

4. To the best of your knowledge, were fuels/flammables other than "typical" (such as JP-5, #2 Fuel Oil) used at the FTAs? If yes, what was used?

A: In the NOAA FTA, they would use aviation gasoline, Bunker fuel oil, standard fuel oil (STP) for bilge fires. In the mid-1940s through the 1960s, they would use Oxblood foam to extinguish fires.

5. For inactive FTAs, to the best of your knowledge, when was the last time that fire training using AFFF was conducted at each one?

A: N/A

6. When AFFF was used during a fire training exercise, to the best of your knowledge, was the AFFF used contained and disposed, and if so, how was the AFFF cleaned up and disposed?

A: N/A

7. To the best of your knowledge, are current and historical FTAs lined? If so, with anything other than concrete?

A: N/A

Records, Spill logs, Historical Information

1. To the best of your knowledge, are there any current or historical data/documents/records associated with AFFF that we may review/copy (such as reports/work plans, historical or operational records, incident reports, crash data, inspection reports, AFFF spill logs, documentation of AFFF releases, photo interpretation)?

A: MFD does not have any records for spills. Old AFFF was stored and was then send to NBK (around 20 to 30 drums).

2. Do you have recollection or records of AFFF being used in response to the following:

    a. Fuel releases to prevent fires

A: No. Fuels at MFD are not a fire risk due to the very high boiling points. Aviator gasoline was moved out. ASTs 48, 49, and 50 contained aviator gasoline.

    b. Emergency response sites (such as plane, helicopter, vehicle crash sites and fires)

A: N/A

    c. Emergency runway landings where foam might have been used as a precaution

A: N/A

d. Other (such as air show demonstrations, AFFF “salutes”)

A: N/A

3. If yes to Question #2, please provide any information you have regarding how and if the releases were addressed and how any released material (including foam and contaminated soil) was disposed?

A: N/A

4. In the potential absence of written records or incomplete written records, can you provide anecdotal/verbal information and locations of spills or other emergency response incidents where AFFF was used that haven’t already been previously discussed?

A: No

5. What are the current and historical storage location(s) of the wreckage from emergency response incidents (if wreckage is stored outside)?

A: No

Location Information

1. If not already covered in previous questions, please provide any information on releases of AFFF that may have been diverted to or could have impacted the following items/areas:

    a. Stormwater conveyances/outfalls that drain runways, taxiways, and aprons

A: Site personnel will provide.

    b. Stormwater management system (such as drainage swales, outfalls, retention/detention basins)

A: Same as above.

    c. Industrial or sanitary wastewater treatment system (such as storm drain, sanitary sewer, OWS, building and plumbing drains)

A: Site personnel can provide location of outfalls on SWPPP and NPDES permit.

    d. Water supply wells (such as potable, agricultural, industrial)

A: Covered in the above answer.

    e. Large-scale disposal (such as landfilling, land application of WWTP sludge, washing, dumping)

A: No.

    f. Other

General Information

1. Is there anyone else or other base organization personnel that you would recommend we interview?

Name, organization, position, phone number, e-mail.

A: Yes, the Former Regional Fuel Manager. The Regional Fuel Manager/Deputy Director will provide his contact information.

2. Are there any other tenants/tenant organizations that currently (or historically) use/used AFFF?

A: No.

Responses to other questions.
Have industrial chemicals been treated through the OWS?

A: The OWS process used oil and recycles it. They do not knowingly take on "other" chemical products or waste, but they may received "Engine Bilge Materials" from time to time and that material may have other chemical by-products.

Other notes from interview:

The Regional Fuel Manager/Deputy Director says site personnel has records of construction of the FFTA. Site personnel also encouraged us to reach out to the Northwest Battalion fire chief, Mr. Jack Woodard.

Appendix C
Site Reconnaissance Photo Log

APPENDIX C

Photograph Log

Team: Jacobs Personnel			Date: 10/10/18
Weather: Overcast to Sunny			
Name of Base/Site: Manchester Fueling Depot			
Photo #	***Time (PST)***	***View, Direction***	***Location/Description***
			
Photo 1 (Above)	10:58	Standing on the western portion of the laydown yard looking East	View of the laydown yard located on the middle-southern edge of the Base. This area is considered a small peninsula with view of the Fire Station to the east-northeast and Puget Sound in the distance. The Base uses the area for laydown of bulk materials and the waste disposition.
			
Photo 2 (Above)	12:00	Same as Photo 1, except standing in the middle of the laydown area.	Same description as Photo 1.

			
Photo 3 (Above)	12:01	Standing in the middle of the laydown area looking west along South Dike Road.	View of the covered laydown structure, fire hydrant, and water conveyance station.
			
Photo 4 (Above)	12:05	View looking east up South Dike Road	Photo taken near “SLOMO” structure, which stands for Slow Moving equipment area. Also known as the Covered Equipment Storage (CES) area. The SLOMO area is in the southwestern corner of the western half of the property, west of the contractor laydown area.

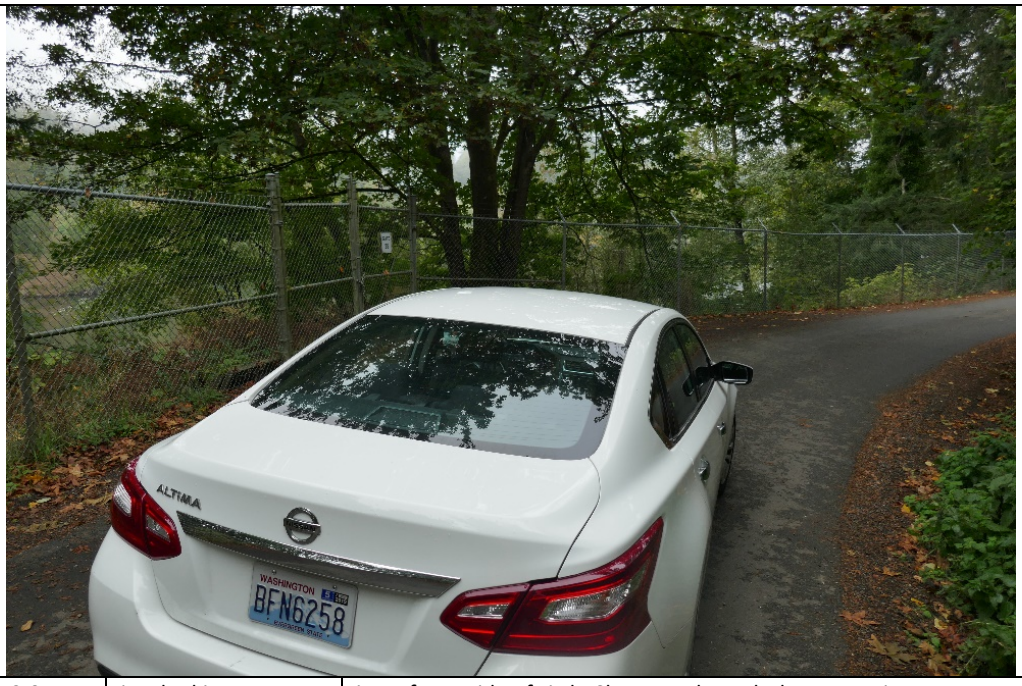

Photo 5 (Above)	12:05	View looking west near intersection of South Dike Road and Clam Bay Road	View of east side of Little Clam Bay through the vegetation.

Photo 6 (Above)	12:08	View looking north-northwest along Clam Bay Road	View of discharge pipe from Oil/Water Separators (OWSs) Nos. 8, No. 8A, and 8B. The discharge pipe empties into Little Clam Bay under an NPDES permit.

Photo 7 (Above)	12:08 through 12:10	View looking primarily north.	Various views of OWS No. 8, 8A, and 8B.

Photo 8 (Above)	12:08 through 12:10	View looking primarily north.	Various views of OWS No. 8, 8A, and 8B.

Photo 9 (Above)	12:11	View looking west on western edge of Clam Bay Road	View of discharge pipe for OWS Nos. 8, 8A, and 8B.

Photo 10 (Above)	12:11	Same as Photo 9.	View of Little Clam Bay through the vegetation, fire hydrant, and what looks to be a water pipe valve stickup.

Photo 11 (Above)	12:14	View to the northwest up Pine Road.	Photo taken to understand topography, which is steep rising up toward Vista Point Drive.

Photo 12 (Above)	12:14	Same as Photo 11.	Same as Photo 11.

Photo 13 (Above)	12:14 – 12:15	Various views.	Views of various underground storage tank (UST) locations. Based on staff interviews and recon, no evidence of fires or usage of PFAS-based chemicals as part of UST maintenance.

Photo 14 (Above)	12:14 – 12:15	Various views.	Views of various UST locations. Based on staff interviews and recon, no evidence of fires or usage of PFAS-based chemicals as part of UST tank maintenance.

Photo 15 (Above)	12:14 – 12:15	Various views.	Views of various UST locations. Based on staff interviews and recon, no evidence of fires or usage of PFAS based chemicals as part of UST tank maintenance.

Photo 16 (Above)	12:14 – 12:15	Various views.	Views of various UST locations. Based on staff interviews and recon, no evidence of fires or usage of PFAS-based chemicals as part of UST tank maintenance.

Photo 17 (Above)	12:58	View to the west along South Dike Road	View of water main access port. Fleet Logistics Center Puget Sound Manchester Fuel Depot (MFD) staff Deputy Environmental Director and Environmental Engineer did not know exactly who installed it. It is most likely associated with the City of Manchester Water Utility.

Photo 18 (Above)	13:11	View to the southwest along Alder Loop Road.	View of National Oceanic and Atmospheric Administration (NOAA) Well.

Photo 19 (Above)	13:11	View to the southwest along Alder Loop Road.	View of NOAA Well.

Photo 20 (Above)	13:14	View looking to the north.	View of the former PCB Site 302. The site is gated off with access prohibited. The site was remediated in the 1990s and is highly vegetated. It would be difficult to identify the previous burn areas and there is no direct evidence to suggest that AFFF was used to extinguish fires.

Photo 21 (Above)	13:14	View looking to the north.	View of the former PCB Site 302. The site is gated off with access prohibited. The site was remediated in the 1990s and is highly vegetated. It would be difficult to identify the previous burn areas and there is no direct evidence to suggest that AFFF was used to extinguish fires.

Photo 22 (Above)	13:24	View looking to the northwest	View of Well Pump House 210.

Photo 23 (Above)	13:34	View to the southeast at Building 85, Fire Station.	Exterior view of Building 85, the former Fire Station.

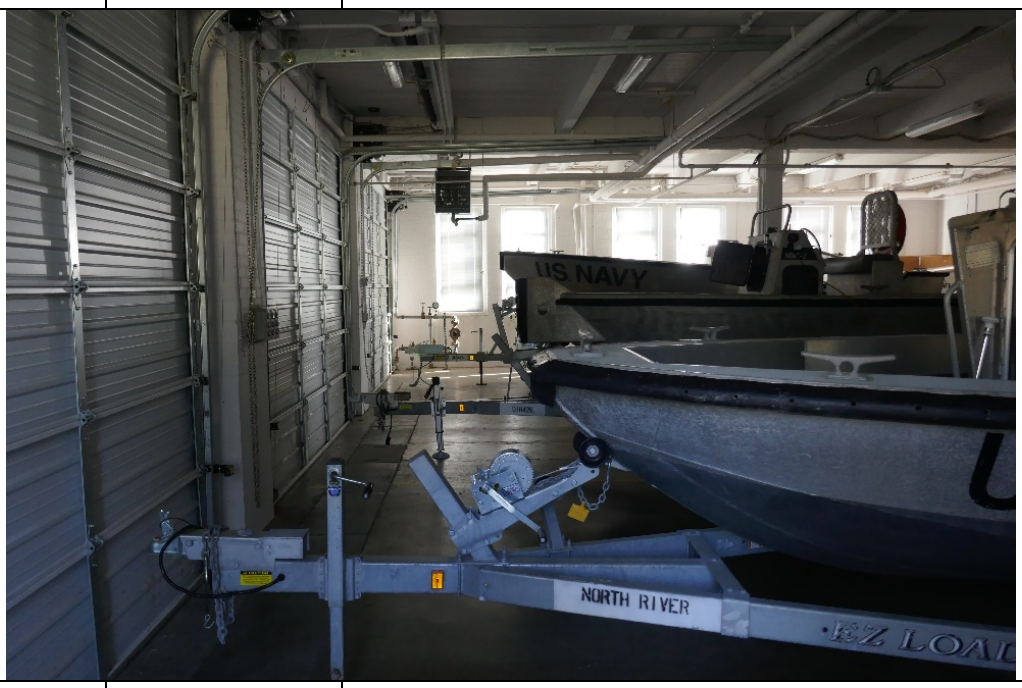

Photo 24 (Above)	13:35-13:38	Interior photos of Building 85	Interior photos of Building 85. Note there is no floor drains in the building. Any wash waters from truck or equipment washing would have drained to the front of the building.

Photo 25 (Above)	13:35-13:38	Interior photos of Building 85	Interior photos of Building 85. Note there is no floor drains in the building. Any wash waters from truck or equipment washing would have drained in the front of the building.

Photo 26 (Above)	13:35-13:38	Interior photos of Building 85	Interior photos of Building 85. Note there is no floor drains in the building. Any wash waters from truck or equipment washing would have drained in front of the building.

Photo 27 (Above)	13:47 through 13:51	Interior photos of Building 12 showing containers of AFFF.	Photos of AFFF stored in Building 12. Note there is 44 containers shown with 1 missing.

Photo 28 (Above)	13:47 through 13:51	Interior photos of Building 12 showing containers of AFFF.	Photos of AFFF stored in Building 12. Note there is 44 containers shown with 1 missing.

Photo 29 (Above)	13:47 through 13:51	Interior photos of Building 12 showing containers of AFFF.	Photos of AFFF stored in Building 12. Note there is 44 containers shown with 1 missing.

Photo 30 (Above)	13:47 through 13:51	Interior photos of Building 12 showing containers of AFFF.	Photos of AFFF stored in Building 12. Note there is 44 containers shown with 1 missing.

Photo 31 (Above)	13:47 through 13:51	Interior photos of Building 12 showing containers of AFFF.	Photos of AFFF stored in Building 12. Note there is 44 containers shown with 1 missing.

Photo 32 (Above)	13:59	View looking to the west	Old potable well.

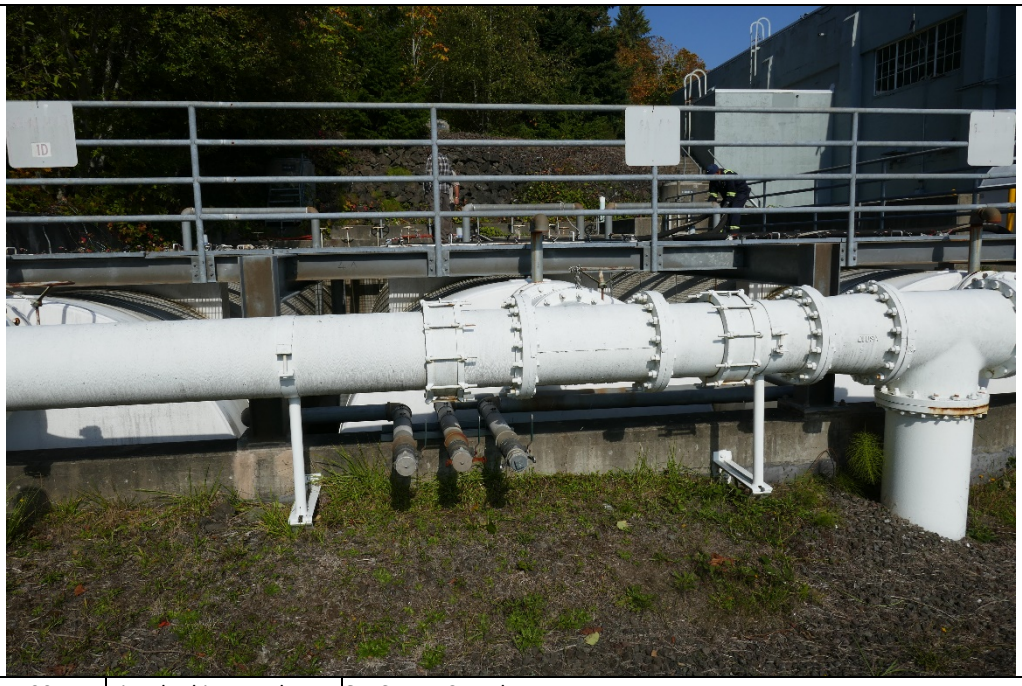

Photo 33 (Above)	14:00	View looking north	OWS 1B, 1C, and 1D.

Photo 34 (Above)	14:00	View looking south-southeast	Primary Electrical Switchgear

Photo 35 (Above)	14:07	Interior photos of Building 178	Interior photos of equipment and tanks in the Oily Water Treatment Plant, Building 178.

Photo 36 (Above)	14:07	Interior photos of Building 178	Interior photos of equipment and tanks in the Oily Water Treatment Plant, Building 178.

Photo 37 (Above)	15:24	View looking north-northwest	Vehicle wash rack. Per Base protocol, Fire Station staff were instructed to wash Fire Engines and Equipment at this wash rack.

Photo 38 (Above)	15:24	View looking north-northwest	Vehicle wash rack. Per Base protocol, Fire Station staff were instructed to wash Fire Engines and Equipment at this wash rack.

Photo 39 (Above)	15:24	View looking southwest.	Pump Island and Building No. 1.

Photo 40 (Above)	15:55	View looking east and northeast	Photos along Blackberry Loop just south of the NOAA property boundary. NOAA fishery facilities and offices are shown.

Photo 41 (Above)	15:55	View looking east and northeast	Photos along Blackberry Loop just south of the NOAA property boundary. NOAA fishery facilities and offices are shown.

Photo 42 (Above)	15:55	View looking east and northeast	Photos along Blackberry Loop just south of the NOAA property boundary. NOAA fishery facilities and offices are shown.

Photo 43 (Above)	15:57	View looking south.	Near the intersection of Blackberry Loop and Olympic Drive.

Photo 44 (Above)	15:57	View looking east.	Along Olympic Drive and crossing over creek flowing into Puget Sound.

Photo 45 (Above)	15:57	View looking east-northeast.	View of outfall of creek flowing into Puget Sound.

Photo 46 (Above)	15:57	View looking southwest	View upstream of the creek running just south of the NOAA property.

Photo 47 (Above)	15:58	View looking east along Olympic Drive	Flat portion of Olympic Drive heading east.

Photo 48 (Above)	15:59	View looking southeast along Olympic Loop Road	Portion of road just west of UST 48.

Photo 49 (Above)	16:00	View looking east along Olympic Drive East	Flat portion of road heading east towards the MFD offices.

Photo 50 (Above)	16:00	View looking north from Olympic Drive East	View of Puget Sound to the North.