Naval Facilities Engineering Systems Command Northwest
Silverdale, Washington

Final

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS)

Naval Base Kitsap Bangor and
Associated Special Areas
Silverdale, Washington

December 2020

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Prepared for NAVFAC Northwest
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Seattle, Washington
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Acronyms and Abbreviations

AFFF	aqueous film-forming foam
AUL	Authorized Use List
bgs	below ground surface
BOSC	Base Operating Support Contract
CH2M	CH2M HILL, Inc.
DASN	Deputy Assistant Secretary of the Navy
DNT	dinitrotoluene
DoD	Department of Defense
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
EDR	Environmental Data Resource
EI&E	Energy, Installations, and Environment
ER,N	Environmental Restoration, Navy
GIS	geographic information system
IWTP	Industrial Waste Treatment Plant
MILSPEC	military specification
NACIP	Navy Assessment and Control of Installation Pollutants
NAVFAC	Naval Facilities Engineering System Command
Navy	Department of the Navy
NBK	Naval Base Kitsap
OEL	Other Environmental Liabilities
OU	operable unit
PA	Preliminary Assessment
pers. comm.	personal communication
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonate
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
ppt	part(s) per trillion
PWS	public water system
RDX	Royal Demolition Explosive
RfD	reference dose
ROD	Record of Decision
RPM	Remedial Project Manager
TNT	trinitrotoluene
TTF	Trident Training Facility
UCMR3	Third Unregulated Contaminant Monitoring Rule
USEPA	United States Environmental Protection Agency
VSI	visual site inspection

SECTION 1

Introduction

This Preliminary Assessment (PA) report documents the evaluation of potential sources of per- and polyfluoroalkyl substances (PFAS) at Naval Base Kitsap (NBK) Bangor. This PA report has been prepared for the Department of the Navy (Navy) under the Comprehensive Long-term Environmental Action—Navy (CLEAN) Contract N62470-16-D-9000, Contract Task Order N4425518F4117.

This PA considered all property associated with NBK Bangor, including the one special area that is currently owned by the Navy, the Bremerton Railroad (from Shelton to Bremerton to Silverdale, Washington) (**Figure 1-1**) and any disposed properties for which the Navy maintains environmental liability:

Upon evaluation of the special area associated with NBK Bangor, the Bremerton Railroad is not recommended for further action. Based on the lack of any structures and documentation of any aqueous film-forming foam (AFFF) storage, use, or transfer, it is unlikely that AFFF or other PFAS-containing materials have been used or released at this location. As such, this special area is not included in this report.

1.1 Preliminary Assessment Objectives

This installation-specific PA for PFAS is part of a Navy wide installations assessment of potential historical sources of PFAS use. The objectives of this NBK Bangor PFAS PA are to:

- Identify and catalog all potential or actual PFAS sources (as listed in the following activities list).
- 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 facility).
- Determine whether an expedited response action is warranted because of current complete exposure pathways (for example, on- or off-Base drinking water sources within 1 mile downgradient of potential source area).

To accomplish these objectives, the following activities have been completed:

- A review of existing information to identify and characterize potential PFAS releases.[1]
- A review of existing information to identify potential off-Base receptors within 1 mile of the facility boundary. Note that this is less extensive than the study area defined in United States Environmental Protection Agency's (USEPA's) PA Guidance (USEPA, 1991), but will be expanded in later project phases if complete pathways beyond 1 mile are identified.
- 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 facility to identify any evidence of PFAS releases, potential receptors, and migration pathways; to identify all areas of concern; and to fill data gaps identified in the data review and interviews.
- Identify any need for initiation of an expedited response drinking water investigation in accordance with Navy policy (DASN, 2016a).

[1] This installation-specific PFAS PA does not include potential releases of PFAS at operational ranges during range activities. In accordance with the Chief of Naval Operations April 6, 2020 policy entitled Navy Policy Assessment of Potential PFAS Releases on Operational Ranges, operational ranges are not included in this PA and will be investigated separately.

1.2 PFAS Background

PFAS have been identified by the U.S. Department of Defense (DoD) and USEPA as "emerging contaminants."[2] 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.

1.2.1 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.[3] 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.

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2 " 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.

3 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.

1.2.2.1 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 (MILSPEC) was issued that described characteristics that AFFF needed to demonstrate to be used by the military, including a requirement for formulations containing PFAS. As such, 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.

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 (machine shops and electroplating operations), housing areas, and waste from wastewater treatment plants and/or homeported ships. These waste streams may contain industrial and/or consumer products that were either manufactured with PFAS or contain PFAS constituents that may leach out of the landfill. Additionally, waste material biosolids and sludge from wastewater treatment plants 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 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. There is limited information on only a few out of the thousands of total PFAS. To date, 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 and Resource Conservation and Recovery Act human health risk assessments.

The Superfund Health Risk Technical Support Center has estimated a Tier 2 noncarcinogenic toxicity value for perfluorobutane sulfonate (PFBS) (USEPA, 2014). The oral reference dose (RfD) is based on kidney effects observed in female rats. Because of a lack of information in the current literature, toxicity values for inhalation exposure and cancer endpoints could not be estimated for PFBS.

The USEPA Office of Water developed a RfD for perfluorooctanoic acid (PFOA), which 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. 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 (USEPA, 2016a).

The USEPA Office of Water estimated a 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)[4] 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 were included in the UCMR3 contaminant list. Of these six PFAS, USEPA issued health advisory levels for only two: PFOA and PFOS. The UCMR3 results found these two chemicals were present in less than 1 percent of the nearly 5,000 public water systems that sampled per UCMR3.

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, including sensitive populations, with a margin of protection from a lifetime of exposure to PFOA and PFOS from drinking water. The health advisory is 70 parts per trillion (ppt) for PFOA and 70 ppt for PFOS. When both PFOA

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

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 take 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 December 2020, no specific PFAS action levels have been established by the State of Washington; however, several state agencies (Washington State Department of Ecology [Ecology], 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, PFHxS, PFNA, and PFBS. These SALs are expected to be finalized in Summer 2021 (DOH, 2020).

1.4 Navy Policy

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

Because of Navy releases impacting PWSs tested under the 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.

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

This policy memo 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, 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 of 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 in drinking water results.

Because the drinking water supplied to NBK Bangor was tested under the UCMR3, no additional testing under this policy was performed at NBK Bangor.

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 and 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 exposure 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/DOE 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.

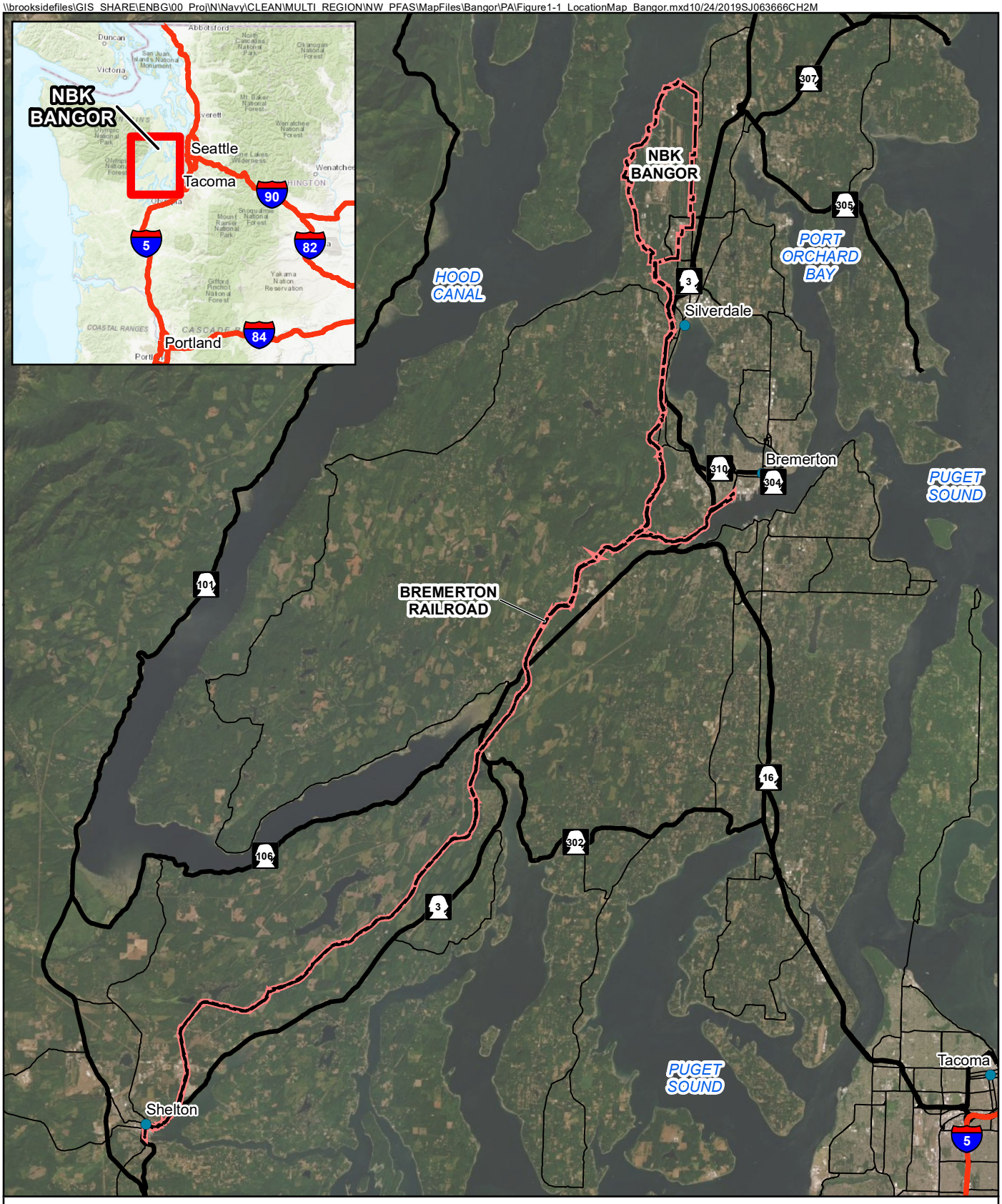
1.6 Report Organization

The PFAS PA Report for Navy Installation is organized in the following sections:

1. Introduction
2. Facility Description
3. Assessment Methodology
4. Findings and Recommendations
5. Conclusions
6. References

The following appendices are included:

A Summary of Records Reviewed
B Interview Record



LEGEND

- City
- Freeway
- State Route
- Local Connecting Road
- Installation Boundary

FOUO

NOTE:
NBK = Naval Base Kitsap

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Imagery, 2016

0 2.5 5 Miles

1 inch = 5 mile

N

Figure 1-1
Location Map: NBK Bangor
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

SECTION 2

Facility Description

NBK Bangor is on the Kitsap Peninsula in Kitsap County, Washington, at a location on Hood Canal approximately 6 miles north of Silverdale, Washington (**Figure 2-1**). NBK Bangor is approximately 7,200 acres in size. The land immediately surrounding NBK Bangor is listed as predominantly rural residential (one dwelling per 5 acres). One area immediately southeast of NBK Bangor is identified as urban industrial (Navy, 2015).

Information relevant to this PA, including facility background, environmental setting, and other PFAS investigations is presented in the following subsections.

2.1 Facility Background

Naval activities began at NBK Bangor in June 1944, when the U.S. Naval Magazine, Bangor, was established to provide a deep-water shipment facility for ordnance. From 1944 into the early 1970s, the Navy facility at Bangor was primarily used for shipment and storage of ordnance and demilitarization of unserviceable and dangerous ammunition. In February 1977, NBK Bangor was commissioned as the West Coast homeport for the Trident Submarine Launched Ballistic Missile System. The current mission of the Base is to provide administrative and personnel support for submarine force operations and logistical support for other Navy activities.

In 1977, a 12-acre parcel along the NBK Bangor historical installation boundary was disposed via quitclaim deed to Central Kitsap School District (**Table 2-1** and **Figure 2-1**). A review of the real estate records indicated that the land was purchased by the Navy in 1945 and remained undeveloped until disposal of the property to Central Kitsap School District in 1977. The property is currently developed with buildings and a parking lot. The disposed property was not evaluated as part of this PA, as it is not currently owned by the Navy.

Table 2-1. NBK Bangor Disposed Property Summary Table
Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) at NBK Bangor, Silverdale, Washington

Date	Disposal ID	Grantee	Disposal Type	Size (acres)
12/6/1977	N68436-BAD1	Central Kitsap School District	Quitclaim	12.00

In 1978, the Navy Assessment and Control of Installation Pollutants (NACIP) program was initiated, and waste disposal sites at NBK Bangor were evaluated under this program. As part of the NACIP program, an initial assessment study was conducted at NBK Bangor (NEESA, 1983a, 1983b). The purpose of the initial assessment study was to identify and assess environmental contamination resulting from past hazardous materials storage, transfer, processing, and disposal operations at NBK Bangor.

Following completion of the initial assessment study, a current situation report was completed for Operable Unit (OU) 1, and a combined current situation report was completed for sites included in OUs 2 through 7. Remedial actions at each of these OUs are described as follows:

- The Record of Decision (ROD) for OU 1 was signed in December 1991. Remedial action (RA) construction occurred in 1997. Groundwater treatment and monitoring is ongoing at OU 1 (Navy, 2005).
- An interim remedial action ROD was signed for OU 2 in September 1991 and the final remedial action ROD was signed in September 1994. RA construction occurred in 1994 for the interim remedial action and in 1997 for the final remedial action. Groundwater treatment and monitoring is ongoing for OU 2 (Navy, 2005).
- The ROD for OU 3 was signed in April 1994. The maintenance of institutional controls is ongoing (Navy, 2005).
- The ROD for OU 4 was signed in July 1994 there has been no remedial action at this OU (Navy, 2005).
- The ROD for OU 5 was signed in September 1993 there has been no remedial action at this OU (Navy, 2005).

- The ROD for OU 6 was signed in September 1994. RA construction occurred in December 1997. RA operations and monitoring was completed in December 1997 (Navy, 2005).
- The ROD for OU 7 was signed in April 1996. RA construction was completed in 1997. Monitoring of groundwater, sediments, and institutional controls is ongoing (Navy, 2005).
- The ROD for OU 8 was signed in September 2000. RA construction occurred in April 2001. Monitored natural attenuation is ongoing (Navy, 2005).

NBK Bangor is listed twice on USEPA's National Priorities List. The Bangor Ordnance Disposal Site (OU 1) was added to the National Priorities List in July 1987, and Bangor Naval Submarine Base Site (OUs 2, 3, 4, 5, 6, 7, and 8) was added in August 1990. In January 1990, the Navy, USEPA, and Ecology entered into a Federal Facilities Agreement. Three sites initially investigated as part of OU 7 (Sites 27, 28, and 29) were included in a separate OU (OU 8) following the discovery that volatile organic compounds (VOCs) had been detected in a newly installed, but not yet operational, off-Base water supply well in the neighborhood southeast of these sites.

OU 8 was added to the Federal Facilities Agreement in October 1994. In addition to Sites 27, 28, and 29, OU 8 also includes the Public Works Industrial Area service station.

The sampling done under the UCMR3 program constitutes a limited PFAS investigation. No other PFAS investigations have been conducted at NBK Bangor.

2.1.1 Active Permits

There are 50 active environmental permits in place for NBK Bangor (USEPA, 2019). These include the following categories:

- National Pollutant Discharge Elimination System stormwater industrial permits: six permits (#WAR05F004, #WAR10F02F, #WAR10BU4F, #WA0025577, #WAR10F02B, #WAP007363)
- Resource Conservation and Recovery Act permits: three permits (#WA3170090051, #WA5170027291, #WAD070967427) describe compliance and/or enforcement activities and hazardous waste programs
- Toxics program permits: nine active permits (#160, #161, #162, #163, #164, #165, #166, #167, #168)
- Superfund Enterprise Management System: two permits (#WA7170027265, #WA5170027291)
- Integrated Compliance Information System: 30 permits (#1800048267, #1800048190, #1800048249, #1800048210, #1800048211, #1800048228, #1800048250, #1800048265, #1800048251, #1800048193, #1800048255, #1800048253, #1800048259, #1800048264, #1800048266, #1800048209, #1800048248, #1800048258, #1800048192, #1800048229, #1800048252, #1800048260, #1800048262, #1800048261, #1800048256, #1800048208, #1800048191, #1800048257, #1800048263, #1800049254).

2.2 Environmental Setting

2.2.1 Climate

The climate at NBK Bangor is characterized by a temperate marine climate (USGS, 1998). Average high temperatures during the summer months range from 70 to 75 degrees Fahrenheit, while winter highs are typically in the 40 to 50 degrees Fahrenheit range. Average low temperatures during the summer months range from 50 to 55 degrees Fahrenheit, while winter lows are typically in the 30 to 35 degrees Fahrenheit range (Weatherbase, 2019). Average annual precipitation for the region is about 34 inches, approximately 85 percent of which falls between October and April. The Bremerton area receives approximately 6.7 inches of snowfall annually (Weatherbase, 2019).

2.2.2 Geologic Setting

NBK Bangor lies within the Puget Sound Lowland, a broad structural trough consisting of glacial and nonglacial deposits overlying volcanic bedrock. The Vashon Glaciation (15 to 13 thousand years ago) was the latest of a series of Puget Lobe glaciers to occupy the area. A 1981 report by Robinson, Noble, and Carr (Paterson, 1981) collected lithologic descriptions from borings ranging from 150 to 1200 ft bgs and interpreted these descriptions in the context of the regional stratigraphy of the Kitsap Peninsula. This study identified five basic geologic units present at NBK Bangor, including deposits of the Vashon Drift (Vashon Glaciation). The units are, from youngest to oldest - units of the Vashon Drift (Vashon Glaciation): Lawton Clay, Esperance Sand, Vashon Advance Outwash/Gravel, Vashon Till, and Vashon Recessional Outwash; Salmon Springs Drift, Devil's Hole Formation, Bangor Formation, and the Fletcher Bay Sequence.

Details about each stratigraphic unit are listed as follows, from youngest to oldest (Paterson, 1981):

- **Alluvium** (Qal): thin, discontinuous stream, beach, and landslide deposits
- **Vashon Drift** (Vashon Glaciation):
  - **Vashon Recessional Outwash** (Qvr): discontinuous, unconsolidated fine to medium silty sand with small amounts of gravel
  - **Vashon Till** (Qvt): dense unit of gravel and cobble through boulder-size material in silt, fine sand, and clay
  - **Vashon Advance Outwash/Gravel** (Qva): discontinuous, generally clean sand and gravel overlying the Esperance Sand; typically, between 100 to 150 feet thick
  - **Esperance Sand** (Qve): medium-grained, well-sorted sand, with some silt including thin silt layers, deposited by streams
  - **Lawton Clay** (Qv1): clay and silt deposited by a major lake complex during the Vashon glaciation. A generally thin, blue clay unit; typically, between 40 to 80 feet thick and more than 200 feet thick in some areas
- **Salmon Springs Drift** (Qst): glacial till and heterogeneous blue clays and brown silty gravels
- **Devil's Hole Formation** (Qdh): non-glacial or interglacial stream deposit; dark basaltic gravel with considerable black sand; numerous layers of silt containing wood fragments and peat. This unit is likely correlative to the Whidbey and Kistap Formations in adjacent areas.
- **Bangor Formation** (Qb1, Qb2): glacial outwash derived from older Puget Lobe glaciations. The lower unit (Qb2) is a gray sandy unit with considerable gravel and traces of peat and wood fragments; the upper unit (Qb1) consists of glacial outwash with coarse sand, gravel, and cobbles
- **Fletcher Bay Sequence** (Qfb): very thick sequence of shaley silt and clay with some gravel and gravelly beds. Non-glacial and may represent an early basin fill that occurred before the Puget Lobe glaciers

2.2.3 Hydrogeologic Setting

The hydrogeologic setting at NBK Bangor is dictated by the formations presented in **Section 2.2.2**. However, it should be noted that previous investigations characterizing the geologic and hydrostratigraphic units present at NBK Bangor have utilized different naming conventions to refer to the various glacial deposits across the Base. An attempt was made to harmonize the various naming conventions based on work done by Kahle (1998).

The occurrence and potential pathways of groundwater flow in the area are determined by the presence or absence of high or low permeability units. The hydrogeologic conditions at NBK Bangor vary from north to south across the Base, therefore more specific northern and southern hydrogeology is described in **Sections 2.2.3.1** and **2.2.3.2.**

Kahle (1998), based on inventories of 489 wells, piezometers, test holes, borings, and springs across NBK Bangor and the surrounding areas, identified nine hydrogeologic units within the glacial and interglacial deposits

discussed above for the region that includes NBK Bangor. In order of increasing depth, the units are the Perched aquifer, the Vashon till, the Shallow aquifer, the upper confining unit, the Sea-level aquifer, the lower confining unit, the Deep aquifer, the basal confining unit, and the undifferentiated deposits (modified from Kahle, 1998). Because fewer wells penetrate deeper deposits, the units near land surface are better understood than those at depth. Deeper units are frequently discontinuous because the glacial deposits in older units were frequently reworked or eroded by subsequent glacial periods. Some of the units are not present in certain portions of the Base and will be discussed in the sections below. The characteristics of the hydrogeologic units are given below:

- **Perched aquifer** (Qvr) – Alluvium and Vashon Recessional Outwash; discontinuous; unconfined; sand, gravel, and silt. Average thickness is 25 feet. Kahle (1998) refers to this unit as the Shallow aquifer; however, to harmonize nomenclature across the Base, this unit will be referred to as the Perched aquifer for the purposes of this report.
- **Vashon till** (**Confining Unit)** (Qvt) – Low-permeability confining unit; compacted and poorly sorted silt, sand, and gravel; locally occurring sandy clay beneath till. Average thickness is 45 feet.
- **Shallow aquifer** (Qva) – Vashon Advance Outwash and Esperance Sand; sand or sand and gravel; confined where fully saturated and overlain by till, otherwise unconfined. Average thickness is 98 feet. Kahle (1998) refers to this unit as the Vashon aquifer; however, to harmonize nomenclature across the Base, this unit will be referred to as the Shallow aquifer for the purposes of this report.
- **Upper confining unit and Permeable Interbeds** (QC1, QC1pi) – Lawton Clay, Salmon Springs Drift, and upper and middle Devil's Hole Formation; low-permeability unit of glaciolacustrine silt and clay and cemented nonglacial sediments; significant permeable interbeds of sand and gravel (QC1pi). Average thickness of the upper confining unit is 200 feet; average thickness of the permeable interbeds is 29 feet.
- **Sea-level aquifer** (QA1) – Lower Devil's Hole Formation and Upper Bangor Formation; confined aquifer; non-glacial sand and gravel; source of NBK Bangor's water supply. Average thickness is 110 feet.
- **Lower confining unit** (QC2) – Lower Bangor Formation; low-permeability unit; sandy silty clay and glacial sand and gravel with silt and clay layers; discontinuous allowing direct hydraulic connection between sea-level aquifer and deep aquifer where the confining unit is absent. Average thickness is 140 feet.
- **Deep aquifer** (QA2) – Lower Bangor Formation, confined; sand and gravel outwash. Average thickness is 120 feet. Source for public water supply wells.
- **Basal confining unit** (QC3) – Fletcher Bay Sequence; low-permeability; blue clay and silt with some gravel. Average thickness is 120 feet.
- **Undifferentiated deposits** (QU) – Overlies bedrock. Undetermined thickness.

The unconfined Perched and Shallow aquifers are recharged via direct infiltration of precipitation. The infiltration rate to the Shallow aquifer is reduced by the low permeability of the overlying Vashon till. The Sea-level aquifer is an extensive and widely used confined aquifer and is the source for NBK Bangor's water supply and many private and community wells outside of the NBK Bangor installation boundary. In the southern part of NBK Bangor, lower water levels within the Sea-level aquifer exist where the Lower confining unit is missing, and the Sea-level aquifer is in direct hydraulic connection with the Deep aquifer (Kahle, 1998).

Groundwater at NBK Bangor generally follows the topography, moving from inland areas of higher elevation toward areas of lower elevation near Hood Canal, Dyes Inlet, and Liberty Bay. Vertical flow is downward in elevated inland areas and upward in nearshore areas, where there are several artesian wells. A Shallow aquifer groundwater elevation map by Kahle (1998) shows a north-south trending groundwater divide along the east boundary of NBK Bangor and bends to the northeast, north of the Base. Based on this map, groundwater east of the divide flows toward Liberty Bay, and groundwater west of the divide flows toward Hood Canal (**Figures 2-2** and **2-3**). Limited saltwater intrusion occurs at coastal areas.

Precipitation provides the primary source of recharge to NBK Bangor. In general, precipitation will infiltrate downward through the various hydrostratigraphic units, where it then flows laterally discharging to springs, drainages, and large water bodies (Clear Creek, Hood Canal, Dyes Inlet, and Liberty Bay) (Foster Wheeler, 1996). Water that does not discharge to springs and surface water bodies, infiltrates downward into the Deep aquifer. The Deep aquifer is recharged by leakage from the Sea-level aquifer and discharges through springs beneath Hood Canal (Robinson, Noble, and Carr, 1981).

Water levels within the aquifers at NBK Bangor respond to tidal cycles. The maximum fluctuations in water levels are 4 to 5 feet along shorelines and less than 1.5 feet at inland areas. Seasonal variability decreases with depth. Water levels vary seasonally from 2 to 7 feet in Vashon aquifer wells, 3 to 4 feet in permeable interbed wells, and less than 3 feet in the Sea-level aquifer. No seasonal variability is observed in Deep aquifer wells (Kahle, 1998).

2.2.3.1 North NBK Bangor Hydrogeology

The local conditions in the northern portion of the Base are best reflected from information collected in historical documents for Site A. Near Site A, the Vashon Advance Outwash described in **Section 2.2.2** is absent, and different sub units of the Vashon Drift are present in this area. The naming convention for Site A hydrostratigraphic units is based on research done for the *Implementation Report, 2017 Bangor Site A Well Installation and Trench Sampling in Support of Site A, Part 2 Treatability Study* (Navy, 2018b). The deepest borings at Site A only extend to a depth of approximately 150 ft bgs. Thicknesses of deeper units were inferred from lithologic information obtained from a 600 ft well located south of Site A which was inventoried by Kahle (1998). The attempt was made to correlate the hydrostratigraphic units with the Basewide nomenclature wherever possible. The principal characteristics of the hydrogeologic units beneath Site A, from youngest to oldest, are given below:

- **Vashon Recessional Outwash** (Qvr) – Correlative to the Perched aquifer. Thin, coarse-grained deposits up to 20 feet thick. At Site A, these deposits are thicker, finer-grained, and more stratified compared to other areas where present at NBK Bangor.
- **Vashon Till** (Qvt) – Acts as an aquitard. Near Site A this unit is cemented, very dense, gravelly, silty to very silty sand. Approximately 15 ft thick. Stratified with varying contents of gravel and silt.
- **Vashon Glaciolacustrine Deposits (Shallow aquifer)** (Qvgl) – Correlative to upper portion of QC1 including the permeable interbeds; the permeable interbeds appear to be much more pervasive such that this unit acts as an aquifer in this part of the Base; referred to as the Shallow aquifer even though the host lithology is different; poorly bedded lenses of sand, silt, and gravel, 60 to 80 feet thick; consists of silty to very silty, medium- to fine-grained sand with abundant interbeds of clayey silt and sandy silt.
- **Vashon Proglacial Deposits** (Qvp) – Correlative to the lower portion of QC1. Very hard, gray to blue-gray, slightly clayey, sandy silt. Approximately 140 to 160 feet thick.
- **Older Sand and Gravel** (Qos) – Correlative to QA1. Consists generally of sand and gravel with smaller amounts of silt, and possibly some cemented sand and gravel deposits. Approximately 50 ft thick.

Groundwater within the Vashon Recessional Outwash at Site A occurs with seasonal saturation and flows to the north-northwest toward Vinland Creek (**Figure 2-3**). Where present, the Vashon Recessional Outwash is encountered at depths typically ranging from 10 to 20 feet below ground surface (bgs), and the water levels fluctuate by up to 10 feet seasonally (Navy, 2018b). The Shallow aquifer at Site A occurs within the Vashon Glaciolacustrine Deposits, and is more fine-grained and heterogeneous than at other similar locations across NBK Bangor. The high clay content observed in borings that penetrate the upper Qvp indicates a very low hydraulic conductivity that likely significantly impedes vertical downward flow (Navy, 2018b). Groundwater within the Vashon Glaciolacustrine Deposits beneath Site A flows toward the west-northwest with discharge to the wetland area that was formerly Cattail Lake. Groundwater flow direction in the deep aquifer units is not well understood.

2.2.3.2 South NBK Bangor Hydrogeology

The local conditions on the southern portion of the Base are best reflected from information collected in historical documents for Site F and OU 8.

OU 8 Hydrogeology

The hydrogeologic setting near OU 8 represents conditions in the southeast part of NBK Bangor. The hydrogeologic units closely correlate to the units presented in **Section 2.2.3** and are based on boring logs from the 1995 OU 8 Removal Action which extend to depths of 130 ft (Foster Wheeler, 1996a, 1996b, 1996c). Estimates of the thicknesses of deeper units in the area are cited from reports prepared by Noble (1986) and Robinson and Noble (1995), however these reports were not available for independent review. The hydrogeologic units at OU 8 from youngest to oldest, are listed below:

- **Vashon Till (Qvt)** – discontinuous and typically unsaturated in this area.
- **Shallow Aquifer (Qva)** – Vashon Advance Outwash and Esperance Sand; approximately 100 to 150 thick.
- **Upper Confining Unit (QC1)** – Lawton Clay, Possession (Salmon Springs) Drift, and upper Kitsap Formation; Lawton clay is estimated to be approximately 50-ft thick in this location. The permeable interbeds (QC1pi) are contained within the discontinuous Possession Drift.
- **Sea Level Aquifer (QA1), Lower Confining Unit (QC2)** – Lower Kitsap Formation; non-glacial sand, gravel, and lacustrine deposits; semi-perched and confined aquifers; the thickness of the Kitsap formation is estimated to be approximately 200 feet.

OU 8 is to the east of the groundwater flow divide (**Figure 2-2**), which transects NBK Bangor. The groundwater flow direction in the vicinity of OU 8 is to the southeast within the Shallow aquifer. Some downward vertical flow does occur in the confining unit between the Shallow aquifer and the permeable interbeds; however, the hydraulic conductivity the Lawton Clay is very low (10^{-6} to 10^{-7} cm/sec). Therefore, downward flow is believed to be very limited. Groundwater flow in the Sea Level and Deep aquifers is not well understood at OU 8.

Site F Hydrogeology

The hydrogeologic setting of Site F represents conditions in the south central part of NBK Bangor. Three aquifer systems are present in the vicinity of Site F (Hart Crowser, 1994). These are the Shallow aquifer (Qva), the Sea-level aquifer, and deeper undifferentiated aquifer(s). Well borings at Site F are completed within the upper 200 ft and indicate that the Shallow aquifer is unconfined, approximately 150 ft thick, and is overlain by up to 100 ft of the silty Vashon Till (Sealaska, 2014). The aquitard underlying the Shallow aquifer is continuous across Site F (Hart Crowser, 1994). Laboratory analyses of the the Lawton Clay, which makes up the top 60-80 ft of this aquitard, indicate a vertical hydraulic conductivity in the range of 10^{-7} cm/sec (Sealaska, 2014) which is sufficient to impede the downward migration of groundwater through it into the Sea Level and Deep aquifers.

Site F lies to the west and north of the groundwater flow divide (**Figure 2-2**) that transects NBK Bangor. The groundwater flow direction in the Shallow aquifer at Site F is to the west and northwest. Existing information indicates that the Shallow aquifer is not continuous west of the Base boundary. The Shallow aquifer discharges as seeps across the Base boundary into streams that flow toward Hood Canal (Hart Crowser, 1994). Groundwater flow direction in the deeper aquifers in this area is not well understood.

2.2.4 Hydrologic Setting

The primary marine or brackish water body near NBK Bangor is Hood Canal, bordering the west and northwest installation boundary for approximately 4.1 miles. Hood Canal is long and narrow with an average width of 1.5 miles and a mean depth of 177 feet. Freshwater at the Base consists mostly of short streams that flow from the interior of the peninsula to Hood Canal. Most streams flow year-round and are fed by springs, distributed groundwater discharge, and surface runoff after storms. Where cliffs are present along the coastline, springs and seeps discharge water directly onto the beach and into Hood Canal (USGS, 2002).

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
- Leaching of PFAS from soil to groundwater
- Transport via advection in groundwater
- Direct release of PFAS to drainage ditches
- Overland flow of stormwater containing PFAS to downgradient areas including soil, drainage ditches and surface water
- Discharge of groundwater to surface water bodies
- Discharge of groundwater to freshwater and marine sediment
- Discharge of water bodies to Clear Creek, Hood Canal, Liberty Bay, and Dyes Inlet.

2.3.2 Human Receptors

Current receptors (including residents, maintenance workers, industrial workers, and visitors), as well as potential future receptors (residents, maintenance and industrial workers, trespassers, visitors, recreators, and construction workers) could be exposed to PFAS in groundwater, soil, sediment, and/or surface water.

Access to NBK Bangor is divided into two regions: upper Base and lower Base. Access to upper Base is restricted to active military personnel and their families, government employees, and government contractors. Access to lower Base is restricted to active military personnel, government employees, and government contractors that have been granted specific access. A perimeter fence runs along the installation boundary at Northern Boundary Road, Eastern Boundary Road, Southern Boundary Road, and Turtle Road in the southwest. The perimeter fence in the west and northwest NBK Bangor is along the installation boundary and the coast of Hood Canal. (**Figure 2-1**). As mentioned in **Section 2.1**, NBK Bangor is comprised of residential and industrial areas. Upper Base is primarily used for military operations with some administrative buildings. On lower Base the south and southwest portion is used for military housing and recreation (such as trails, ballparks, and playgrounds), and the southeast portion is used for industrial purposes, with some administrative buildings.

As of 2010, the population residing on NBK Bangor was 6,054 (EDR, 2018b). High-use receptor sites within a 1-mile radius of NBK Bangor includes three elementary schools and two childcare centers (EDR, 2018b) (**Figures 2-2** and **2-3**).

2.3.2.1 Groundwater

On-Base drinking water supply comes from wells screened in the Sea-level and deep aquifers, while off-Base drinking water comes from wells screened in all three aquifers. The Shallow, Sea-level and Deep aquifers are regionally extensive and have hydraulic conductivities that are favorable for groundwater supply. The likelihood of PFAS-contaminated groundwater migrating into the Sea-Level and Deep aquifers is low due to the low permeability of the Upper confining unit that overlies the Sea-level aquifer. Initial review of off-Base drinking

water wells indicates that these wells have a wide range of screened intervals and so it is likely one or more off-Base drinking water wells are screened in the Shallow aquifer. As a result, there is potential for exposure to PFAS-contaminated groundwater in downgradient drinking water supply wells within the Shallow aquifer.

In areas where groundwater is within the potential depth of construction activities, construction workers could be exposed to PFAS in groundwater through dermal contact during excavation activities.

There are no regulatory screening levels or other criteria for dermal contact with PFAS in groundwater. Toxicological information will be evaluated during the site inspection (SI).

On-Base Drinking Water Sources - The drinking water at NBK Bangor is obtained from on-Base water supply wells which draw water from the Sea-level aquifer and are screened between 260 and 350 ft bgs.. The Bangor Wellhead Protection Plan (NAVFAC, 2019) lists seven wells. Only four of the seven wells (S01, S02, S04, and S09) are actively used for the Base water supply. These wells were tested for PFAS through the water distribution buildings under the UCMR3 program. PFAS were not detected. A fifth well (S05) is maintained as an emergency water source. Two of the wells are listed as inactive for use. The active and emergency water supply wells are installed between 260 and 420 ft bgs (NAVFAC, 2019).

Off-Base Drinking Water Sources – Drinking water within the 1-mile radius at NBK Bangor is provided by private, community, Silverdale Water District and Kitsap Puplic Utilities District water supply wells. Based on data obtained from Ecology and DOH (Ecology, 2019; DOH, 2019), private drinking water wells exist within 1 mile of the boundaries of NBK Bangor. A total of 267 private wells, 57 two-party wells, 25 community wells, and 2 public water supply wells have been identified within 1 mile downgradient of potential PFAS source areas at NBK Bangor. Total depth of the wells ranges from 9 to 638 feet bgs. An investigation of off-Base drinking water was initiated in February 2020 and is ongoing. As of July 2020, drinking water samples have been collected from 292 drinking water supply wells. PFAS were detected in samples from 80 wells, with two detections in exceedance of the US EPA lifetime health advisory.

The Navy continues to collect samples from any off-Base potentially impacted drinking water sources that were identified but not previously sampled. Known exposures have been addressed, and any future exposure will be addressed accordingly.

2.3.2.2 Soil and Air

Workers, visitors/trespassers, recreators, and residents 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 particulate emissions from surface soil in the air. There are USEPA human health risk-based screening levels for some PFAS for the ingestion and dermal exposure pathways (USEPA, 2018). There are no screening levels or other criteria for inhalation of PFAS. Humans could be indirectly exposed to PFAS in soil through the consumption of terrestrial organisms.

2.3.2.3 Toxicological information will be evaluated during the SI. Sediment

Workers, visitors/trespassers, recreators, and residents within 1 mile of PFAS source areas could be exposed to PFAS in sediment through incidental ingestion of and dermal contact with sediment. Humans could be indirectly exposed to PFAS in sediment through the consumption of terrestrial and aquatic organisms. There is a potential for indirect exposure via locally caught or harvested food sources as discussed in **Section 2.3.2.5**.

2.3.2.4 Surface Water

Surface water is not used as a drinking water source at NBK Bangor or the surrounding area. However, workers, visitors/trespassers, recreators, 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. There are no screening levels or other criteria for dermal contact with PFAS in water. Humans could be indirectly exposed to PFAS in surface water through consumption of terrestrial and aquatic organisms.

2.3.2.5 Toxicological information will be evaluated during the SI. Locally Caught or Harvested Food Sources

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 harvested terrestrial and aquatic food sources such as fish, shellfish, waterfowl, wild game, berries, nuts, plants, and fungi. Some PFAS may or are known to bioaccumulate in terrestrial and aquatic organisms (NGWA, 2018). Hunting and fishing are important aspects of life for many native and non-native residents in the Puget Sound region, and several areas on and near NBK Bangor are used for recreational and commercial harvesting of local food sources. While hunting is restricted on-Base at NBK Bangor, fishing is allowed at designated locations such as Trident Lakes.

2.3.3 Ecological Receptors

A wide variety of terrestrial and wetland/aquatic ecological receptors may reside at NBK Bangor. 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 due to 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 released to surface soil through root uptake, direct contact, and/or direct ingestion. Because there is some evidence that PFAS 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 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 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 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.

There is minimal ecotoxicology data available for ecological receptor exposures in soil, sediment, and surface water, and no formal ecological screening values have been released by USEPA for PFAS. However, some literature-based ecological screening values are available for some PFAS (such as PFOA, PFOS, and PFBS) for soil, sediment, and/or surface water exposures. PFAS ecotoxicology is an active field of research, and additional data are likely to become available in the 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 1 mile of NBK Bangor (EDR, 2018b):

- Birds: Federally-listed species: Marbled Murrelet (*Brachyramphus marmoratus*, threatened), Yellow-billed Cuckoo (*Coccyzus americanus*, threatened). Additional state-listed species: Little Willow Flycatcher (*Empidonax Trailii Brewsteri*), Black Tern (*Chlidonias Niger*), and 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*), Pacific Townsend's Big-Eared Bat (*Plecotus Townsendii Townsendii*), and Destruction Island Shrew (*Sorex Trowridgii Destructioni*).
- 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), Sockeye Salmon (*Oncorhynchus Nerka*), and Chinook Salmon (*Oncorhynchus Tshawytscha*), Steelhead (*Oncorhynchus Mykiss*).

- Amphibians: Federally listed species: Oregon Spotted Frog (Rana pretiosa, threatened). Additional state-listed species: Northern Red-Legged Frog (*Rana Aurora Aurora*), Cascades Frog (*Rana Cascadae*), and Tailed Frog (*Ascaphus Truei*).
- Flowering Plants: Thurber's reedgrass (*Calamagrostis crassiglumis*, species of concern), Larkspur (*Delphinium leucophaeum*, species of concern), *Astragalus diaphanous* diurnus (species of concern), *Pyrrocoma liatriformis* (species of concern), Howells's fleabane (*Erigeron howellii,* species of concern), Mountain blue-eyed grass (*Sisyrinchium sarmentosum*, under review), *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), *Penstemom 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 (*Dedecatheon 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 umbellate acutalata,* species of concern), Washington monkey-flower (*Mimulus washingtonensis,* species of concern), and Stalk-leaved monkey-flower (*Mimulus patulus,* species of concern).

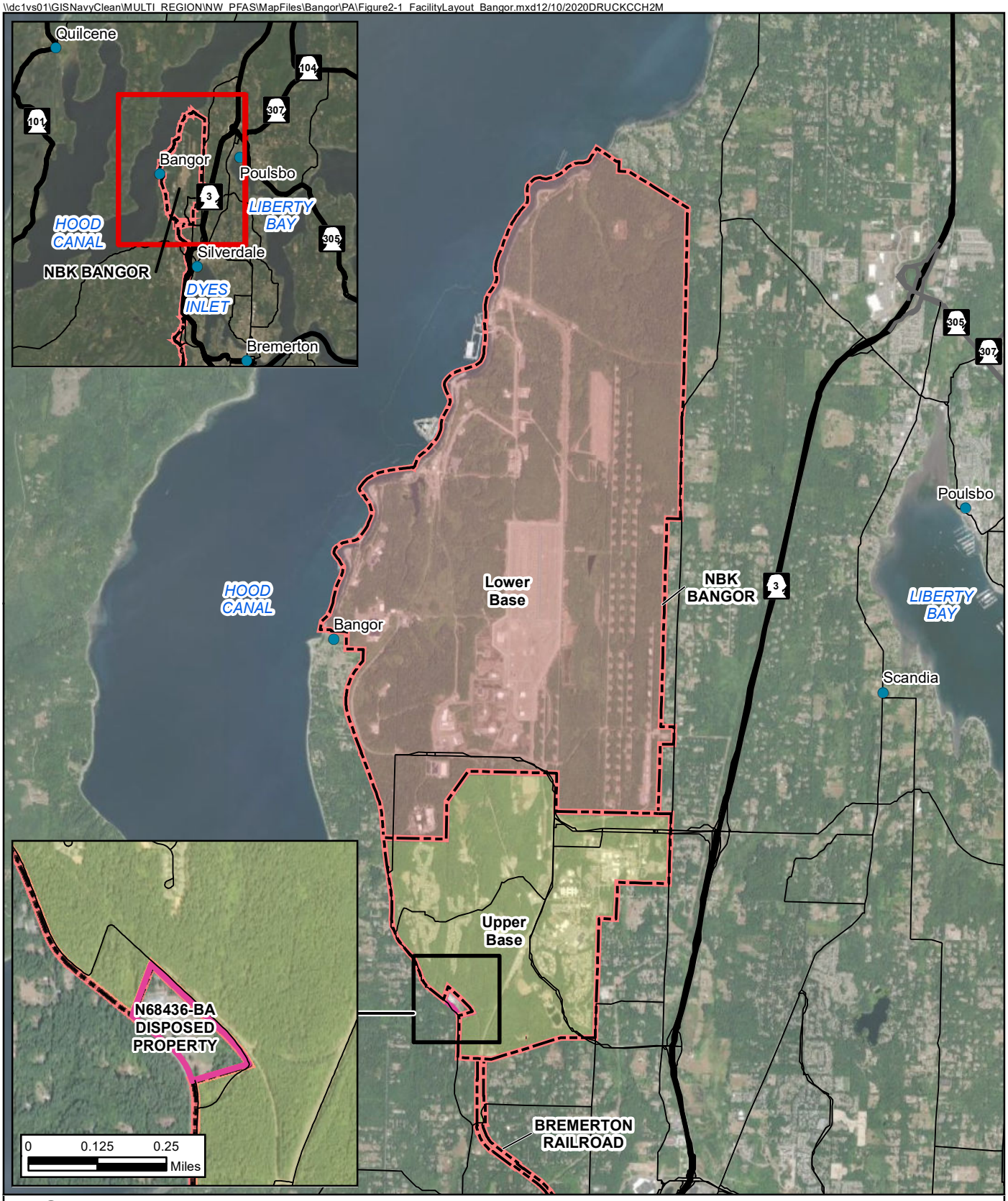


Figure 2-1
Facility Layout: NBK Bangor
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

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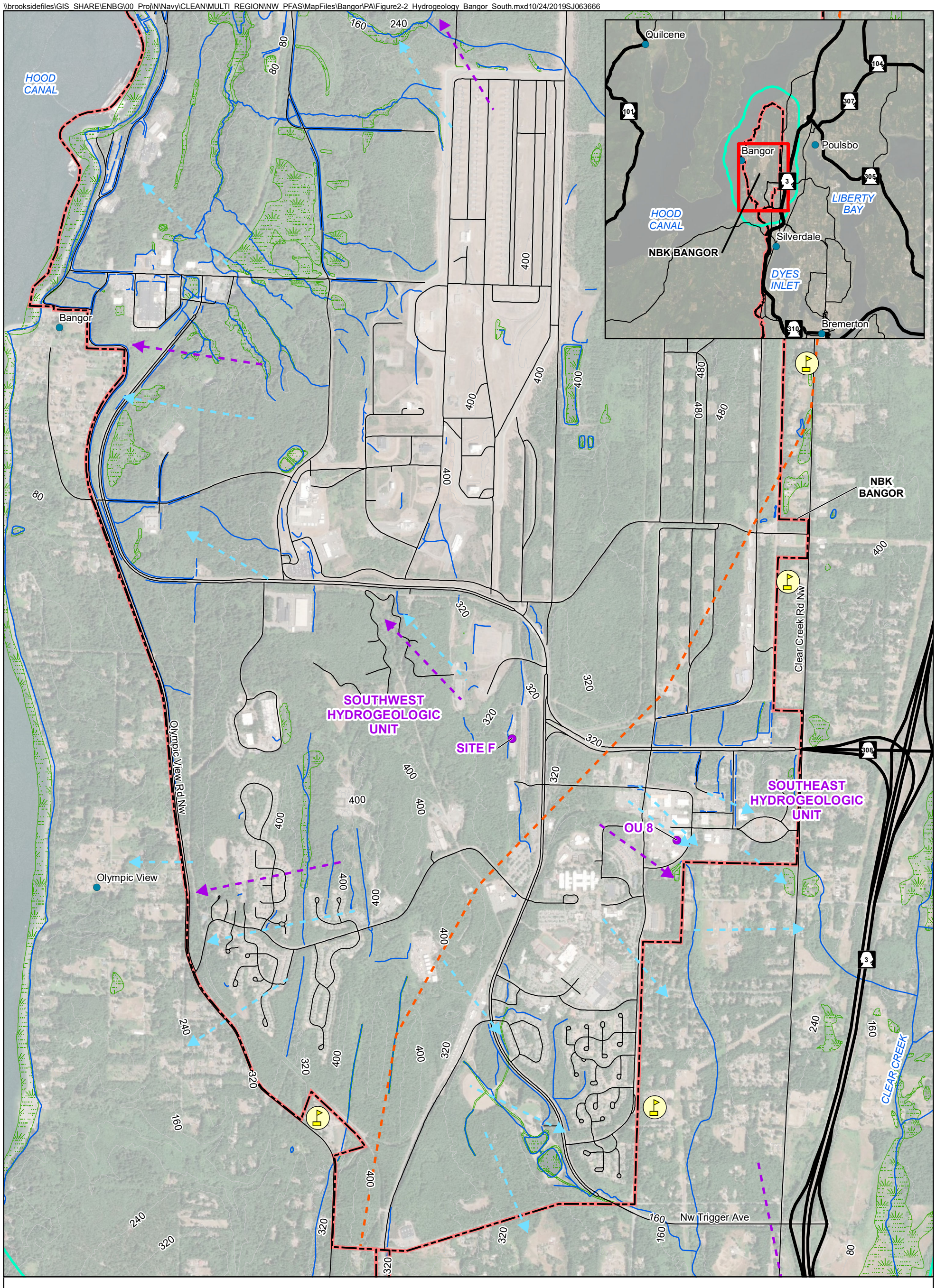

Legend

- City
- Other Major Road
- Local Road
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Wetlands
- Hydrogeologic Unit Site
- High-Use Receptors
- Surface Waterbodies
- Shallow Aquifer Groundwater Divide
- 1 Mile Installation Boundary Buffer
- Installation Boundary

Figure 2-2
Hydrogeology: South - NBK Bangor
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

FOUO

0 0.15 0.3 Miles
1 inch = 0.3 miles

N

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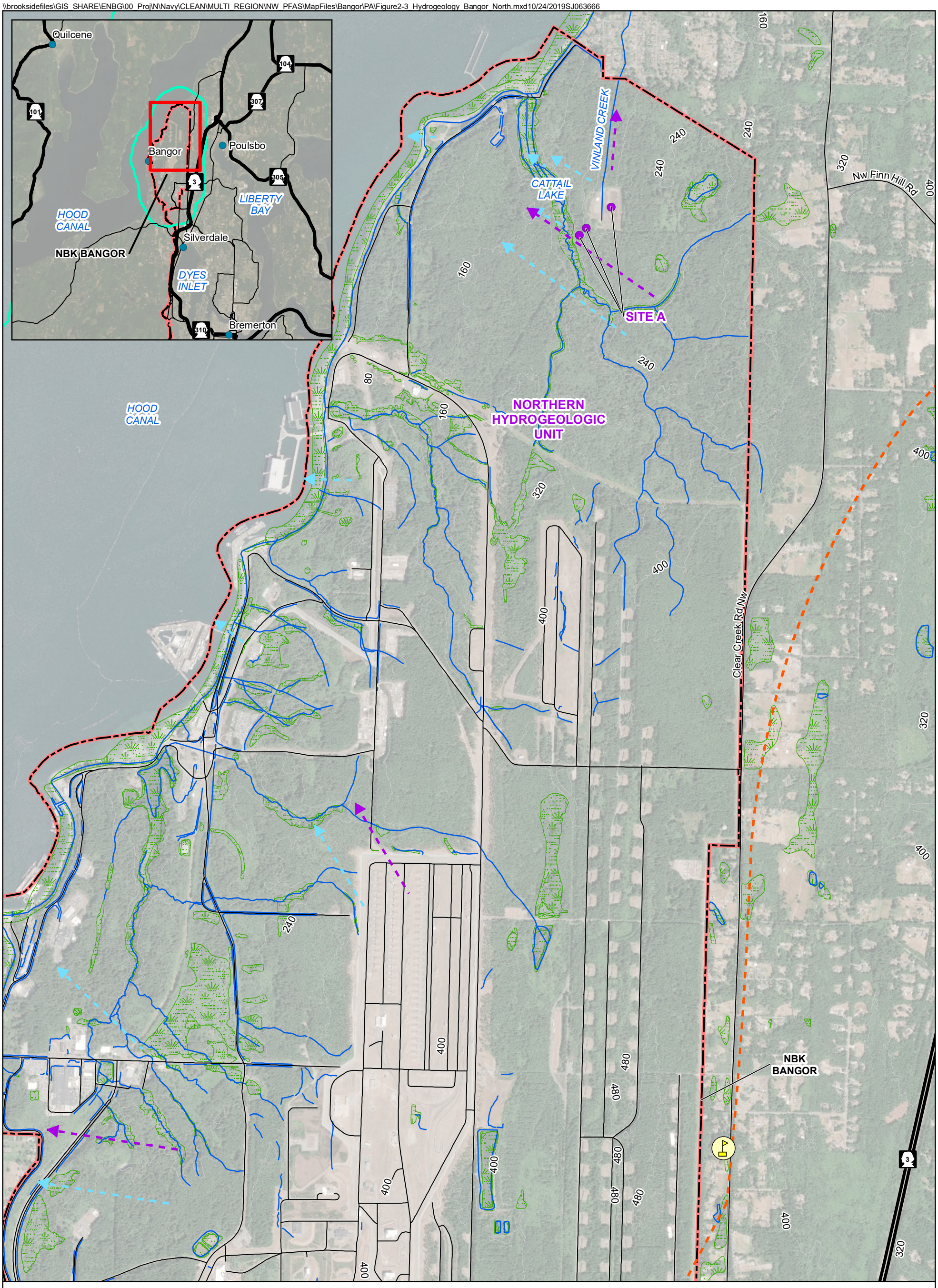


Legend

- Other Major Road
- Local Road
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Wetlands
- Hydrogeologic Unit Site
- High-Use Receptors
- Surface Waterbodies
- Shallow Aquifer Groundwater Divide
- 1 Mile Installation Boundary Buffer
- Installation Boundary

Figure 2-3
Hydrogeology: North - NBK Bangor
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

FOUO

0 0.15 0.3 Miles
1 inch = 0.3 miles

N

SECTION 3

Assessment Methodology

Assessment of areas identified in this PA were conducted in accordance with the *Guidance for Performing Preliminary Assessments under CERCLA* (USEPA, 1991), with additional guidance from the *Interim Per-and Polyfluoroalkyl Substances (PFAS) Site Guidance for NAVFAC Remedial Project Managers (RPMs)/September 2017 Update* (Navy, 2017).

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

- A review of existing information to identify and characterize potential PFAS releases and to identify potential off-Base receptors.
- 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 facility to identify any evidence of PFAS releases and potential receptors and migration pathways, to identify all areas of concern, and to fill data gaps identified in the data review and interviews.

Each activity is described in the following subsection.

3.1 Review of Existing Information

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

3.1.1 Naval Installation Restoration Information Solution Records

Naval Installation Restoration Information Solution (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 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 NBK Bangor. In addition, separate queries were performed in the Other Environmental Liabilities (OEL) module to identify OEL units associated with NBK Bangor and the 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 NBK Bangor, the special area, and nearby receptors. Documents, websites, and internet databases reviewed during this PA are listed in **Appendix A**.

3.1.4 Facility Operations and Property Records

Facility operations records, inventories, authorized use lists, and property records were reviewed for NBK Bangor. Historical facility records and real estate records were reviewed where available for NBK Bangor and the associated special area. The Authorized Use List (AUL) was provided by the Navy as a data export from the Enterprise Resource Planning program and was reviewed for NBK Bangor.

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 NBK Bangor and the special area. The resulting list of available documents was reviewed to identify those with the potential to contain information relevant to this PA.

3.1.6 Environmental Data Resource Reports

National Environmental Policy Act and Offsite Receptor Environmental Data Resource (EDR) Reports (EDR, 2018a, 2018b) were reviewed for NBK Bangor and the surrounding 1- and 5-mile radii.

3.1.7 Aerial Photographs

Recent and historical aerial photographs were reviewed for Building 1006 to determine the demolishment of the structure and for Building 1014 to determine the exact building location, which showed a parked fire truck at the building. These photographs captured the following years.

- NBK Bangor: 2006, 2019 (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 and NAVFAC Georeadiness Center. Additional information was gathered from scanned maps available in reports and permits. Sources are referenced in the body of this report and/or in **Appendix A**.

3.2 Interviews

Interviews were conducted on December 17, 2018; January 23, 2019; February 20, 2019; and April 24, 2019, with current and former personnel associated with past and present operations at NBK Bangor and NAVFAC Northwest personnel to gather pertinent information regarding the history and operations at NBK Bangor and potential PFAS storage, use, or release. The goal of these interviews was to validate and verify data collected during document and record reviews, and also to identify other information related to PFAS not previously found in historical documents.

Each interview session was guided by a standard questionnaire. Completed questionnaires are provided in **Appendix B**. The information from the interviews was also used to confirm and select additional locations to observe during visual site inspection (VSI) activities. This information is referenced throughout this report.

The following personnel were interviewed[5] (additional interviewee details are presented in **Appendix B**):

- Regional Fire Chief – December 17, 2018
- NBK Pollution Prevention Manager – January 23, 2019

[5] In addition to the interviewees listed here, CH2M requested interviews with representatives with ties to NB Bangor. 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; in other cases, the potential interviewees responded to interview requests, but declined to be interviewed.

- Fire Protection Specialist – February 20, 2019
- Industrial Waste Treatment Plant Operators – April 24, 2019

Conversations or email communications with the following personnel occurred where a full interview was not necessary (additional details are presented in **Appendix B**):

- NAVFAC RPM – December 18, 2018
- Environmental Services Crew Member – December 18, 2018
- Trident Training Facility Director – December 18, 2018
- Public Affairs Officer – December 18, 2018
- Fire Captain – April 24, 2019
- NAVFAC RPM – Transmittal of AUL
- Building Managers – June 2019

3.3 Site Reconnaissance

Preliminary VSIs were completed on December 17 and 18, 2018. A follow-on VSI was conducted on April 24, 2019. During the VSI, accessible areas were visited to identify evidence of PFAS use and disposal, 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. Information gathered during the VSIs is summarized in **Section 4**.

SECTION 4

Findings and Recommendations

This section presents detailed descriptions and potential exposure points and routes relevant to the areas of each potential PFAS source areas identified in **Table 4-1** and **Figure 4-1**.

4.1 Off-Base Drinking Water Exposure Assessment

An evaluation of off-Base drinking water was conducted to determine if off-Base drinking water could have been impacted by any of the potential PFAS source areas identified in **Table 4-1**. In all, 144 private wells, 5 community wells, and 31 public water supply wells have been identified within 1 mile of NBK Bangor. It is noted, however, that at least 339 wells identified in the Ecology well database could not be mapped due to lack of geographic information. Some of these unmapped wells may be within 1 mile of NBK Bangor. The public and private drinking water wells to the north, southeast, and southwest have been identified as being downgradient of 13 confirmed or suspected PFAS release areas (**Figures 4-1** and **4-2**). Based on a review of well depths, there are wells screened within the Shallow, Sea-level, and Deep aquifers. There is the potential for off-Base drinking water wells screened within the shallow aquifer to be impacted by releases at the confirmed or suspected PFAS release areas. As shown on **Figures 2-2** and **2-3**, a north-south trending groundwater divide runs along the east boundary of NBK Bangor and bends to the northeast, north of the Base. Groundwater east of the divide flows toward Liberty Bay, and groundwater west of the divide flows toward Hood Canal.

As discussed in **Section 2.3.2**, Base drinking water is supplied by four supply wells located on-Base. These wells are screened between 260 and 350 ft bgs. These wells may be downgradient of the potential PFAS source areas; these wells were tested for PFAS through the water distribution buildings under the UCMR3 program. PFAS were not detected above laboratory reporting limits, however laboratory reporting limits have been improved since testing (DASN (E), 2020).

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

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) at NBK Bangor, Bremerton, Washington

Area	Potential PFAS Source Area (Yes/No)	Rationale
Firefighting Training Areas		
Building 1301	Yes	Building 1301 is located directly east of the fire station (**Figure 4-3**) and is used as a fire fighting training area. During an interview, an Environmental Services Crew Member recalled that in either 1988 or 1989, AFFF was used during fire training (Environmental Services Crew Member, 2019, personal communication [pers. comm.]). See **Section 4.3.1** for additional information and **Section 5** for the recommended path forward.
Building 2014	No	Building 2014 is located to the east of Trigger Avenue and west of Guardfish Street (**Figure 4-3**). Building 2014 was built around 1992 and was designed to be a fire fighting training facility. The facility has had the same use since its construction and it is not designed for fuel fires. During an interview with the Trident Training Facility (TTF) Safety Manager, it was stated the training facility uses Calsoft, a type of soap that simulates AFFF, to extinguish propane fires (TTF Safety Manager, 2018, pers. comm.). The TTF Safety manager also stated that upon review of the current and historical AUL, AFFF was not listed (TTF Safety Manager, 2018, pers. comm.). The Regional Fire Chief confirmed that there is strict instruction at Building 2014 not to use AFFF, it was stated that due to the type of training, for ship fires, at TTF no AFFF is used there (Regional Fire Chief, 2018, pers. comm.). The water and soap are captured in a contained treatment tank, and disposal is managed through the Bangor Waste Identification System process. Per the Calsoft manufacturer, Calsoft is a non-fluorinated product and is manufactured at a different location than its fluorinated products (Principal Hydrogeologist, 2019, pers. comm.). Because of the lack of AFFF or use of PFAS-containing materials at this location, no further action is required for this area.
1986 Fire Training Facility	Yes	The 1986 Fire Training Facility was located south of Luzon Avenue in an open area surrounded by a heavily forested area (**Figure 4-3**). The NAVFAC Northwest RPM identified a historical training facility to the south of Tower Road and stated that AFFF was used in oil fire response training at this location around 1986. See **Section 4.3.2** for additional information and **Section 5** for the recommended path forward.
Fire Stations		
Building 1300	Yes	Building 1300 is located south of Trident Boulevard on Silversides Road and has forested areas to the north and west (**Figure 4-3**). Building 1300 is used as a fire station for upper Base. Building 1301 is to the east and is associated with Building 1300. Based on the confirmed practice of, AFFF equipment flushing at this location, and transfer of AFFF during refilling, further investigation is recommended as part of an SI. See **Section 4.3.3** for additional information and **Section 5** for the recommended path forward.
Building 7600	Yes	Building 7600 is located on the southeast corner of Trigger Avenue and Attu Road and is surrounded by a heavily forested area (**Figure 4-4**). Building 7600 is used as a fire station for lower Base. Based on periodic equipment checks of AFFF equipment as part of morning checks, further investigation is recommended as part of an SI. See **Section 4.3.4** for additional information and **Section 5** for the recommended path forward.
Hangars		
No hangars were identified at NBK Bangor.		

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

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) at NBK Bangor, Bremerton, Washington

Area	Potential PFAS Source Area (Yes/No)	Rationale
Buildings with AFFF Suppression Systems		
No buildings with AFFF fire suppression systems were identified at NBK Bangor.		
Emergency Response Areas		
2001 Car Fire (Intersection of Escolar Road and Trigger Avenue)	Yes	During an interview, the Regional Fire Chief recalled that between 2001 and 2005, a car fire at the intersection of Escolar Road and Trigger Avenue was extinguished with AFFF (**Figure 4-3**). AFFF ran into the ditch on the southeast corner of the intersection (Regional Fire Chief, 2018, pers. comm.). See **Section 4.3.5** for additional information and **Section 5** for the recommended path forward.
Car Crash (Intersection of Trident Boulevard and Scorpion Avenue)	Yes	An Environmental Services Crew Member stated AFFF was used at an auto accident at either the northwest or southwest corner of Trident Boulevard and Scorpion Avenue (**Figure 4-3**) (Environmental Services Crew Member, 2019, pers. comm.). See **Section 4.3.6** for additional information and **Section 5** for the recommended path forward.
2001 Agility Course Fire	Yes	The agility course at the Marine barracks is located southeast of the intersection of Tunny Street and Scorpion Avenue (**Figure 4-3**). The Regional Fire Chief stated that in 2001, AFFF was used to extinguish a half-acre brush fire at the agility course. See **Section 4.3.7** for additional information and **Section 5** for the recommended path forward.
Brush Fire	Yes	The Regional Fire Chief stated a half-acre brush fire broke out at the south end of Grampus Road sometime between 2001 and 2005, and AFFF was used to extinguish the fire (**Figure 4-3**). See **Section 4.3.8** for additional information and **Section 5** for the recommended path forward.
Building 1006 Fire	Yes	Both the Regional Fire Chief and the Public Affairs Officer stated that sometime between 2005 and 2006, a fire broke out at Building 1006, an administrative building located at the southwest corner of Hunley Road and Skate Street (**Figure 4-3**) (Regional Fire Chief, 2018, pers. comm.; Public Affairs Officer, 2019, pers. comm.). AFFF was used to extinguish the fire. The location is currently a parking lot; the building was demolished following the fire. See **Section 4.3.9** for additional information and **Section 5** for the recommended path forward.
Helipad	Yes	The helipad is located west of the intersection of Trigger Avenue and Trident Boulevard. It is a concrete pad approximately 100 feet long by 100 feet wide (**Figure 4-3**). The helipad is surrounded by a grassy area and adjacent to a parking area. The current use of the helipad is unknown. An Environmental Services Crew Member provided information via email about the helipad, noting that AFFF emergency response training was frequently conducted at the helipad (Environmental Services Crew Member, 2019, pers. comm.). Exact dates, frequency, and details of AFFF usage could not be confirmed. See **Section 4.3.10** for additional information and **Section 5** for the recommended path forward.
2012 Car Fire	Yes	A fire captain stationed at Fire Station 61 stated that around 2012 AFFF was deployed at a car fire that was located on Nautilus Avenue on the east side of Nautilus Avenue just past the second fire hydrant (**Figure 4-3**) (Fire Captain, 2019, pers. comm.). See **Section 4.3.11** for additional information and **Section 5** for the recommended path forward.
AFFF Spray Test Areas		
No AFFF Spray Test Areas were identified at NBK Bangor.		

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

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) at NBK Bangor, Bremerton, Washington

Area	Potential PFAS Source Area (Yes/No)	Rationale
Wastewater Treatment Plants and Associated Disposal Areas[6]		
Building 7030	Yes	Building 7030 is located on Runner Road, east of Delta Pier (**Figure 4-4**) and is used as an industrial waste treatment facility. Industrial waste from a variety of sources is treated at Building 7030. AFFF was stored at this location and trickled into the treatment system from a manhole to the south of Building 7030. See **Section 4.3.12** for additional information and **Section 5** for the recommended path forward.
Former Wastewater Lagoon (Site F)	No	The Former Wastewater Lagoon at Site F is located west of Trigger Avenue in central NBK Bangor (**Figure 4-3**). Site F was used between approximately 1960 and 1970 for the disposal of wastewater produced during the demilitarization of ordnance items in the adjacent Segregation Facility building. The site consisted of an approximately 300-square-foot unlined evaporation lagoon and overflow area. Prior to 1972, the final wastewater solution was discharged through a drain line directly into the former wastewater lagoon. Periodically the lagoon was drained, and waste materials at the surface were burned off in place with waste oil during the 1960s or transported to Site A for burning and disposal (Hart Crowser, 1994). The method in which the lagoon was drained is not known. Beginning in 1972-1973 wastewater was collected into 55-gallon barrels and delivered to the liquid waste incinerator. The lagoon soil contamination, including Royal Demolition Explosive (RDX) fuel, 2,4,6-trinitrotoluene (TNT) fuel, and 2,6-dinitrotoluene (DNT) explosive, extends to the water table (approximately 50 feet below grade) (Navy, 2005). In February 1972, 500 cubic feet of soil were excavated from the top several feet of the former lagoon area and delivered to Site A for burning. In 1980 the former lagoon area was filled in and covered with asphalt. Currently a groundwater containment system is in place that is designed to hydraulically limit migration of groundwater contaminants within the Shallow aquifer by groundwater extraction. The extracted groundwater is treated by granular activated carbon for ordnance and includes treatment for nitrates to achieve all groundwater cleanup action levels. The treated water is returned to the Shallow aquifer through reintroduction wells (Hart Crowser, 1994). There is no documentation of releases, emergency response activities, or spills associated with AFFF or PFAS-containing materials at Site F. Therefore, no further action is required for this area.
Landfills and Waste Disposal Areas		
Site A	Yes	Site A is located on an elevated plateau surrounded by dense timber on the northern edge of NBK Bangor at the intersection of Pintado Road and Tinosa Road (**Figure 4-4**) (The Environmental Company Inc., 2002). Site A occupies 12 acres and consists of a historical 7-acre burn area, Debris Areas 1 and 2, and a stormwater discharge area. AFFF was released in the flat open area at Site A. See **Section 4.3.13** for additional information and **Section 5** for the recommended path forward.
Dunnage Canyon (Site 12)	Yes	Dunnage Canyon is an approximately 5-acre ravine area that served as a disposal site from about 1950 into the late 1970s (**Figure 4-4**). Dunnage Canyon was used as a disposal site during the time in which AFFF was used at NBK Bangor. See **Section 4.3.14** for additional information and **Section 5** for the recommended path forward.

6 An interviewee noted that wastewater was reportedly sprayed in a field behind the SWFPCC building and that sewage ponds may have been present. The exact location of either the spray fields or sewage ponds was not identified. This information and possible location could not be verified, so was not considered a potential PFAS-source area (**Appendix B**).

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

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) at NBK Bangor, Bremerton, Washington

Area	Potential PFAS Source Area (Yes/No)	Rationale
Building 1032 Waste Ditch	No	Building 1032 is located northeast of the intersection of Hunley Road and Harder Road (**Figure 4-3**). Historically, public works personnel mixed and applied paint in Building 1032. Unknown quantities of paint and solvent waste from Building 1032 paint operations were disposed of in a ditch adjacent to Building 1032 (**Figure 4-3**) until the 1970s, when the wastes were sent to Site 24 to be burned in the liquid waste incinerator (**Figure 4-3**) or were disposed of off Base (**Figure 4-3**) (NEESA, 1983a). The disposal ditch runs parallel to Hunley Road, and it is possible that paint and solvent waste disposed in this area may have contained PFAS as it was generated from industrial operations on Base. The Waste Ditch at Building 1032 was included in OU 8. The Navy has completed two voluntary time-critical removal actions at OU 8. A plume of volatile organic compounds extends off Base in the intermediate zone of the aquifer of the residential community along Mountain View Road and Clear Creek Road (Sealaska, 2018). In 1995, the Navy connected the Mountain View neighborhood, southeast of the Base boundary, to a municipal water supply. In 1996, the Navy installed a groundwater containment system to minimize off-Base plume migration (Navy, 2005). Building 1032 is currently the Bangor Tower Site. Some paints and solvents may contain PFAS. There is no indication that PFAS was released into the waste ditch when paint waste was disposed of in the ditch. The ditch was only used until 1970s; after the 70s, paint waste was incinerated. PFAS compounds were not used in paints until the 1990s and then, the levels were low and only in specialty paints. There is no documentation indicating a release of pesticides containing PFAS. The Navy recognizes that some paints, solvents, and pesticides have been manufactured utilizing PFAS; however, information regarding paints, solvents, and pesticides that contain PFAS as well as any percentage or concentration is proprietary information not available. Therefore, no further CERCLA action is currently recommended for this site. If information becomes available confirming PFAS was contained in materials used and/or disposed of at this site then this site may be recommended for further investigation as part of a future site inspection.
Floral Point (Site B)	Yes	Floral Point is located on Amberjack Avenue west of the wetland leading to Cattail Lake (**Figure 4-4**) and covers approximately 5 acres on Hood Canal (**Figure 4-4**). See **Section 4.3.15** for additional information and **Section 5** for the recommended path forward.
East Ordnance Wastewater Disposal Area (Site C)	No	Site C is located south of the intersection of Pogy Road and Darter Road (**Figure 4-4**). It was used as a disposal site for ordnance wastes from about 1946 to 1973. From 1946 to 1957, unspecified quantities of explosive D, sludge, and dyes were disposed of at this location. In 1957, 44 tons of wastewater containing unknown concentrations of explosive D were disposed of at this location. From 1957 to 1964, unspecified quantities of explosive D wastewater were disposed of at this location. From 1971 to 1973, intermittent disposal of truckloads of Otto fuel wastewater occurred. There is no documentation of disposal of AFFF or PFAS-containing materials at Site C. Therefore, no further action is required for this area.
Luotto Road Disposal Site (Site 14)	No	Site 14 is located along the railroad tracks north of Trident Boulevard (**Figure 4-3**). It was reported that old cans, barrels, and ammunition boxes were discarded here on both sides of the track. The area was used for disposal prior to 1964 (NEESA, 1983a). There is no documentation of disposal of AFFF or PFAS-containing materials Site 14. Therefore, no further action is required for this area.
Classification Yard	Yes	The Classification Yard is located in the north-south trending ravine between Nautilus Avenue and Trigger Avenue (**Figure 4-3**). The Classification Yard was used as a disposal site during the time that AFFF was used at NBK Bangor. See **Section 4.3.17** for additional information and **Section 5** for the recommended path forward.
Old Brass Yard (Site 13)	Yes	The Old Brass Yard is located southwest of the intersection of Tautog Circle and Southern Boundary Road. (**Figure 4-3**). The Old Brass Yard was used as a disposal site during the time that AFFF was used at NBK Bangor. See **Section 4.3.18** for additional information and **Section 5** for the recommended path forward.

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

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) at NBK Bangor, Bremerton, Washington

Area	Potential PFAS Source Area (Yes/No)	Rationale
Former Metallurgy Facility Rubble (Site 5)	No	Site 5 is located in central NBK Bangor, to the north of Luzon Avenue and Greenfish Drive (**Figure 4-3**). The site is surrounded by a heavily forested area. The metallurgy facility located at Keyport in Building 274 housed a testing operation that used mercuric nitrate and was demolished in 1973. The rubble from the building's demolition was disposed of in Site 5. There is no documentation of releases, emergency response activities, or spills associated with AFFF or PFAS-containing materials at Site 5. Therefore, no further action is required for this area.
Old Acid Pit (Site E)	Yes	The Old Acid Pit is located in the south-central portion of NBK Bangor, north of Thresher Avenue (**Figure 4-3**). See **Section 4.3.21** for additional information and **Section 5** for the recommended path forward.
Specialty Paint, Cleaner, or Pesticide Use or Release		
Buried Barrels and Cans of Pesticides (Site 11)	No	Site 11 is situated in the south-central portion of NBK Bangor, one-half mile north of Thresher Avenue (**Figure 4-3**) and consists of a pesticide/herbicide drum disposal area. In the 1968 to 1969 timeframe, empty pesticide containers were buried between two barricaded railroad siding areas. The burial pit was not lined and was approximately 10 to 20 feet deep and of unknown width and length. A removal action was initiated in 1992 where 72, 1- to 5-gallon containers and 13, 55-gallon drums were removed, along with approximately 400 cubic yards of soil containing pesticides. The trenches were subsequently filled to grade with uncontaminated, excavated material and clean backfill (Navy, 1996). There is no documentation indicating a release of pesticides containing PFAS. The Navy recognizes that some pesticides have been manufactured utilizing PFAS; however, information regarding pesticides that contain PFAS as well as any percentage or concentration is proprietary information not available. Therefore, no further CERCLA action is currently recommended for this site. If information becomes available confirming PFAS was contained in materials used and/or disposed of at this site then this site may be recommended for further investigation as part of a future site inspection.
Old Paint Can and Drum Disposal Site (Site 7)	Yes	The Disposal Site at Site 7 is located on a hillside above the south end of the wetland leading to Cattail Lake and occupies an area approximately 200 by 300 feet on a forested slope (**Figure 4-4**). Site 7 was used as a disposal site during the time that AFFF was used at NBK Bangor. See **Section 4.3.20** for additional information and **Section 5** for the recommended path forward.
Old Paint Cans and Drum Disposal Site (Site 22)	Yes	Site 22 is located west of the intersection of Tinosa Road and Pintado Road (**Figure 4-4**) and is situated on a steep ravine. Site 22 was used as a disposal site during the time that AFFF was used at NBK Bangor. See **Section 4.3.19** for additional information and **Section 5** for the recommended path forward.
Former Pesticides Storage Quonset Huts (Site 10)	No	Site 10 is located just west of the Public Works Industrial Area at the intersection of Scorpion Avenue and Guardfish Street (**Figure 4-3**). Prior to 1979, two Quonset huts (formerly Buildings 1676 and 1677) were used for storage of pesticides and herbicides. During pesticide storage, the wooden floors often became damp, and barrels containing chemicals occasionally rusted through and leaked. It was common practice to turn over leaking barrels. Oily and crystalline residue was visible on the wooden floors of the Quonset huts (NEESA, 1983a). The Quonset huts were demolished in 1983, and the location is currently a paved parking area for Buildings 2011 and 2012. The entire area has been extensively and repeatedly excavated, leveled, and developed. The selected remedial alternative for groundwater and soil at Site 10 is a no-action alternative. (Navy, 1996). There is no documentation of PFAS-containing materials being stored at Site 10. There is no documentation of emergency response activities or spills associated with AFFF or PFAS-containing materials at Site 10. Therefore, no further action is required for this area.

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

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) at NBK Bangor, Bremerton, Washington

Area	Potential PFAS Source Area (Yes/No)	Rationale
Chrome Plating Shops		
No chromium plating shops were identified at NBK Bangor.		
Potential PFAS Storage Areas		
Incinerator Storage Area (Site 16)	Yes	Site 16 was used as a drum storage area for the incinerator from 1970 to 1983 and is located at the north side of the industrial area (**Figure 4-3**). Remnants from two car fires, where AFFF was used, are currently stored at this location. See **Section 4.3.22** for additional information and **Section 5** for the recommended path forward.
Other		
Building 1014	Yes	Building 1014 is located in the Public Works Industrial Area on Scorpion Avenue (**Figure 4-3**) and is used to maintain heavy equipment. An interview with the Fire Protection Specialist stated that fire trucks have historically and currently been taken to the Building 1014 for maintenance and cleaning (Fire Protection Specialist, 2019, pers. comm.). Review of historic Google Imagery shows a fire truck parked in front of Building 1014 (Google Earth, 2019). See **Section 4.3.23** for additional information and **Section 5** for the recommended path forward.
Building 1202/Site 29	No	Site 29 is located in the Public Works Industrial Area (**Figure 4-3**). This building is used by public works to perform maintenance on the vehicles used by the Base On-Site Contractor. Site 29 is the location of an area historically used to rinse neutralized pesticide containers on the west side of Building 1021 and perform routine service on trucks and other vehicles. The area is covered with concrete and used for parking and industrial vehicle traffic. During interviews with the Regional Fire Chief and the Fire Protection Specialist, Building 1202 was not mentioned as a location that would service fire trucks (Regional Fire Chief, 2018, pers. comm.; Fire Protection Specialist, 2019, pers. comm.). There is no documentation of releases, emergency response activities, or spills associated with AFFF or PFAS-containing materials at Building 1202. Therefore, no further action is required for this area.
Liquid and Solid Waste Incinerators (Site 24)	No	Site 24 is the former site of liquid and solid waste incinerators (**Figure 4-3**). The liquid waste incinerator began operation in 1973, while the solid waste incinerator began operation in about 1974. The incinerators were deactivated in 1983 and removed in 1987 because of the projected inability of the incinerators to meet future air emission and Resource Conservation and Recovery Act requirements. The liquid waste incinerator was fired with No. 2 fuel oil and was designed for a maximum operational burn of 960 gallons per 8-hour shift. Wastes were fed to the liquid waste incinerator by two 2000-gallon mixing tanks, which were reported to contain TNT/RDX wastewaters, Otto fuel, wastewater mixed with solvents, waste solvents, sea water, and fresh water (Navy, 1994; NEESA, 1983). The solid waste incinerator was used to burn contaminated solid waste, including rags, sawdust, and protective clothing contaminated with Otto fuel. Beginning in 1977, carbon filters contaminated with Otto fuel also were destroyed in the solid waste incinerator. Records are not available on the total quantity of solid waste incinerated (Navy, 1994). It is not known if there were any spills at this location. There is no documentation of releases, emergency response activities, or spills associated with AFFF or PFAS-containing materials at Site 24. Therefore, no further action is required for this area.

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

Preliminary Assessment for Per- and Polyfluoroalkyl Substances (PFAS) at NBK Bangor, Bremerton, Washington

Area	Potential PFAS Source Area (Yes/No)	Rationale
Building 1202A	No	Building 1202A is located in the Public Works Industrial Area and is attached to Building 1202 (**Figure 4-3**). It is used to wash maintenance vehicles used by the Base Operating Support Contract (BOSC) contractor, and access to the facility is regulated by public works. The facility has a floor drain, and a site visit showed the facility is well-maintained. There is no documentation of releases, emergency response activities, or spills associated with AFFF or PFAS-containing materials at Building 1202A. Therefore, no further action is required for this area.
Building 2956	No	Building 2956 is located at the northwest corner of Trigger Avenue and Nautilus Avenue (**Figure 4-3**). Building 2956 was built in the 1990's as a car wash and is currently used as such. During an interview with a Fire Captain at Fire Station 61 it was stated that the fire trucks were taken to Building 2956 after hours for cleaning the road grime off of the fire trucks (Fire Captain, 2019, pers. comm.). There is no indication from interview records that AFFF hoses and tanks were flushed, cleaned, or maintained at this location. There is no documentation of releases, emergency response activities, or spills associated with AFFF or PFAS-containing materials at Building 2956. Therefore, no further action is required for this area.
Building 1460	Yes	Building 1460 is located directly east of Building 1300 and Building 1301, on the corner of Silversides Road and Scorpion Avenue (**Figure 4-3**). Building 1460 is used as a recycling facility. Handling and disposal of AFFF containers was conducted at this building and remnants of a car fire, where AFFF was used, were stored at this location. See **Section 4.3.24** for additional information and **Section 5** for the recommended path forward.

4.2 Summary of Areas Evaluated

A list of all areas evaluated in this PA is presented on **Table 4-1** and on **Figures 4-3** and **4-4**. The table documents whether the areas were or were not identified as a potential PFAS source areas, along with the rationale. Areas identified as potential PFAS source areas are further evaluated in **Section 4.3**. Areas evaluated that were not identified as potential PFAS source areas are recommended for no further action and are not further evaluated.

4.3 Potential PFAS Source Areas

4.3.1 Building 1301

4.3.1.1 Description and Operational History

Building 1301 is located in the southern portion of the installation, directly east of Building 1300 on Silversides Road (**Figure 4-5**). Building 1301 is used as a fire fighting training area. Building 1301 adjoins the fire station at Building 1300 and is utilized by the staff stationed there.

Building 1301 was constructed to be used as a fire training area, utilizing mostly propane for fire training. The NBK Pollution Prevention Manager indicated that during historical fire training activities, the fire department would limit the use of AFFF due to the cleanup procedures involved afterward. Training is currently conducted daily at Building 1301 (Fire Captain, 2019, pers. comm.). The training area consists of concrete surfaces without containment or lining (NBK Pollution Prevention Manager, 2019, pers. comm.).

4.3.1.2 Potential for PFAS Storage, Use, or Release

According to an interview with an Environmental Services Crew Member, it was stated that in either 1988 or 1989, AFFF was used during fire training at this location (Environmental Services Crew Member, 2018, pers. comm.).

It was also reported that AFFF was released into the woods adjacent to Building 1301 and behind Building 1300 when AFFF was flushed from the fire truck equipment (Regional Fire Chief, 2018, pers. comm.). During the VSI conducted on December 17, 2018, the Fire Fighting Rescue Training Area was not in use.

A conversation with a Fire Captain stationed at Fire Station 61 stated that currently, fire trucks containing AFFF are used during training activities at Building 1301, but no foam is deployed (Fire Captain, 2019, pers. comm.).

4.3.1.3 Migration Pathway and Exposure Assessment

Groundwater

Any liquids released onto the paved surfaces, including AFFF used in fire training activities, could have flowed overland to surrounding forested areas located to the south, southeast and southwest of Building 1301 (**Figure 4-5**). It then could have potentially infiltrated into the subsurface within the unpaved areas and then potentially through the till layer into the shallow aquifer. Additionally, any cracks or joints in concrete surfaces, including the roadway to the east of the training area, could provide an alternate pathway to the subsurface and subsequently groundwater. Shallow aquifer groundwater flow at the Fire Fighting Rescue Training Area is assumed to mimic topography and flow to the southeast. Depth to groundwater at this location is unknown.

The assumed Shallow aquifer groundwater flow direction is to the southeast, based on topography. At least 20 water supply wells and one on-Base water supply well have been identified within 1-mile downgradient of Building 1301[7] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS.

[7] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at Building 1301; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater.

Soil and Air

AFFF sprayed or released during fire training activities could have leaked through cracks or joints in the paved surfaces into the soil at Building 1301. Additionally, surface runoff of AFFF to surrounding forested areas located to the south, southeast and southwest could provide an alternate pathway to soil (**Figure 4-5**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil. Workers and visitors/trespassers are present at Building 1301; workers, visitors/trespassers, recreators, and residents are present within 1 mile.

Sediment and Surface Water

The topography at Building 1301 has an overall slope to the south. Paved surfaces on the western portion of the area slope gently to the south-southwest, while paved areas on the eastern portion of the area slope gently to the southeast (**Figure 4-5**). The slope of the paved surfaces directs overland flow towards topographically low areas to the southwest and southeast. During heavy precipitation events, these areas drain to the south of Silversides Road through a series of culverts. Surface runoff drains to the south of Building 1301 and eventually drains to Clear Creek, southwest of Bangor, which discharges to Dyes Inlet.

Workers and visitors/trespassers are present at Building 1301; workers, visitors/trespassers, recreators, and residents are present within 1 mile.

4.3.1.4 Recommendation

Based on known usage of AFFF during fire training and confirmed practice of, AFFF equipment flushing at this location, further investigation is recommended at Building 1301 as part of a Site Inspection (SI). If the SI identifies impacted groundwater, soil, sediment, or surface water at Building 1301, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.2 Building 1300

4.3.2.1 Description and Operational History

Building 1300 is located in the southern portion of the installation, on Silversides Road and has forested areas to the north, west and east (**Figure 4-5**). Building 1300 is used as a fire station and the training area at Building 1301 is located to the east (**Section 4.3.1**).

4.3.2.2 Potential for PFAS Storage, Use, or Release

Interviews with the Regional Fire Chief and NBK Pollution Prevention Manager indicated that historically, fire trucks were washed with soap and water near the grassy area behind Building 1300, and the fire truck equipment would be flushed of AFFF behind Building 1300 by spraying water into the equipment, draining the flushed water into the grassy area, or draining into a storm drain directly behind the apparatus bay (Regional Fire Chief, 2018, per. comm.; NBK Pollution Prevention Manager, 2019, pers. comm.). Currently fire trucks are washed inside the apparatus bay, and anything captured in the grates outside of the bays is cleaned out by the BOSC (Fire Captain, 2019, pers. comm.).

The Regional Fire Chief stated that prior to 2010, refilling the truck tanks with AFFF was usually done by the driver in the apparatus bay and was performed by hand-pouring AFFF into the fire truck tanks. After 2010, a drafting system was used to fill the fire truck AFFF tanks (Regional Fire Chief, 2018, pers. comm.).

During the VSI on April 24, 2019, an empty 55-gallon AFFF drum on a wooden pallet behind a storage shed was observed (**Figure 4-5**).

4.3.2.3 Migration Pathway and Exposure Assessment

Groundwater

Any liquids, including AFFF, released onto the paved surfaces outside the fire station or on the fire truck ramp, if not contained within the building's containment system, would have flowed overland to surrounding forested areas to the north and east or to a small grass-covered area to the west between the building and the parking lot (**Figure 4-5**). AFFF spilled or released at the AFFF storage area outside the northeast corner of the fire station would have flowed to the forested areas to the southeast. Any AFFF released to these areas could have potentially infiltrated into the subsurface and then through the till layer into the shallow aquifer. Additionally, any cracks or joints in paved surfaces could provide an alternate pathway to the subsurface and subsequently groundwater. Shallow aquifer groundwater flow at Building 1300 is assumed to mimic topography and flow to the southeast. Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (southeast) and the location in the southeastern portion of the installation, there are at least 20 water supply wells and one on-Base water supply well have been identified downgradient of Building 1300[8] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are likely not in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at Building 1300; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at Building 1300, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during fire station activities could have leaked through cracks or joints in the paved surfaces into the soil at Building 1300. Additionally, surface runoff or direct release of AFFF to surrounding forested and grass-covered areas could provide an alternate pathway to soil (**Figure 4-5**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at Building 1300; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at Building 1300, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The topography at Building 1300 has an overall slope to the south; however paved surfaces on the northern side of the fire station slope to the north (**Figure 4-5**). The slope of the paved surfaces directs overland flow towards topographically low areas to the north, southwest, and southeast dependent upon the area. During heavy precipitation events, these areas drain to the south of Silversides Road through a series of culverts.

Workers and visitors/trespassers are present at Building 1300; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at Building 1300, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

8 Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

4.3.2.4 Recommendation

Based on the confirmed practice of, AFFF equipment flushing at this location, and transfer of AFFF during refilling, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at Building 1300, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.3 1986 Fire Training Facility

4.3.3.1 Description and Operational History

The 1986 Fire Training Facility is located in the southern portion of the installation, south of Tower Road (**Figure 4-6**). The 1986 Fire Training Facility is situated in an open unpaved area surrounded by a heavily forested area.

4.3.3.2 Potential for PFAS Storage, Use, or Release

A NAVFAC Northwest RPM identified this historical fire training facility to the south of Tower Road (**Figure 4-6**) and stated that AFFF was used in oil fire response training at this location around 1986. The oil fire was lit within a metal structure and was subsequently extinguished with AFFF (RPM, 2018, pers. comm.). The exact location of the metal structure is unknown.

4.3.3.3 Migration Pathway and Exposure Assessment

Groundwater

The ground surface at the 1986 Fire Training Facility is largely unpaved aside from a few poorly maintained paved roads (**Figure 4-6**). Any AFFF used in fire training activities could have potentially infiltrated into the subsurface within the unpaved areas and then potentially through the till layer into the shallow aquifer. Shallow aquifer groundwater flow at the 1986 Fire Training Facility is assumed to mimic topography and flow towards Hood Canal to the west. Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (west) and the location in the southern portion of the installation, there are at least15 water supply wells have been identified downgradient of the 1986 Fire Training Facility[9] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at the 1986 Fire Training Facility; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the 1986 Fire Training Facility, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during fire training activities could have infiltrated directly into the soil at the 1986 Fire Training Facility. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil. Workers and visitors/trespassers are present at the 1986 Fire Training Facility; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the 1986 Fire Training Facility, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

[9] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

Sediment and Surface Water

The topography at the 1986 Fire Training Facility slopes gently to the west toward an unnamed stream that flows toward the southwest and eventually drains into Hood Canal (**Figure 4-6**).

Workers and visitors/trespassers are present at the 1986 Fire Training Facility; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the 1986 Fire Training Facility, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.3.4 Recommendation

Based on the confirmed firefighting training with AFFF at this location, further investigation is recommended at the 1986 Fire Training Area as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the 1986 Fire Training Area, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.4 Building 7600

4.3.4.1 Description and Operational History

Building 7600 is located in the central portion of the Base to the east of the intersection of Sturgeon Street and Snook Road and is immediately surrounded by a grassy area with a parking lot to the east, followed by a heavily forested area, to the east, south, and west (**Figure 4-7**). Building 7600 is used as a fire station and is located in the restricted lower Base section of NBK Bangor.

4.3.4.2 Potential for PFAS Storage, Use, or Release

The Building 7600 Fire Protection Specialist stated that to his/her knowledge, AFFF is not used, transferred, or stored at Building 7600. The fire truck permanently assigned to Building 7600 does not contain AFFF, although when the assigned fire truck is undergoing maintenance, alternate fire trucks with AFFF tanks (including those used at Fire Station 61) are temporarily assigned to Building 7600 (Fire Protection Specialist, 2019, pers. comm.).

At the time of the interview, February 20, 2019, the fire truck assigned to Building 7600 was out for maintenance and a backup fire truck was present (Fire Protection Specialist, 2019, pers. comm.).

During the interview the Fire Protection Specialist stated that maintenance of the fire trucks occurs at the Building 1014 and at a maintenance facility in Tacoma, Washington. Any fire trucks stationed at Building 7600, including alternate fire trucks, are either washed in the apparatus bay at Building 7600, which drains to a containment system, or at Building 1014. The firefighters conduct daily morning checks that can include flushing out the equipment. The daily morning checks are conducted in the parking space outside of the apparatus bay, which drains to the containment system (Fire Protection Specialist, 2019, pers. comm.).

The Fire Protection Specialist had limited knowledge of the operations at Building 7600 from 2018 to present.

4.3.4.3 Migration Pathway and Exposure Assessment

Groundwater

Any liquids, including AFFF, released onto the paved surfaces in the parking lot to the east of Building 7600 or on the fire truck ramp, if not contained within the building's containment system, would have flowed overland to surrounding grass-covered areas to the west, to a forested area to the north across Sturgeon Street or to an unlined ditch on the south side of Sturgeon Street. (**Figure 4-7**). Any AFFF released to these areas could have potentially infiltrated into the subsurface and then through the till layer into the shallow aquifer. Additionally, any cracks or joints in paved surfaces could provide an alternate pathway to the subsurface and subsequently the shallow aquifer. Shallow aquifer groundwater flow at Building 7600 is assumed to mimic topography and flow to the west-northwest. Depth to groundwater at this location is unknown.

Based on available information, no water supply wells have been identified downgradient of Building 7600[10] (**Figure 4-4**). However, as stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. Workers and visitors/trespassers are present at Building 7600; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at Building 7600, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during fire station activities could have leaked through cracks or joints in the paved surfaces into the soil at Building 7600. Additionally, surface runoff of AFFF to surrounding forested and grass-covered areas could provide an alternate pathway to soil (**Figure 4-7**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at Building 7600; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at Building 7600, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The general topography at Building 7600 slopes gently to the northwest (**Figure 4-7**). The slope of the ground surface to the northwest of the fire station directs overland flow to surrounding grass-covered areas to the west, to a forested area to the north across Sturgeon Street or to an unlined ditch on the south side of Sturgeon Street that connects to an unnamed stream, while overland flow south of the fire station drains to the west directly into the unnamed stream. A second unnamed stream and a small pond are located east of the fire station; however, due to the slope of the ground surface the unnamed stream to the east is not likely to receive runoff from Building 7600.

Workers and visitors/trespassers are present at Fire Station 62; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at Fire Station 62, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.4.4 Recommendation

Based on periodic equipment checks of AFFF equipment as part of morning checks, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at Building 7600, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.5 2001 Car Fire

4.3.5.1 Description and Operational History

The 2001 Car Fire occurred at the intersection of Escolar Road and Trigger Avenue (**Figure 4-8**). This location is surrounded by forested area, administrative buildings, and parking lots.

4.3.5.2 Potential for PFAS Storage, Use, or Release

During an interview, the Regional Fire Chief recalled that between 2001 and 2005, a car fire at the intersection of Escolar Road and Trigger Avenue in which AFFF was deployed to extinguish the fire. AFFF ran into the ditch on the southeast corner of the intersection (Regional Fire Chief, 2018, pers. comm.). The Regional Fire Chief confirmed that it was common practice to leave any residual AFFF in place after fires were extinguished.

[10] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

During an interview with the Industrial Waste Treatment Plant (IWTP) Operators it was stated that the vehicle that had caught fire had been transferred to the Recycling Facility and then to the Incinerator Storage Area (Site 16), which currently operates as an impound lot (IWTP Operators, 2019, pers. comm.).

4.3.5.3 Migration Pathway and Exposure Assessment

Groundwater

Any liquids, including AFFF, released at the crash location during the emergency response activities would have flowed overland to the unlined drainage ditch along the south side of Trigger Avenue (**Figure 4-8**). AFFF in the drainage ditch could have infiltrated into the subsurface and then through the till layer into the Shallow aquifer. Additionally, any cracks or joints in paved surfaces along Trigger Avenue could provide an alternate pathway to groundwater. Shallow aquifer groundwater flow in the vicinity of the 2001 Car Fire is assumed to mimic topography and flow to the east-southeast. Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (west-northwest) and the location in the southwestern portion of the installation, at least four water supply wells have been identified downgradient of the 2001 Car Fire[11] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. Workers and visitors/trespassers are present at the 2001 Car Fire; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted groundwater at the 2001 Car Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during the emergency response activities could have leaked through cracks or joints in the paved surfaces on Trigger Avenue into the soil at the 2001 Car Fire. Additionally, surface runoff of AFFF to the unpaved drainage ditch along the southern side of Trigger Avenue could provide an alternate pathway to soil (**Figure 4-8**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil. Workers and visitors/trespassers are present at the 2001 Car Fire; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the 2001 Car Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the 2001 Car Fire slopes gently to the southeast; however, the slope along the southbound lanes of Trigger Avenue directs overland flow to the south-southwest into the unpaved drainage ditch along the southern side of Trigger Avenue (**Figure 4-8**). Stormwater within the unpaved ditch drains flows toward and unnamed stream to the east (**Figure 4-8**). Workers and visitors/trespassers are present at the 2001 Car Fire; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the 2001 Car Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.5.4 Recommendation

Based on the confirmed use of AFFF during emergency response at the location of the 2001 Car Fire, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface

[11] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

water at the 2001 Car Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.6 Car Crash

4.3.6.1 Description and Operational History

During an interview with an Environmental Services Crew Member it was stated that a Car Crash occurred in approximately 2001 at either the northwest or southwest corner of Trident Boulevard and Scorpion Avenue, located in the southern portion of the Base (**Figure 4-5**) (Environmental Services Crew, 2019, pers. comm.). This location is surrounded by forested and grassy areas and is frequently travelled as it is directly west of the Trident Boulevard security gate.

4.3.6.2 Potential for PFAS Storage, Use, or Release

The Environmental Services Crew Member stated that AFFF was deployed in response to the car crash (Environmental Services Crew Member, 2019, pers. comm.). The Regional Fire Chief confirmed that it was common practice to leave any residual AFFF in place after fires were extinguished with AFFF. The vehicle wreckage was reportedly taken off-Base for disposal (Regional Fire Chief, 2018, pers. comm.). The date of this occurrence could not be confirmed, however AFFF was deployed during the crash response.

4.3.6.3 Migration Pathway and Exposure Assessment

Groundwater

Any AFFF, released at the crash location during the emergency response activities would have flowed overland into the grass immediately surrounding the intersection and then into the forested areas located northwest and southwest of the intersection (**Figure 4-5**). Any AFFF released to these areas could have potentially infiltrated into the subsurface and then through the till layer into the shallow aquifer. Additionally, any cracks or joints in paved surfaces could provide an alternate pathway to the subsurface and subsequently the shallow aquifer. Shallow aquifer groundwater flow at the Car Crash location is assumed to flow to the southeast. Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (southeast) and the location in the southeastern portion of the installation, at least 20 water supply wells and one on-Base water supply well have been identified downgradient of the Car Crash[12] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at the Car Crash location; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the Car Crash, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

Any AFFF released at the crash location during emergency response activities would have flowed overland into the grass immediately surrounding the intersection and then into the forested areas located northwest and southwest of the intersection (**Figure 4-5**)**.** Any AFFF released to these areas could have potentially infiltrated into the subsurface. Any AFFF released during emergency response activities could have leaked through cracks or joints in

[12] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

the paved surfaces at the intersection or into the soil at the Car Crash location (**Figure 4-5**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at the Car Crash location; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Car Crash, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the Car Crash location slopes to the west; however, the slope of paved surfaces at the intersection directs overland flow to forested areas located to the northwest and southwest (**Figure 4-5**). Stormwater runoff from the northern half of the intersection flows to the northwestern forested area, while runoff from the southern half flows to the southwest forested area (**Figure 4-5**). Therefore, potential migration of PFAS to surface water is low. However, discharge of shallow groundwater to Hood Canal is likely.

Workers and visitors/trespassers are present at the Car Crash location; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the Car Crash, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.6.4 Recommendation

Based on the confirmed use of AFFF in response to this car crash, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the Car Crash, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.7 2001 Agility Course Fire

4.3.7.1 Description and Operational History

The Marine Barracks Agility Course is located along the southeastern Base boundary at the intersection of Tunny Street and Scorpion Avenue and is a restricted access area southeast of (**Figure 4-9**). The area around the agility course is primarily grass and forested. The Marine Barracks Agility Course has off-Base residential parcels to the south and east, and Navy administrative buildings to the north and west.

4.3.7.2 Potential for PFAS Storage, Use, or Release

The Regional Fire Chief stated that in 2001, AFFF was used to extinguish a half-acre brush fire at the agility course. The Regional Fire Chief confirmed that it was not common practice to conduct cleanup in areas where AFFF was released during fire response (Regional Fire Chief, 2018, pers. comm.).

4.3.7.3 Migration Pathway and Exposure Assessment

Groundwater

Any liquids, including AFFF, released at the 2001 Agility Course Fire during the emergency response activities would have flowed to the east towards the forested area or accumulated in unpaved depressions within the course itself (**Figure 4-9**). Any AFFF released to these areas could have potentially infiltrated into the subsurface and then through the till layer into the shallow aquifer. Shallow aquifer groundwater flow at the 2001 Agility Course Fire is assumed to mimic topography and flow to the east. Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (east) and the location in the southeastern portion of the installation, at least 10 water supply wells have been identified downgradient of the 2001 Agility Course Fire[13] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**,

[13] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

private and public wells in this area are likely screened within the Shallow, Sea-level, and Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors are present at the 2001 Agility Course Fire; workers, visitors, recreators and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the 2001 Agility Course Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during emergency response activities could have infiltrated the soil at the 2001 Agility Course Fire or in the forested area to the east (**Figure 4-9**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at the 2001 Agility Course Fire; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the 2001 Agility Course Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the 2001 Agility Course Fire slopes to the east towards the installation boundary and an off-Base unnamed stream (**Figure 4-9**). Overland flow from the Agility Course would mimic topography and flow to the east towards the installation boundary, off-Base residential parcels, and an unnamed stream off-Base (**Figure 4-10**).

Workers and visitors/trespassers are present at the 2001 Agility Course Fire; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the 2001 Agility Course Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.7.4 Recommendation

Based on the confirmed use of AFFF to extinguish a brush fire at this location, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the 2001 Agility Course Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.8 Brush Fire

4.3.8.1 Description and Operational History

The Brush Fire area is located near the southwestern Base boundary to the northeast of Grampus Road (**Figure 4-10**). This area is primarily gravel with some grass and surrounded by heavily forested areas to the north, west and south.

4.3.8.2 Potential for PFAS Storage, Use, or Release

The Regional Fire Chief stated that a half-acre brush fire occurred at the south end of Grampus Road sometime between 2001 and 2005, and that AFFF was used to extinguish the fire. The exact date and location of this occurrence could not be confirmed. The Regional Fire Chief confirmed that it was not common practice to conduct cleanup in areas where AFFF was released during fire response (Regional Fire Chief, 2018, pers. comm.).

4.3.8.3 Migration Pathway and Exposure Assessment

Groundwater

The ground surface at the Brush Fire area is unpaved including Grampus Road, which is gravel and dirt. Any liquids, including AFFF, released at the Brush Fire during the emergency response activities would have flowed towards the forested area to the west (**Figure 4-10**). Any AFFF released to these areas could have potentially infiltrated into the subsurface and then through the till layer into the shallow aquifer. Shallow aquifer groundwater flow at the Brush Fire is assumed to mimic topography and flow to the west. Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (west) and the location in the southwestern portion of the installation, at least 10 water supply wells are located downgradient of the Brush Fire[14] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers, visitors/trespassers, and recreators are present at the Brush Fire location; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the Brush Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during the emergency response activities could have infiltrated the soil at the Brush Fire location or in the forested area to the west (**Figure 4-10**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers, visitors/trespassers, and recreators are present at the Brush Fire location; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Brush Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the Brush Fire location slopes to the west (**Figure 4-10**). There is a moderately steep embankment located on the western portion of the fire location near the tree line of the forested area (**Figure 4-10**). Stormwater runoff from the Brush Fire Area would flow down this embankment towards Olympic View Road Northwest and the installation boundary (**Figure 4-10**). Therefore, potential migration of PFAS to surface water is low. However, discharge of shallow groundwater to Hood Canal is likely.

Workers, visitors/trespassers, and recreators are present at the Brush Fire location; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the Brush Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.8.4 Recommendation

Based on the confirmed use of AFFF to extinguish a brush fire at this location, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the Brush Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

[14] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

4.3.9 Building 1006 Fire

4.3.9.1 Description and Operational History

Building 1006 was located near the southeastern Base boundary on the southwest corner of the intersection of Hunley Road and Skate Street (**Figure 4-11**). Historically Building 1006 was an administrative building and is currently the location of a parking lot.

4.3.9.2 Potential for PFAS Storage, Use, or Release

During the interview with the Regional Fire Chief it was stated that AFFF was used in emergency response for a fire located at Building 1009 at some time between 2001 to 2005 (Regional Fire Chief, 2018, pers. comm.). The location of the fire was later confirmed to be Building 1006 and AFFF usage was confirmed in a conversation with the Public Affairs Officer at NAVFAC Northwest, who was working in the building at the time of the fire (Public Affairs Officer, 2019, pers. comm.). The exact date of the fire could not be recalled.

4.3.9.3 Migration Pathway and Exposure Assessment

Groundwater

The historical location of Building 1006 is entirely paved with asphalt and concrete. At the time of the fire, there was grass-covered area that bordered the building to the west and north. A paved parking lot bordered Building 1006 to the east and south. Beyond the parking lot to the south was a large grass field. Any liquids, including AFFF, released at the Building 1006 Fire would have either flowed overland to the grass-covered area north/east of the building or to the grass field to the south (**Figure 4-11**). Any AFFF released to these areas could have potentially infiltrated into the subsurface and then through the till layer into the shallow aquifer. Shallow aquifer groundwater flow at the Building 1006 Fire is assumed to mimic topography and flow to the southeast. Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (southeast) and the location in the southeastern portion of the installation, at least 11 water supply wells have been identified downgradient of the Building 1006 Fire[15] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at the former location of Building 1006; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the Building 1006 Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during the emergency response activities could have leaked through cracks or joints in the paved surfaces into the soil at the Building 1006 Fire. Additionally, surface runoff of AFFF to surrounding unpaved areas to the north, west, and south could provide an alternate pathway to soil (**Figure 4-11**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at the former location of Building 1006; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Building

15 Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

1006 Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

Currently, the overall topography at the Building 1006 Fire slopes gently to the south (**Figure 4-11**). Based on historical imagery (Google Earth, 2006), the topography was likely the same at the time of the fire. The slope of the ground surface likely would have directed overland flow towards the grass field to the south (**Figure 4-11**). Therefore, there is a potential for migration of PFAS to surface water.

Workers and visitors/trespassers are present at the former location of Building 1006; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the Building 1006 Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.9.4 Recommendation

Based on the confirmed use of AFFF to extinguish a building fire at this location, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the Building 1006 Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.10 Helipad

4.3.10.1 Description and Operational History

The Helipad is located in the southern portion of the Base at the end of Flying Fish Road. It is a concrete pad approximately 100 feet long by 100 feet wide (**Figure 4-12**). The helipad is surrounded by a grassy area and is adjacent to a parking lot. The current use of the helipad is unknown.

4.3.10.2 Potential for PFAS Storage, Use, or Release

An Environmental Services Crew Member provided information via email about the helipad, noting that AFFF emergency response training was frequently conducted at the helipad (Environmental Services Crew Member, 2019, pers. comm.). Exact dates, frequency, and details of AFFF usage could not be confirmed.

4.3.10.3 Migration Pathway and Exposure Assessment

Groundwater

Any AFFF used in emergency response training activities would have flowed overland to grass-covered areas that surround the Helipad. Any AFFF released to these areas could have potentially infiltrated into the subsurface and then through the till layer into the shallow aquifer. Additionally, any cracks or joints in paved surfaces could provide an alternate pathway to the subsurface and subsequently the shallow aquifer. Shallow aquifer groundwater flow at the Helipad is assumed to mimic topography and flow to the northwest towards Hood Canal (**Figure 4-12**). Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (northwest) and the location in the south portion of the installation, at least 9 water supply wells and two on-Base water supply wells have been identified downgradient of the Helipad[16] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely

16 Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at the Helipad; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the Helipad, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during emergency response training activities could have infiltrated directly into the soil in the unpaved areas surrounding the Helipad (**Figure 4-12**). Additionally, any cracks or joints in paved surfaces could provide an alternate pathway to the soil beneath the Helipad. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at the Helipad; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Helipad, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The Helipad is situated on a small topographic high and the ground surface slopes away from the Helipad to the west, north and east towards forested areas (**Figure 4-12**). There are two small drainage areas to the east and west of the Helipad that captures runoff that flows to the forested areas east and west, respectively (**Figure 4-12**). Therefore, potential migration of PFAS to larger surface water bodies is low.

Workers and visitors/trespassers are present at the Helipad; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the Helipad, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.10.4 Recommendation

Based on the confirmed use of AFFF during emergency response training activities at the Helipad, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the Helipad, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.11 2012 Car Fire

4.3.11.1 Description and Operational History

The 2012 Car Fire area is located in the southern portion of the Base on the east side of Nautilus Avenue, southwest of the Classification Yard. It is a grassy area immediately next to the paved roadway. (**Figure 4-13**).

4.3.11.2 Potential for PFAS Storage, Use, or Release

A Fire Captain stationed at Fire Station 61 stated that around 2012 AFFF was used in response to a car crash in this area (**Figure 4-13**) (Fire Captain, 2019, pers. comm.). The Regional Fire Chief confirmed that it was not common practice to conduct cleanup in areas where AFFF was released during fire response (Regional Fire Chief, 2018, pers. comm.).

4.3.11.3 Migration Pathway and Exposure Assessment

Groundwater

Any liquids, including AFFF, released at the 2012 Car Fire location during the emergency response activities would have flowed overland to grass-covered areas located on the east side of Nautilus Avenue down to the embankment (**Figure 4-13**). Any AFFF released to these areas could have potentially infiltrated into the subsurface

and then through the till layer into the shallow aquifer. Additionally, any cracks or joints in paved surfaces could provide an alternate pathway to the subsurface and subsequently the shallow aquifer. Shallow aquifer groundwater flow at the 2012 Car Fire is assumed to mimic topography and flow to the east-southeast. Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (east-southeast) and the location in the southern portion of the installation, at least 15 water supply wells have been identified downgradient of the 2012 Car Fire[17] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespasser are present at the 2012 Car Fire; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the 2012 Car Fire location, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during emergency response activities could have leaked through cracks or joints in the paved surfaces into the soil at the 2012 Car Fire location. Additionally, surface runoff of AFFF to grass-covered areas located on the east side of Nautilus Avenue could provide an alternate pathway to soil (**Figure 4-13**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespasser are present at the 2012 Car Fire; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the 2012 Car Fire location, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the 2012 Car Fire location slopes to the southeast; however, Nautilus Avenue slopes gently to the northeast (**Figure 4-13**). Stormwater runoff from the 2012 Car Fire location flows northwest along Nautilus Avenue and through a culvert that discharges to the southeast in a forested area (**Figure 4-13**). The stormwater runoff may intersect a stream located in the forested area that flows to the southeast toward two small lakes.

Workers and visitors/trespasser are present at the 2012 Car Fire; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the 2012 Car Fire location, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.11.4 Recommendation

Based on the confirmed use of AFFF in response to the 2012 Car Fire, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the 2012 Car Fire, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

[17] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

4.3.12 Building 7030

4.3.12.1 Description and Operational History

Building 7030 is located in the northern portion of the Base to the east of Delta Pier and adjacent to Runner Road (**Figure 4-14**). Building 7030 operates as an industrial waste treatment building. Building 7030 is immediately surrounded by a parking lot to the north, gravel/staging area to the east and south, and grass and paved areas to the west. Beyond the plant facility there are heavily forested areas to the north, east, and south, and is bordered by roadways and grassy areas leading to Hood Canal to the west.

Interviews with the Industrial Waste Treatment Plant (IWTP) Operators indicated that Building 7030 receives and processes waste from several Base operations including bilge waste from visiting ships and submarines at the docs and piers. Sludge is primarily shipped off-Base to the Olympic View Landfill, while hazardous waste sludge is managed through the Waste Identification System process (IWTP Operators, 2019, pers. comm.). The effluent from Building 7030 is discharged to the sewer, which flows off-Base to the Brownsville Sewer Plant.

4.3.12.2 Potential for PFAS Storage, Use, or Release

During the interview with the IWTP Operators it was stated that AFFF previously brought to the Industrial Waste Treatment Building was placed into a storage tank located on a concrete pad south of Building 7030. The AFFF was trickled into the sewer system via a manhole located outside Building 7030, which is part of the Industrial Waste Treatment system. It was stated that there are cracks in the concrete pad and any AFFF may have leaked into the soil at this location. During the interview with the ITWP Operators, it was also stated that a fire truck flushed AFFF equipment in the graveled area south of Building 7030 (IWTP Operators, 2019, pers. comm.).

Any spill debris from crashes or fire would have come to the IWTP and that foam-over events of influent containing AFFF had occurred within the treatment system inside Building 7030. During foam-over events the overflow would get sprayed down and drain into the 220,000-gallon tank below Building 7030 for recirculation back and into the system. The 220,000-gallon tank is inspected annually and has not undergone any maintenance, sealing or repairs for cracks or leakage. (IWTP Operators, 2019, pers. comm.).

Bilge waste offloaded from boats or submarines is flowed, via a lift station, to the Industrial Waste Treatment Building but would be covered by oil in the tanks so it may not be noticed in the system (IWTP Operators, 2019, pers. comm.).

4.3.12.3 Migration Pathway and Exposure Assessment

Groundwater

Building 7030 consists of both paved and unpaved surfaces. The area where AFFF trickling and flushing of the fire truck tank occurred is unpaved. The area where the AFFF tank was stored is paved but it was stated that there are cracks in the concrete (IWTP Operators, 2019, pers. comm.) (**Figure 4-14**). Any liquids, including AFFF or PFAS-containing materials, spilled or released during flushing or transfer activities could have infiltrated the subsurface at this location and then infiltrated directly into the Perched aquifer or through the till layer into the Shallow aquifer. Additionally, any cracks or joints in paved surfaces could provide an alternate pathway to the subsurface and subsequently the Shallow aquifer. Shallow aquifer groundwater flow at Building 7030 is assumed to mimic topography and flow to the northwest towards Hood Canal (**Figure 4-14**). Depth to groundwater at this location is unknown.

No water supply wells have been identified downgradient of Building 7030[18] (**Figure 4-2**). Workers and visitors/trespassers are present at Building 7030; workers, visitors/trespassers, recreators, and residents are present within 1 mile (**Figure 4-2**). If the depth to water is less than 15 feet bgs, construction workers could be

[18] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at Building 7030, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF sprayed or released during flushing or trickling activities could have infiltrated directly into the soil in the unpaved areas surrounding Building 7030 or into the soil below the concrete pad that has cracks in the surface (**Figure 4-14**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at Building 7030; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Industrial Waste Treatment Building, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the Building 7030 slopes to the west-northwest toward Hood Canal (**Figure 4-14**). However, the area around the manhole where AFFF was reportedly flushed is relatively flat. Any AFFF or PFAS-containing materials released at this location would have accumulated in the immediate vicinity. Two culverts drain the surface water from the Building 7030 area toward the west to discharge into an unpaved drainage ditch along Runner Road, which is not continuous (**Figure 4-14**). Due to the proximity to Hood Canal and slope of topography, the surface water runoff could discharge into Hood Canal.

Workers and visitors/trespassers are present at Building 7030; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at Building 7030, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.12.4 Recommendation

Based on the confirmation of releases from an AFFF storage tank, foam-over events, confirmed AFFF equipment flushing at this location, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the Industrial Waste Treatment Building, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.13 Site A

4.3.13.1 Description and Operational History

Site A is located on an elevated plateau surrounded by dense timber on the northern edge of NBK Bangor at the intersection of Pintado Road and Tinosa Road (**Figure 4-15**) (The Environmental Company, 2002). Site A occupies 12 acres and consists of a historical seven-acre Burn Area, Debris Areas 1 and 2, and a stormwater discharge area.

From 1962 to 1975, the Navy used Site A to detonate and incinerate ordnance materials. Site A originally had burn mounds, facilities for personnel, fire suppression vehicles and equipment, and an ammunition incinerator. Buildings were demolished and burned on site in 1977. Inert solid waste material (e.g., metal casings) resulting from the Burn Area Operations was deposited at the two adjacent Debris Areas (Navy, 1991). Grading and redistribution of soil at the Burn Area continued through 1984 (Navy, 2005). A treatment facility for RDX in groundwater was constructed on the west side of Pintado Road in 1994 and was constructed to treat leachate from a passive soil washing system, and subsequently, the groundwater. The treatment system consists of two 20,000-pound granulated activated carbon units, which treat groundwater recovered from the extraction wells at Site A. The carbon removes the RDX from the groundwater and the treated groundwater is pumped back into the Shallow aquifer via a reintroduction well (The Environmental Company, 2002).

4.3.13.2 Potential for PFAS Storage, Use, or Release

An Environmental Services Crew member noted via email that prior to 1981, AFFF was used in the flat open area at the north end of the Base, southeast of the wetland leading to Cattail Lake, although this area was not a designated spray testing or fire training area, the release of AFFF is documented. The actual purpose for using AFFF at this area is unknown. (Environmental Services Crew, 2019, pers. comm.). While the exact location of this flat open area could not be confirmed, the description of the flat open area matches the Burn Area at Site A, and there are no areas with similar descriptions at the north end of the Base. Debris Areas 1 and 2 were used as a disposal site during the time that AFFF was used at NBK Bangor.

4.3.13.3 Migration Pathway and Exposure Assessment

Groundwater

The burn area within Site A is unpaved and bounded by earthen berms on all sides (**Figure 4-15**). A small discharge valve located on the western side of the burn area prevents stormwater accumulation. Any liquids, including AFFF, released at the burn area within Site A would have either infiltrated the subsurface within the burn area or flowed through the discharge valve into a surface water drainage along the eastern side of Pintado Road.

Debris Area 1 and Debris Area 2 at Site A are surrounded by heavily forested areas (**Figure 4-15**). Liquids entering the subsurface at these debris areas could potentially infiltrate directly to the Perched aquifer or through the till layer into the Shallow aquifer. A portion of the Perched groundwater dries up in the summer, and in the rainy winter months, a portion of the Perched aquifer flows to the north-northeast toward Vinland Creek. Shallow aquifer groundwater flow at Site A is towards the wetland leading to Cattail Lake to the west-northwest. Perched groundwater, where present, is encountered between 10 and 20 ft bgs. Depth to groundwater in the Shallow aquifer is between 70 and 105 feet bgs (Navy, 2018b).

Based on the Shallow aquifer groundwater flow directions (west-northwest) and the location in the northern portion of the installation, no water supply wells have been identified downgradient of Site A[19] (**Figure 4-2**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at Site A; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at Site A, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

AFFF released at Site A could have infiltrated the soil within the burn area or within the surface drainage along Pintado Road (**Figure 4-15**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at Site A; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at Site A, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

[19] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

Sediment and Surface Water

The topography at Site A has an overall slope to the west and the burn area is designed to direct surface runoff towards the burn area discharge valve located along Pintado Road (**Figure 4-15**). Surface water within the drainage west of the burn area flows to Vinland Creek to the north and eventually discharges into Hood Canal off-Base to the north.

Workers and visitors/trespassers are present at Site A; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at Site A, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.13.4 Recommendation

Based on confirmed use of AFFF at the Site A Burn Area, documented use of AFFF at the Base, and limited information regarding what was disposed of at Disposal Areas 1 and 2, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at Site A, an assessment is recommended to determine if the exposure pathway is complete for identified receptors.

4.3.14 Dunnage Canyon

4.3.14.1 Description and Operational History

The Dunnage Canyon is an approximately 5-acre ravine that is located in the northern portion of the Base to the west of Northwest Boundary Road. It is surrounded by a heavily forested area and to the west is Hood Canal (**Figure 4-16**).

The Dunnage Canyon served as a disposal site from about 1950 into the late 1970s. Dunnage, scrap metal, and possibly explosives were disposed, and dunnage from ships was burned and buried on-site (NEESA, 1983a). At the lowest point, at the northern edge of the site, substantial flow of leachate was historically observed toward the northwest, although the date of this observation is unknown (NEESA, 1983a).

This site was recommended for a one-time seep and sediment sampling event and is not included in any OUs (NEESA, 1983a). It is unknown if any sampling or removal actions have occurred.

4.3.14.2 Potential for PFAS Storage, Use, or Release

In 1986 drums were observed scattered across the surface of the site; some of the drums were labeled as containing antifreeze, Freon, and Otto fuel. It is unknown whether the drums were empty or contained waste. During the early period of waste disposal (approximately 1971) an underground fire started at the site and smoldered for 2 years before extinguishing itself (RCA, 1989).

Dunnage Canyon has historically been used as a disposal site and burning of dunnage from ships occurred prior to the 1970s at this location (NEESA, 1983a).

The contents of all of the waste disposed of at Dunnage Canyon is unknown. AFFF was in use at NBK Bangor during the disposal timeframe of Dunnage Canyon and may have been disposed of at this location.

4.3.14.3 Migration Pathway and Exposure Assessment

Groundwater

If AFFF or other PFAS-containing materials were disposed of at the Dunnage Canyon, AFFF or PFAS would have been released directly into the subsurface and could have potentially infiltrated directly into the Perched aquifer or through the till layer into the Shallow aquifer. Shallow aquifer groundwater flow at the Dunnage Canyon is assumed to mimic topography and flow to the west towards Hood Canal (**Figure 4-16**). Depth to groundwater at this location is unknown.

No water supply wells have been identified downgradient of the Dunnage Canyon[20] (**Figure 4-2**). However, if the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater.

Workers and visitors/trespassers are present at the Dunnage Canyon; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted groundwater at the Dunnage Canyon, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

If AFFF or other PFAS-containing materials were disposed of at the Dunnage Canyon, AFFF and PFAS would have been in direct contact with the subsurface, potentially impacting soil. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at the Dunnage Canyon; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Dunnage Canyon, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the Dunnage Canyon slopes to the west towards Hood Canal (**Figure 4-16**). The slope of the ground surface in the northern portion of the Dunnage Canyon directs overland flow to the northwest, while overland flow in the southern portion of the Dunnage Canyon is to the southwest towards an unnamed stream that discharges into Hood Canal. Additionally, discharge of shallow groundwater to the unnamed stream in the southwest is possible.

Workers and visitors/trespassers are present at the Dunnage Canyon; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at Dunnage Canyon, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.14.4 Recommendation

Based on the timeframe of operation, and documented use of AFFF at the Base, AFFF waste may have been disposed of at the Dunnage Canyon, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at Dunnage Canyon, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.15 Floral Point (Site B)

4.3.15.1 Description and Operational History

Floral Point is located in the northwest portion of the Base on Amberjack Avenue and covers approximately 5 acres directly adjacent to Hood Canal (**Figure 4-17**). Floral Point was historically used for pyrotechnics testing and disposal during the 1950s and 1960s. It was also used, as a garbage disposal area, and burn pit (NEESA, 1983a).

A burn pit was located at Floral Point in 1953, and trash was burned in the burn pit from 1962 through 1966. Garbage from NBK Keyport was transferred to Floral Point from 1967 to 1972 and was buried in the disposal pit (Navy, 2005; URS, 1991; NEESA, 1983a; Navy, 1981). Specifications of the disposal pit are unknown. The remedy for Floral Point was implemented from June through November 1997 and included covering areas of contaminated soil; installing a shoreline protection system and a stormwater drainage system to control erosion; monitoring sediment and clam tissue; and installing signs notifying visitors the site is to be used for recreational purposes only, and approval is required for digging or mowing (Navy, 2015).

[20] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

4.3.15.2 Potential for PFAS Storage, Use, or Release

The disposal area held considerable dunnage, brush, scrap metal, and construction debris (NEESA, 1983a). The contents of the garbage from NBK Keyport is unknown, however waste from NUWES Keyport could have PFAS-containing materials or waste from plating activities that are documented to have occurred at NUWES Keyport. It is unknown whether AFFF was used to control the burning at Floral Point, but historically AFFF has been used at NBK Bangor. Floral Point was used as a disposal site during the time that AFFF was used at NBK Bangor.

4.3.15.3 Migration Pathway and Exposure Assessment

Groundwater

If AFFF or other PFAS-containing materials were disposed of at Floral Point, AFFF or PFAS would have been released directly into the subsurface and could have potentially infiltrated directly into the Perched aquifer or through the till layer into the Shallow aquifer. Shallow aquifer groundwater flow at Floral Point is assumed to mimic topography and flows northwest towards Hood Canal (**Figure 4-17**). Depth to groundwater at this location is not known.

No water supply wells have been identified downgradient of Floral Point[21] (**Figure 4-2**). However, if the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater.

Workers, visitors/trespassers, and recreators are present at Floral Point; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted groundwater at Floral Point, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

If AFFF or other PFAS-containing materials were disposed of at Floral Point, AFFF and PFAS would have been in direct contact with the subsurface, potentially impacting soil. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers, visitors/trespassers, and recreators are present at Floral Point; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at Floral Point, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at Floral Point slopes to the west towards Hood Canal (**Figure 4-17**). The slope of the ground surface in the northern portion of Floral Point directs overland flow to the northwest, while overland flow in the southern portion of Floral Point is directed to a small depression near the center of Floral Point (**Figure 4-17**). Additionally, discharge of shallow groundwater to Hood Canal is likely.

Workers, visitors/trespassers, and recreators are present at Floral Point; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at Floral Point, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.15.4 Recommendation

Based on the time frame of operation, documented use of AFFF at the Base, and limited information regarding what was disposed of at Floral Point including the potential of PFAS-containing waste from NBK Keyport, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at Floral Point, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

[21] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

4.3.16 Luotto Road Disposal Site (Site 14)

4.3.16.1 Description and Operational History

The Luotto Road Disposal Site is located in the southern portion of the Base along the railroad tracks north of Trident Boulevard (**Figure 4-18**). It was used as a disposal site prior to 1964 (NEESA, 1983a). It is surrounded by a heavily forested area and is situated along the railroad tracks.

4.3.16.2 Potential for PFAS Storage, Use, or Release

Old cans barrels, and ammunition boxes were discarded at the Luotto Road Disposal Site and it was reported that disposal occurred on both sides of the railroad track (NEESA, 1983a). Exact contents of the Luotto Road Disposal Site are unknown.

4.3.16.3 Recommendation

Based on the lack of disposal at the Luotto Road Disposal Site after 1964 it is unlikely that AFFF or other PFAS containing materials to have been disposed of at this site, and further investigation is not recommended.

4.3.17 Classification Yard

4.3.17.1 Description and Operational History

The Classification Yard is located in the southern portion of the Base along the north-south trending ravine between Nautilus Avenue and Trigger Avenue (**Figure 4-13**). The Classification Yard is surrounded by recreational areas, a vehicle storage area, and on-Base residential parcels.

The Classification Yard was divided into two subareas designated Sites 2a and 2b (**Figure 4-13**) and was used as a disposal area from the late 1960s. It is unknown how long disposal at this location occurred. A time-critical removal action was completed in 1993 (Navy, 1996).

Soil excavated during this action were placed in two stockpiles onsite. The remedy selected for the Classification Yard was to prevent direct contact with and ingestion of stockpiled soil, and underlying soil to a depth of 15 feet, containing PCB concentrations above the MTCA Method A residential soil cleanup level (Navy, 2005). Remediation was completed in December 1995.

4.3.17.2 Potential for PFAS Storage, Use, or Release

Site 2a was a disposal area for small-caliber projectiles, and Site 2b was an authorized disposal area. Numerous items were disposed of on Site 2b; reportedly scrap steel, empty barrels and drums, dunnage, paint sludge, waste oil, and unused paint (NEESA, 1983a, Navy, 2005). A cleanup of surface debris at Site 2a was completed in 1986 and 1987. Old furniture, signs, empty ammunition boxes, cans, bottles and partially buried drums were removed from Site 2b during a time-critical removal action completed in 1993 (Navy, 1996).

The contents of all of the waste disposed of at the Classification Yard is unknown. It is known that AFFF has been used historically at NBK Bangor during the disposal timeframe of the Classification Yard and may have been disposed of at this location.

4.3.17.3 Migration Pathway and Exposure Assessment

Groundwater

If AFFF or other PFAS-containing materials were disposed of at the Classification Yard, AFFF or PFAS would have been released directly into the subsurface and could have potentially infiltrated through the till layer into the Shallow aquifer. Shallow aquifer groundwater flow at the Classification Yard is assumed to follow topography and flow to the southeast (**Figure 4-13**). Depth to groundwater at this location is unknown.

Based on the assumed Shallow aquifer groundwater flow direction (southeast) and the location in the southern portion of the installation, at least 15 water supply wells have been identified downgradient of the Classification

Yard[22] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers, visitors/trespassers, recreators, and residents are present at the Classification Yard; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the Classification Yard, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

If AFFF or other PFAS-containing materials were disposed of at the Classification Yard, AFFF and PFAS would have been in direct contact with the subsurface, potentially impacting soil. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers, visitors/trespassers, recreators, and residents are present at the Classification Yard; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Classification Yard, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the Classification Yard slopes to the southeast towards an unnamed stream to the northeast of the playfields that eventually drains into two small lakes (**Figure 4-13**). Surface water captured by an unpaved drainage ditch along Nautilus Avenue flows through a culvert and into the stream in the southern portion of the Classification Yard.

Workers, visitors/trespassers, recreators, and residents are present at the Classification Yard; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the Classification Yard, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.17.4 Recommendation

Based on time frame of operation, and documented use of AFFF at the Base, AFFF waste may have been disposed - in the Classification Yard, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the Classification Yard, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.18 Old Brass Yard

4.3.18.1 Description and Operational History

The Old Brass Yard is located in the southern portion of the Base east of Thresher Avenue (**Figure 4-19**). The Old Brass Yard has a forested area to the south and Navy administrative buildings to the north.

From 1967 to 1974 the Old Brass Yard was used for the large-scale storage of 55-gallon drums. Approximately 200 to 400 drums with unknown contents were stored at the location. Additionally, recovered metal items were transferred to the Old Brass Yard for salvage.

[22] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

4.3.18.2 Potential for PFAS Storage, Use, or Release

Solvents and oils were reported to have been burned at the Old Brass Yard, but the quantities and dates are unknown. Sandblasting may have also been performed at the Old Brass Yard, but it is unconfirmed (NEESA, 1983a).

Exact contents of what was burned at the Old Brass yard is unknown. It is known that AFFF has been used historically at NBK Bangor for fire response during the timeframe of operation of the Old Brass Yard and may have been disposed of at this location.

4.3.18.3 Migration Pathway and Exposure Assessment

Groundwater

If AFFF or PFAS-containing materials were spilled, disposed of or burned at the Old Brass Yard, AFFF or PFAS would have been released directly onto the surrounding soil and could have infiltrated through the till layer into the Shallow aquifer. Shallow aquifer groundwater flow at the Old Brass Yard is assumed to follow topography and flow to the southeast (**Figure 4-19**). Depth to groundwater at this location is unknown.

Because of the assumed Shallow aquifer groundwater flow direction (southeast) and the location in the southeastern portion of the installation, at least 5 water supply wells have been identified downgradient of the Old Brass Yard[23] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at the Old Brass Yard; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the Old Brass Yard, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

If AFFF or PFAS-containing materials were spilled, disposed of or burned at the Old Brass Yard, AFFF or PFAS would have been released directly onto the surrounding soil. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at the Old Brass Yard; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Old Brass Yard, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the Old Brass Yard slopes gently to the north towards a grass-covered area (**Figure 4-19**). Because of the lack of defined drainages in this area, surface runoff would likely pool in the grass-covered area to the north. Therefore, there is a low potential for migration to surface water.

Workers and visitors/trespassers are present at the Old Brass Yard; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the Old Brass Yard, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

[23] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

4.3.18.4 Recommendation

Based on the timeframe of use of the Old Brass Yard as a disposal area, and documented use of AFFF at NBK Bangor, AFFF waste may have been disposed of at this location. As such, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the Old Brass Yard, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.19 Old Paint Can and Drum Disposal Site (Site 22)

4.3.19.1 Description and Operational History

The Old Paint Can and Drum Disposal Site (Site 22) is located in the northern portion of the Base to the west of the intersection of Tinosa Road and Pintado Road and is situated on a steep ravine (**Figure 4-15**). Site 22 is surrounded by a heavily forested area and Hood Canal is located to the north and west. Heavy vegetation and topography prevented visual verification and mapping of the Site 22 boundary.

4.3.19.2 Potential for PFAS Storage, Use, or Release

Site 22 was used as a disposal area with unknown dates of operation. Numerous items have been discarded at Site 22, including empty drums, ammunition cans and boxes, casings, a box of small caliber casings, gas cylinders, fire extinguishers, and other pressure type cylinders. It is reported that many types of industrial wastes were collected and mixed together in drums before disposal at this location (NEESA, 1983a).

4.3.19.3 Migration Pathway and Exposure Assessment

Groundwater

If AFFF or other PFAS-containing materials were disposed of at Site 22, AFFF or PFAS would have been released directly into the subsurface and could have potentially infiltrated directly into the Perched aquifer or through the till layer into the Shallow aquifer. Shallow aquifer groundwater flow at Site 22 is assumed to mimic topography and flow west-northwest towards a small stream that flows to an area that was formerly Cattail Lake and on to Hood Canal (**Figure 4-15**). Depth to groundwater at this location is unknown.

No water supply wells have been identified downgradient of Site 22[24] (**Figure 4-2**). Workers and visitors/trespassers are present at Site 22; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at Site 22, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

If AFFF or other PFAS-containing materials were disposed of at Site 22, AFFF and PFAS would have been in direct contact with the surface and subsurface, potentially impacting soil. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at Site 22; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at Site 22, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

Site 22 is situated on a steep embankment that slopes to the west-northwest towards a small stream that flows to an area that was formerly Cattail Lake but is now a wetland that connects to Hood Canal (**Figure 4-15**). The United States Army Corps of Engineers permit for a dam removal project was issued February 11, 2011. Construction

[24] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

began in September of 2011. Construction, including dam removal, was completed in October 2013 (RPM, 2020, pers. comm.).

Workers and visitors/trespassers are present at Site 22; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at Site 22, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.19.4 Recommendation

Based on the timeframe of operation, documented use of AFFF at the Base, known disposal of fire extinguishers and industrial waste, and the potential of disposal of AFFF at Site 22, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at Site 22, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.20 Old Paint Can and Drum Disposal Site (Site 7)

4.3.20.1 Description and Operational History

The Old Paint Can and Drum Disposal Site (Site 7) is located in the northern portion of the Base on a hillside above the south end of the wetland leading to Cattail Lake and occupies an area approximately 200 by 300 feet on a forested slope (**Figure 4-15**). Site 7 is located west of Tinosa Road surrounded by a heavily forested area. Heavy vegetation and topography prevented visual verification and mapping of Site 7 boundaries.

Site 7 was used as a disposal area during the mid-1970s. Containers disposed of at Site 7 were removed in 1981 and no visible evidence of disposal remains (NEESA, 1983a; URS, 1992). Site 7 is part of OU 7, and the OU 7 ROD states that no remedial action is required for this site (Navy, 2005).

4.3.20.2 Potential for PFAS Storage, Use, or Release

During the mid-1970s paint cans and drums from the former paint shop (Building 1032) were disposed of over the side of an embankment at Site 7. Approximately 25 containers, ranging from 1-gallon cans to 55-gallon drums, were brought to Site 7 either empty or partially full of paint, thinner, and solvents. The containers were removed in 1981 (NEESA, 1983a; URS, 1992). It is unknown if any of the waste had PFAS-containing materials. Site 7 was used as a disposal site during the time that AFFF was used at NBK Bangor.

4.3.20.3 Migration Pathway and Exposure Assessment

Groundwater

If AFFF or other PFAS-containing materials were disposed of at Site 7, AFFF or PFAS would have been released directly into the subsurface and could have potentially infiltrated directly into the Perched aquifer or through the till layer into the Shallow aquifer. Shallow aquifer groundwater flow at Site 7 is assumed to mimic topography and flow west-northwest towards the location of the wetland leading to Cattail Lake (**Figure 4-15**). Depth to groundwater at this location is unknown.

No water supply wells have been identified downgradient of Site 7[25] (**Figure 4-2**). Workers and visitors/trespassers are present at Site 7; workers, visitors/trespasser, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at Site 7, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

[25] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

Soil and Air

If AFFF or other PFAS-containing materials were disposed of at Site 7, AFFF and PFAS would have been in direct contact with the subsurface, potentially impacting soil. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at Site 7; workers, visitors/trespasser, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at Site 7, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

Site 7 is situated on a steep embankment that slopes to the southwest towards the former location of the wetland leading to Cattail Lake, which connects to Hood Canal (**Figure 4-15**). Surface runoff mimics topography and may discharge into the wetland leading to Cattail Lake and Hood Canal. Workers and visitors/trespassers are present at Site 7; workers, visitors/trespasser, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at Site 7, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.20.4 Recommendation

Based on the timeframe of operation, documented use of AFFF at the Base, disposal of industrial waste, and limited documentation, AFFF waste may have been disposed of at Site 22. As such, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at Site 7, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.21 Old Acid Pit (Site E)

4.3.21.1 Description and Operational History

The Old Acid Pit is located in the south-central portion of NBK Bangor, northwest of Fire Trail Road (**Figure 4-20**). The Old Acid Pit is surrounded by a heavily forested area. Heavy vegetation and topography prevented visual verification and mapping of the Old Acid Pit boundaries.

The Old Acid Pit is a leachate pit that was used for the disposal of chemical-plating wastes, electroplating wastes, and Otto fuel between 1960 and 1973. The leachate pit was 3 to 5 feet deep, approximately 10 by 15 feet, and lined with gravel. There is no record that an impermeable barrier or liner was placed beneath the gravel. Approximately 250 cubic yards of soil were removed from the Old Acid Pit in a time-critical removal action in 1992, and the trenches were subsequently filled to grade with uncontaminated excavated material and clean backfill (Navy, 1981, 1996; NEESA, 1983; URS, 1991)

4.3.21.2 Potential for PFAS Storage, Use, or Release

Approximately 1,500 to 2,000 gallons of high pH, high-metals-concentration-plating waste were transported to the site twice yearly from Naval Undersea Warfare Engineering Station (NUWES) Keyport and were disposed of quarterly (NEESA, 1983a). In 1970 a minimum of two truckloads of an undetermined quantity of Otto fuel were disposed of at this site. Use of PFAS-containing materials may have occurred in the industrial operations at NUWES Keyport at the Former Metal Plating Shop located within NUWES Keyport's OU 2/Area 8. In September 2018, eight PFAS were detected, including PFOA and PFOS, in groundwater samples collected near OU 2/Area 8 at NBK Keyport.

4.3.21.3 Migration Pathway and Exposure Assessment

Groundwater

The ground surface at and around the Old Acid Pit is completely unpaved. If AFFF or other PFAS-containing materials were disposed of at the Old Acid Pit, PFAS would have been released directly into the subsurface and

could have potentially infiltrated through the till layer into the Shallow aquifer. Depth to groundwater at this location is approximately 120 feet bgs.

The dominant groundwater flow in the Shallow aquifer at the Old Acid Pit is assumed to be to the north, based on water level measurements collected as part of the LongTerm Monitoring program in progress since the 1990s (**Figure 4-20**). Additionally, given the known heterogeneity of the saturated subsurface in this vicinity, it is possible that some groundwater flows northwesterly toward Hood Canal.

Based on the possibility that some component of the Shallow aquifer groundwater flow direction is to the northwest, and the location in the southern portion of the installation, at least 10 off-Base water supply wells and two on-Base water supply wells are downgradient of the Old Acid Pit[26] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at the Old Acid Pit; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the Old Acid Pit, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

If AFFF or other PFAS-containing materials were disposed of at the Old Acid Pit, AFFF and PFAS would have been in direct contact with the subsurface, potentially impacting soil. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at the Old Acid Pit; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Old Acid Pit, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The topography of the Old Acid Pit area slopes to the southeast towards Fire Trail Road (**Figure 4-20**). There are no developed surface water drainage features near the Old Acid Pit; therefore, potential migration of PFAS to surface water is low. However, discharge of shallow groundwater to Hood Canal is likely.

Workers and visitors/trespassers are present at the Old Acid Pit; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the Old Acid Pit, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.21.4 Recommendation

Based on the disposal of potential PFAS-containing materials from NBK Keyport Former Metal Plating Shop at the Old Acid Pit, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the Old Acid Pit, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

[26] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns..

4.3.22 Incinerator Storage Area (Site 16)

4.3.22.1 Description and Operational History

The Incinerator Storage Area is located in the southern portion of the Base at the north side of the industrial area, north of Seadevil Road (**Figure 4-11**). The Incinerator Storage Area is surrounded by a forested area to the north and industrial buildings to the south.

The Incinerator Storage Area was used as a drum holding area until the contents of the drums could be incinerated. Storage of drums began in about 1970 and was shut down in 1983 with removal from the site in 1987 (B&V, 1991). The Incinerator Storage Area currently operates as a vehicle impound lot.

4.3.22.2 Potential for PFAS Storage, Use, or Release

Drums of wastewater containing Otto fuel, TNT, RDX, and waste solvents were stored at the Incinerator Storage Area until their contents could be incinerated. Small spills (less than 10 gallons) reportedly occurred at the site, and open drums occasionally overflowed onto the ground during heavy rain (Navy, 1994).

The IWTP Operators stated that remnants from two car fires where AFFF was used were stored at the Incinerator Storage Area (IWTP Operators, 2019, pers. comm.). The VSI conducted on April 24, 2019, confirmed the presence of two burned vehicles at the Incinerator Storage Area.

4.3.22.3 Migration Pathway and Exposure Assessment

Groundwater

The ground surface at the Incinerator Storage Area is unpaved (**Figure 4-11**). If AFFF or other PFAS-containing materials were spilled at the storage area or were released to the ground from residual runoff from burned vehicles, AFFF or PFAS would have been released directly to the surrounding unpaved surfaces and could have potentially infiltrated through the till layer into the Shallow aquifer. Shallow aquifer groundwater flow at the Incinerator Storage Area is assumed to mimic topography and flow to the southeast. Depth to groundwater at this location is not known due to a lack of groundwater monitoring wells in the immediate vicinity.

Based on the assumed Shallow aquifer groundwater flow direction (southeast) and the location in the southeastern portion of the installation, at least 12 water supply wells have been identified downgradient of the Incinerator Storage Area[27] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at the Incinerator Storage Area and workers, visitors/trespassers, recreators, and residents are present within 1 mile. If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. If additional evaluation identifies impacted groundwater at the Incinerator Storage Area, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

If AFFF or other PFAS-containing materials were spilled at the Incinerator Storage Area or were released to the ground from residual runoff from burned vehicles, AFFF and PFAS could have been in released or spilled onto surrounding unpaved areas, potentially impacting soil. Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

[27] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

Workers and visitors/trespassers are present at the Incinerator Storage Area and workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Incinerator Storage Area, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at the Incinerator Storage Area slopes to the southwest; however, the ground surface in the northern portion of the area is designed to direct surface water towards an unpaved drainage along Seadevil Road (**Figure 4-11**). The ground surface in the southern portion of the area directs overland flow to the south down a moderately steep embankment towards Sculpin Road (**Figure 4-11**).

Workers and visitors/trespassers are present at the Incinerator Storage Area and workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the Incinerator Storage Area, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.22.4 Recommendation

Because remnants from two car fires, where AFFF was used, are currently stored at the Incinerator Storage Area, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at the Incinerator Storage Area, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.23 Building 1014

4.3.23.1 Description and Operational History

Building 1014 is located in the southern portion of the Base in the Public Works Industrial Area on Scorpion Avenue (**Figure 4-11**). Building 1014 is used to maintain heavy equipment on NBK Bangor. Building 1014 is surrounded by parking lots and industrial buildings.

4.3.23.2 Potential for PFAS Storage, Use, or Release

An interview with the Fire Protection Specialist stated that fire trucks have historically and currently been taken to the Building 1014 for maintenance and cleaning (Fire Protection Specialist, 2019, pers. comm.). Review of historic Google Imagery shows a fire truck parked in front of Building 1014 (Google Earth, 2019).

4.3.23.3 Migration Pathway and Exposure Assessment

Groundwater

The ground surface surrounding Building 1014 is paved with asphalt and concrete. The slope of the paved surfaces directs overland flow to a forested area to the southwest (**Figure 4-11**). Any liquids, including AFFF, released could have infiltrated in unpaved areas and could have potentially infiltrated through the till layer to the Shallow aquifer at this location. Additionally, any cracks or joints in paved surfaces could provide an alternate pathway to groundwater. Shallow aquifer groundwater flow at Building 1014 is assumed to mimic topography and flow to the southeast. Water levels measured at Shallow aquifer wells near Building 1014 indicate that the depth to groundwaterat this location is between 30 and 35 ft bgs (Sealaska, 2018).

Based on the assumed Shallow aquifer groundwater flow direction (southeast) and the location in the southeastern portion of the installation, at least 4 water supply wells have been identified downgradient of Building 1014 (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and/or Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for

PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

Workers and visitors/trespassers are present at Building 1014, visitors/trespassers, recreators, and residents are present within 1 mile. The depth to water is greater than 15 feet bgs; therefore construction workers are not likely to be exposed to impacted groundwater.

Soil and Air

If AFFF or other PFAS-containing materials were spilled at Building 1014, PFAS could have leaked through cracks or joints in the paved surfaces into the soil at Building 1014. Additionally, surface runoff of AFFF to the forested area to southwest could provide an alternate pathway to soil (**Figure 4-11**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil.

Workers and visitors/trespassers are present at Building 1014 and workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at Building 1014, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The overall topography at Building 1014 is generally flat; however, the paved surface is designed to direct surface water toward culverts west of Building 1014 and toward an unpaved, forested area to the southwest (**Figure 4-11**).

Workers and visitors/trespassers are present at the Building 1014, and workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at Building 1014, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.23.4 Recommendation

Based on the washing and/or maintenance of fire trucks that occurred at Building 1014 further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at Building 1014, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.24 Building 1460

4.3.24.1 Description and Operational History

Building 1460 is located in the southern portion of the Base directly east of Building 1300 and Building 1301, on the corner of Silversides Road and Scorpion Avenue (**Figure 4-5**). Building 1460 is used as a recycling facility. To the north is a heavily forested area and to the south are industrial buildings.

4.3.24.2 Potential for PFAS Storage, Use, or Release

During an interview with a Fire Lieutenant at Jackson Park Housing Complex, the Lieutenant stated that historically, empty AFFF containers used to fill fire trucks at the Jackson Park Fire Station would be taken to the recycling facility at NBK Bangor for disposal (Fire Lieutenant, 2018).

The IWTP operators stated that the burned vehicles from the 2001 car fire, where AFFF was used, was removed from the scene and stored at the Recycling Center parking lot for a number of years. They were eventually moved to their current location at the Incinerator Storage Area, currently operating as an impoundment lot (IWTP Operators, 2019, pers. comm.).

4.3.24.3 Migration Pathway and Exposure Assessment

Groundwater

Currently, the area adjacent to the Recycling Facility is paved with asphalt and concrete and has areas of gravel. The slope of the paved surfaces directs overland flow to a forested area to the southwest (**Figure 4-5**). The date

when this area was paved could not be confirmed. Any liquids, including AFFF, released could have infiltrated in unpaved areas and could have potentially leached into the Shallow aquifer at this location. Additionally, any cracks or joints in paved surfaces could provide an alternate pathway to groundwater. Shallow aquifer groundwater flow at Building 1460 is assumed to mimic topography and flow to the southeast (**Figure 4-5**). Depth to groundwater at this location is not known due to a lack of groundwater monitoring wells in the immediate vicinity.

Based on the assumed Shallow aquifer groundwater flow direction (southeast) and the location in the southeastern portion of the installation, at least 20 off-Base water supply wells and one on-Base supply well have been identified downgradient of Building 1460[28] (**Figure 4-1**). As stated in **Section 2.3.2**, several wells could not be mapped due to lack of information; therefore, the exact number of downgradient water supply wells in unknown. As described in **Section 2.3.2**, private and public wells in this area are likely screened within the Shallow, Sea-level, and Deep aquifers. Public and private wells screened within the unconfined Shallow aquifer present a potential exposure pathway for PFAS. Public and private wells screened within the confined Sea-level and Deep aquifers are not likely in hydraulic communication with the Shallow aquifer due to the Upper confining unit that overlies the Sea-level aquifer.

If the depth to water is less than 15 feet bgs, construction workers could be exposed to impacted groundwater. Workers and visitors/trespassers are present at Building 1460; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted groundwater at Building 1460, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Soil and Air

If AFFF was spilled during recycling center activities, PFAS could have leaked through cracks or joints in the paved surfaces into the soil at Building 1460. Additionally, surface runoff of AFFF to the forested area to southwest could provide an alternate pathway to soil (**Figure 4-5**). Construction or other ground-disturbing activities could result in potential worker exposure to impacted dust or soil. Workers and visitors/trespassers are present at Building 1460; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted soil at the Recycling Facility, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

Sediment and Surface Water

The topography at Building 1460 has a gently slope to the southeast towards a topographically low forested area to the southeast (**Figure 4-5**). During heavy precipitation events, these areas drain to the south of Silversides Road through a series of culverts (**Figure 4-5**). Therefore, potential migration of PFAS to surface water is low.

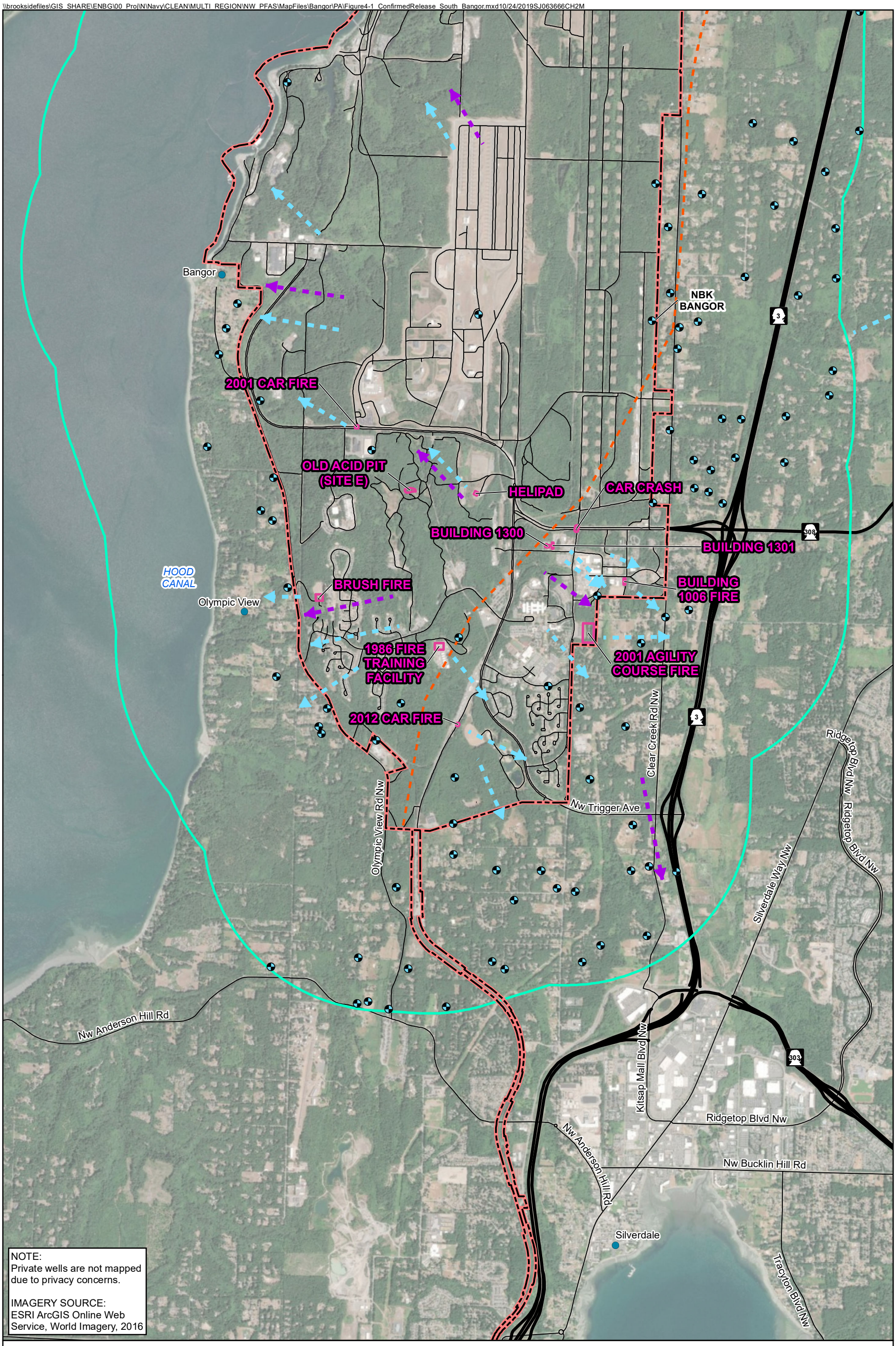
Workers and visitors/trespassers are present at Building 1460; workers, visitors/trespassers, recreators, and residents are present within 1 mile. If additional evaluation identifies impacted sediment and surface water at the Recycling Facility, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

4.3.24.4 Recommendation

Because handling and disposal of AFFF containers was conducted at this building and because remnants of a car fire, where AFFF was used, were stored at Building 1460, further investigation is recommended as part of an SI. If the SI identifies impacted groundwater, soil, sediment, or surface water at Building 1460, an assessment will be conducted to determine if the exposure pathway is complete for identified receptors.

[28] Figures show public water supply wells only. Private wells are not mapped due to privacy concerns.

\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-1_ConfirmedRelease_South_Bangor.mxd10/24/2019SJ063666CH2M



LEGEND

- City
- Drinking Water Well
- Other Major Road
- Secondary Road
- Local Road
- Confirmed AFFF Release Areas
- Shallow Aquifer Groundwater Divide
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- 1 Mile Installation Boundary Buffer
- Installation Boundary

Figure 4-1
Confirmed AFFF Releases: South - NBK Bangor
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

0 0.25 0.5 Miles
1 inch = 0.5 miles

FOUO

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\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-2_ConfirmedRelease_North_Bangor.mxd10/24/2019SJ063666CH2M

NOTE:
Private wells are not mapped due to privacy concerns.

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

HOOD CANAL

Pioneer Way Nw

Nw Pioneer Hill Rd

SITE A
BURN AREA

Cattail Lake

Nw Finn Hill Rd

Clear Creek Rd Nw

HOOD CANAL

BUILDING 7030

Delta Pier

3

LEGEND

- City
- Drinking Water Well
- Other Major Road
- Secondary Road
- Local Road
- Confirmed AFFF Release Areas
- Shallow Aquifer Groundwater Divide
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- 1 Mile Installation Boundary Buffer
- Installation Boundary

Figure 4-2
Confirmed AFFF Releases: North - NBK Bangor
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

0 0.25 0.5 Miles
1 inch = 0.5 miles

FOUO

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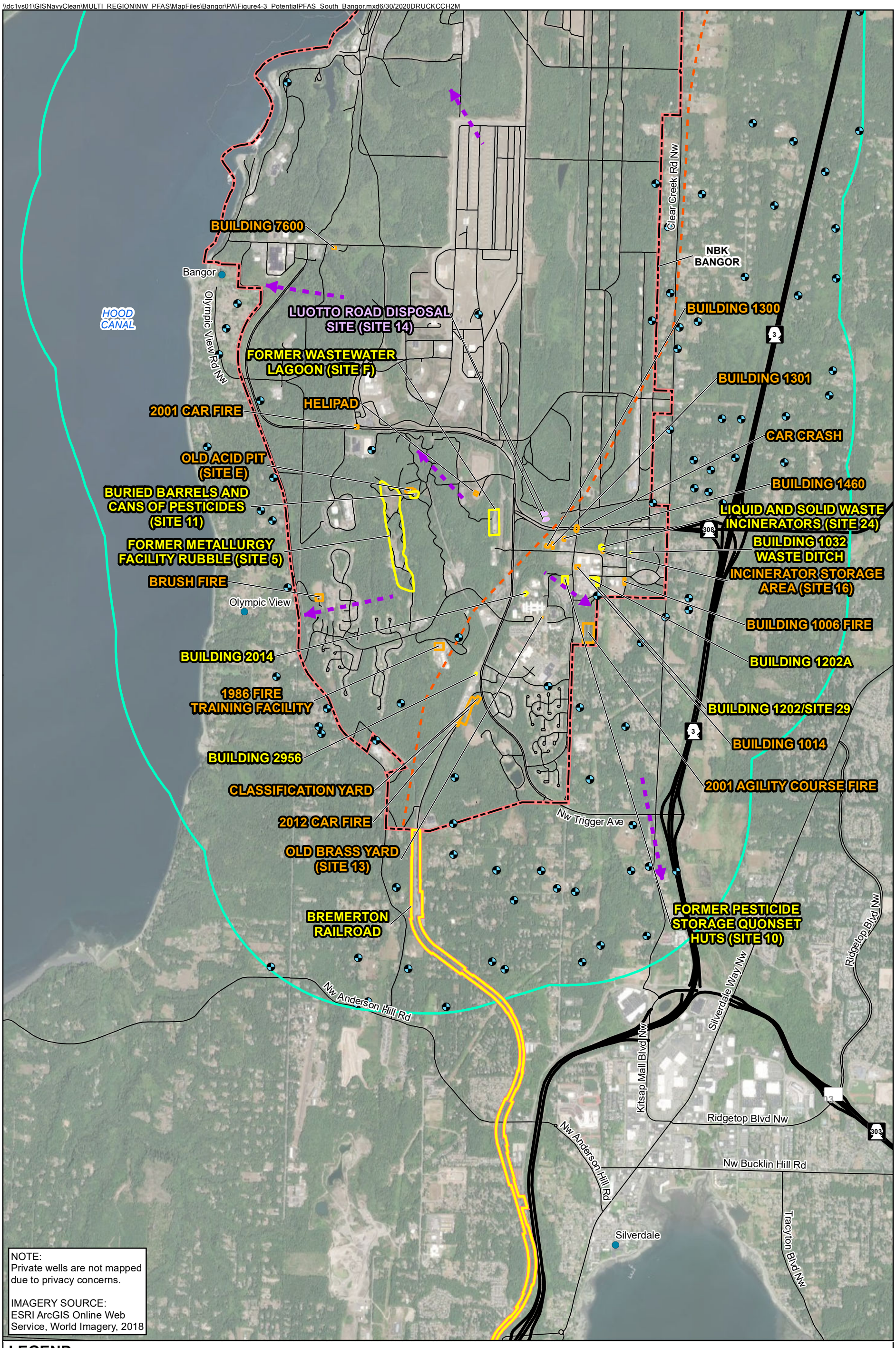
\\dc1vs01\GISNavyClean\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-3_PotentialPFAS_South_Bangor.mxd6/30/2020DRUCKCCH2M



LEGEND

- City
- Drinking Water Well
- Other Major Road
- Secondary Road
- Local Road
- Shallow Aquifer Groundwater Divide
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Potential PFAS Source Area
- Potential PFAS Source Area - Recommend for No Further Action
- No Further Action Recommended
- 1 Mile Installation Boundary Buffer
- Installation Boundary

Figure 4-3
Areas Investigated: South - NBK Bangor
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

0 0.25 0.5 Miles
1 inch = 0.5 mile

FOUO

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\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-4_PotentialPFAS_North_Bangor.mxd10/24/2019SJ063666CH2M

NOTE:
Private wells are not mapped due to privacy concerns.

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

HOOD CANAL

Pioneer Way Nw

Nw Pioneer Hill Rd

OLD PAINT CAN AND DRUM DISPOSAL SITE (SITE 7)

OLD PAINT CAN AND DRUM DISPOSAL SITE (SITE 22)

FLORAL POINT (SITE B)

Cattail Lake

BURN AREA (SITE A)

DEBRIS AREA 1 (SITE A)

Nw Finn Hill Rd

DEBRIS AREA 2 (SITE A)

EAST-ORDNANCE WASTEWATER DISPOSAL AREA (SITE C)

DUNNAGE CANYON (SITE 12)

BUILDING 7030

Delta Pier

Clear Creek Rd Nw

NBK BANGOR

3

HOOD CANAL

LEGEND

- City
- Drinking Water Well
- Other Major Road
- Secondary Road
- Local Road
- Shallow Aquifer Groundwater Divide
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Potential PFAS Source Area
- No Further Action Recommended
- 1 Mile Installation Boundary Buffer
- Installation Boundary

Figure 4-4
Areas Investigated: North - NBK Bangor
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

0 0.25 0.5 Miles

1 inch = 0.5 mile

FOUO

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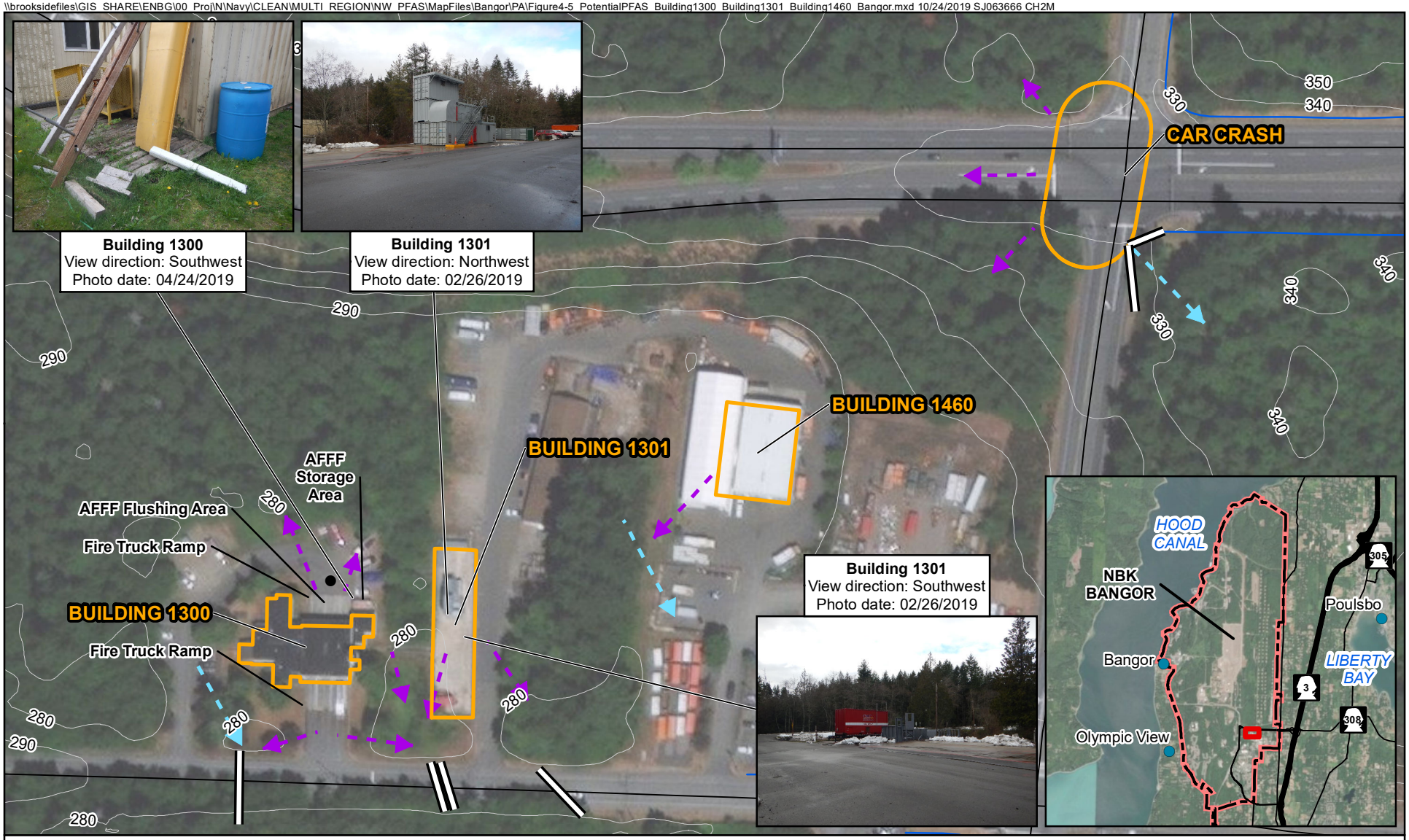
\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-5_PotentialPFAS_Building1300_Building1301_Building1460_Bangor.mxd 10/24/2019 SJ063666 CH2M



LEGEND

- Stormwater Catch Basin
- Culvert
- Surface Waterbodies
- 10' Contour
- Local Road
- Potential PFAS Source Area
- Anticipated Upper Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

FOUO

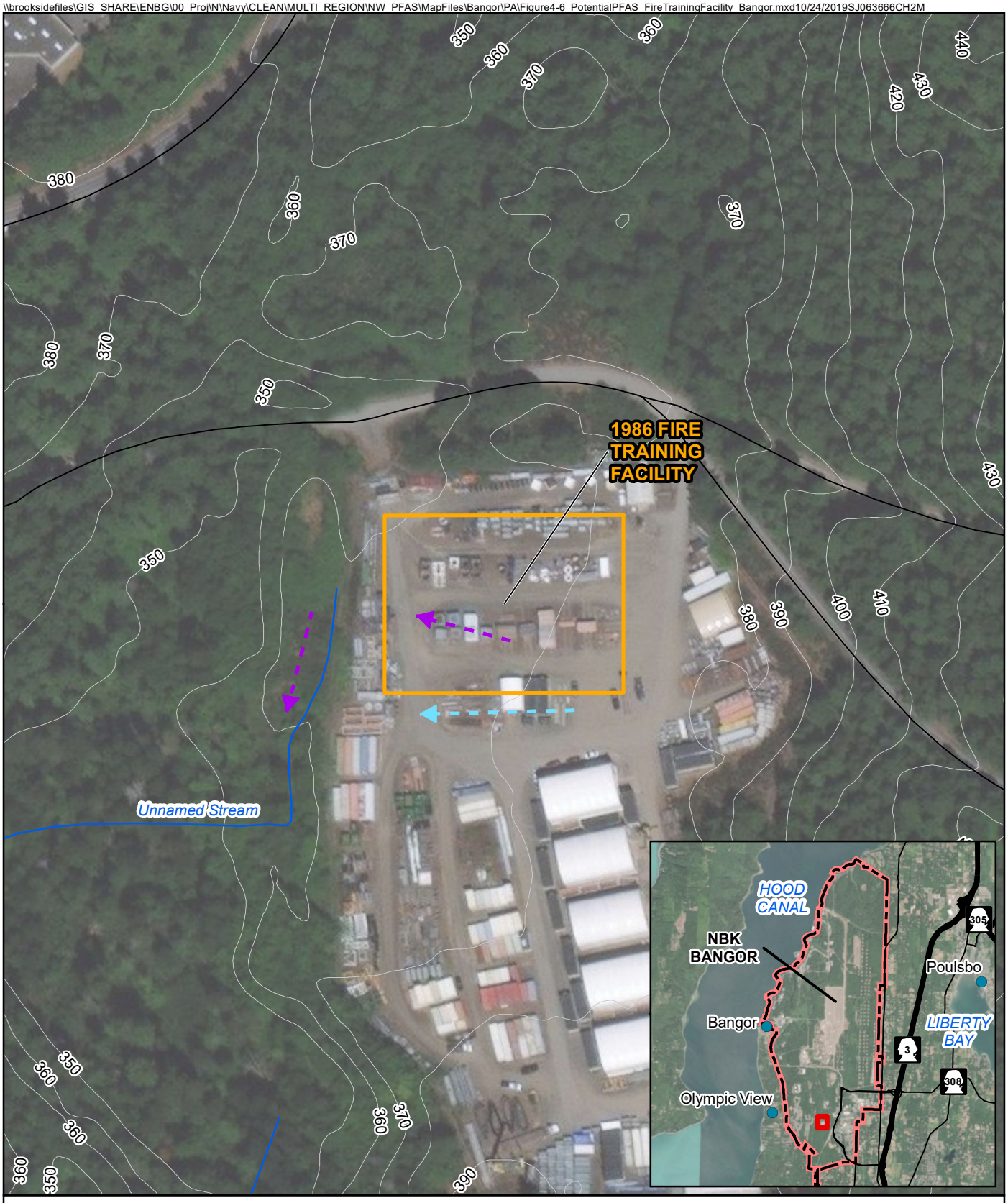
0 75 150 Feet

1 inch = 150 feet

N

Figure 4-5
Potential PFAS Source Area: Building 1300, Car Crash, Building 1301 and Building 1460
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-6_PotentialPFAS_FireTrainingFacility_Bangor.mxd10/24/2019SJ063666CH2M



LEGEND

- Surface Waterbodies
- 10' Contour
- Local Road
- Anticipated Upper Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Potential PFAS Source Area

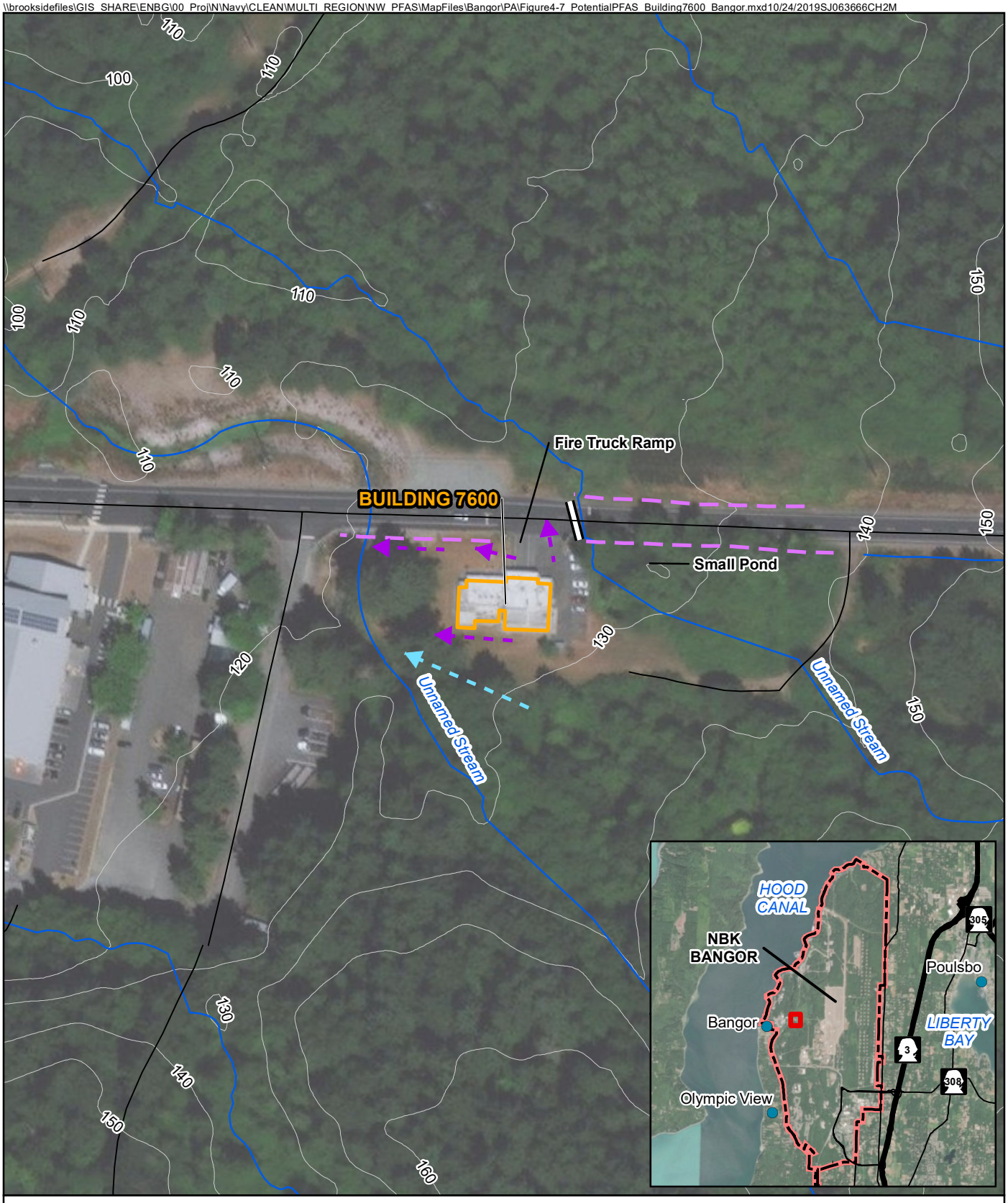
FOUO

Figure 4-6
Potential PFAS Source Area: 1986 Fire Training Facility
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 75 150 Feet
1 inch = 150 feet

N



LEGEND

- Culvert
- Unpaved Ditch
- Surface Waterbodies
- 10' Contour
- Local Road
- Potential PFAS Source Area
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

FOUO

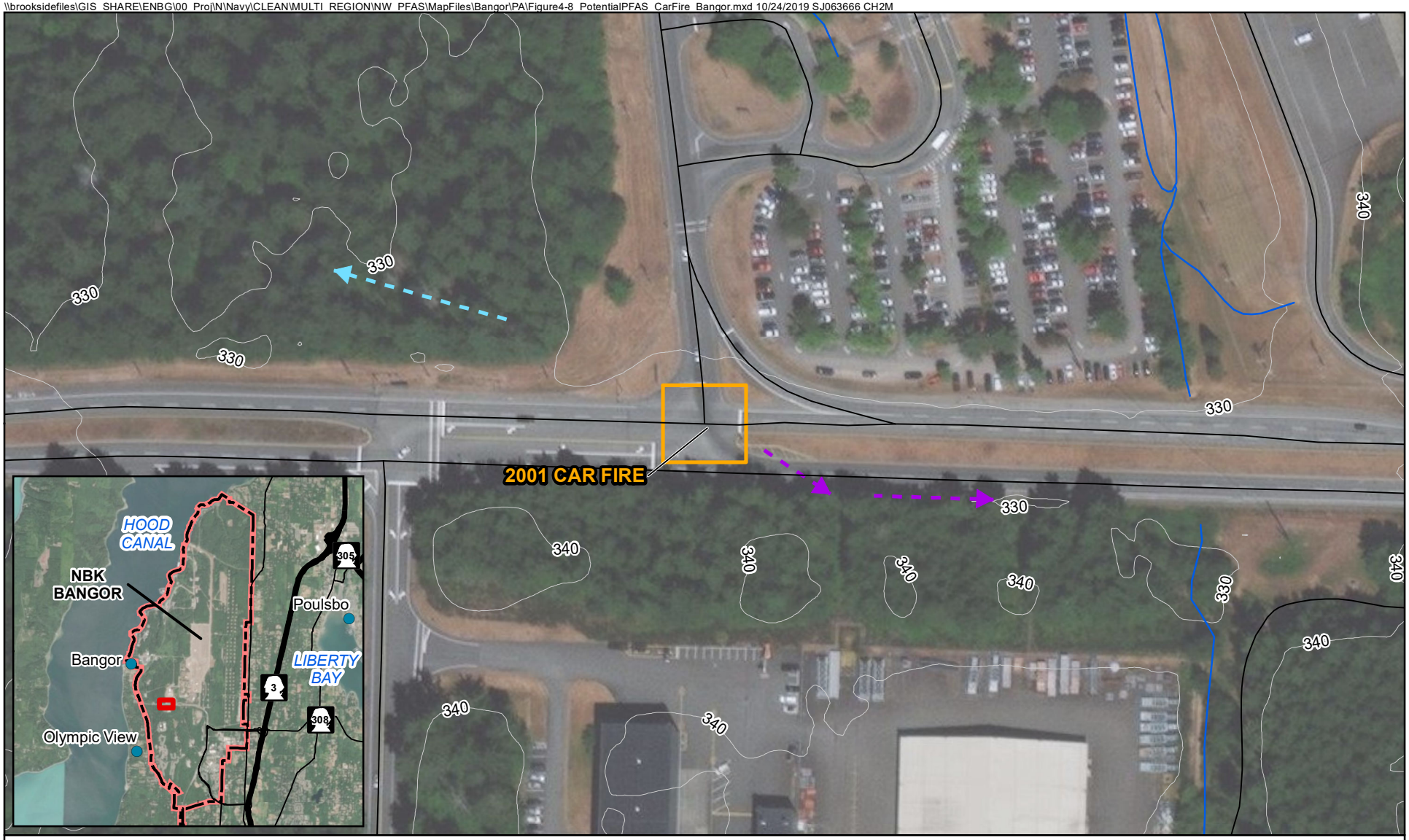
Figure 4-7
Potential PFAS Source Area: Building 7600
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 75 150 Feet
1 inch = 150 feet

N

\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-8_PotentialPFAS_CarFire_Bangor.mxd 10/24/2019 SJ063666 CH2M



LEGEND

- Surface Waterbodies
- 10' Contour
- Local Road
- Potential PFAS Source Area
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

Figure 4-8
Potential PFAS Source Area: Car Fire
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

FOUO

0 75 150 Feet
1 inch = 150 feet

N

LEGEND

- Discharge
- Culvert
- Surface Waterbodies
- 10' Contour
- Local Road
- Potential PFAS Source Area
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Installation Boundary

FOUO

Figure 4-9
Potential PFAS Source Area: 2001 Agility Course Fire
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 75 150 Feet
1 inch = 200 feet

N

\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-10_PotentialPFAS_BrushFire_Bangor.mxd10/24/2019SJ063666CH2M

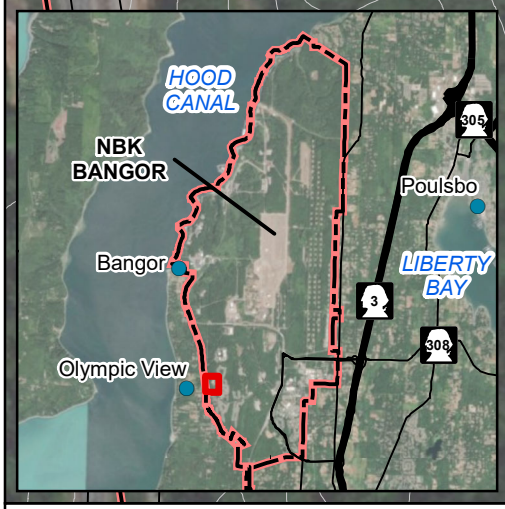
Brush Fire
View direction: Southwest
Photo date: 02/26/2019

Playfields

Former Playground

BRUSH FIRE

On-Base Housing



LEGEND

- Surface Waterbodies
- Fence
- 10' Contour
- Local Road
- Potential PFAS Source Area
- Installation Boundary
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

FOUO

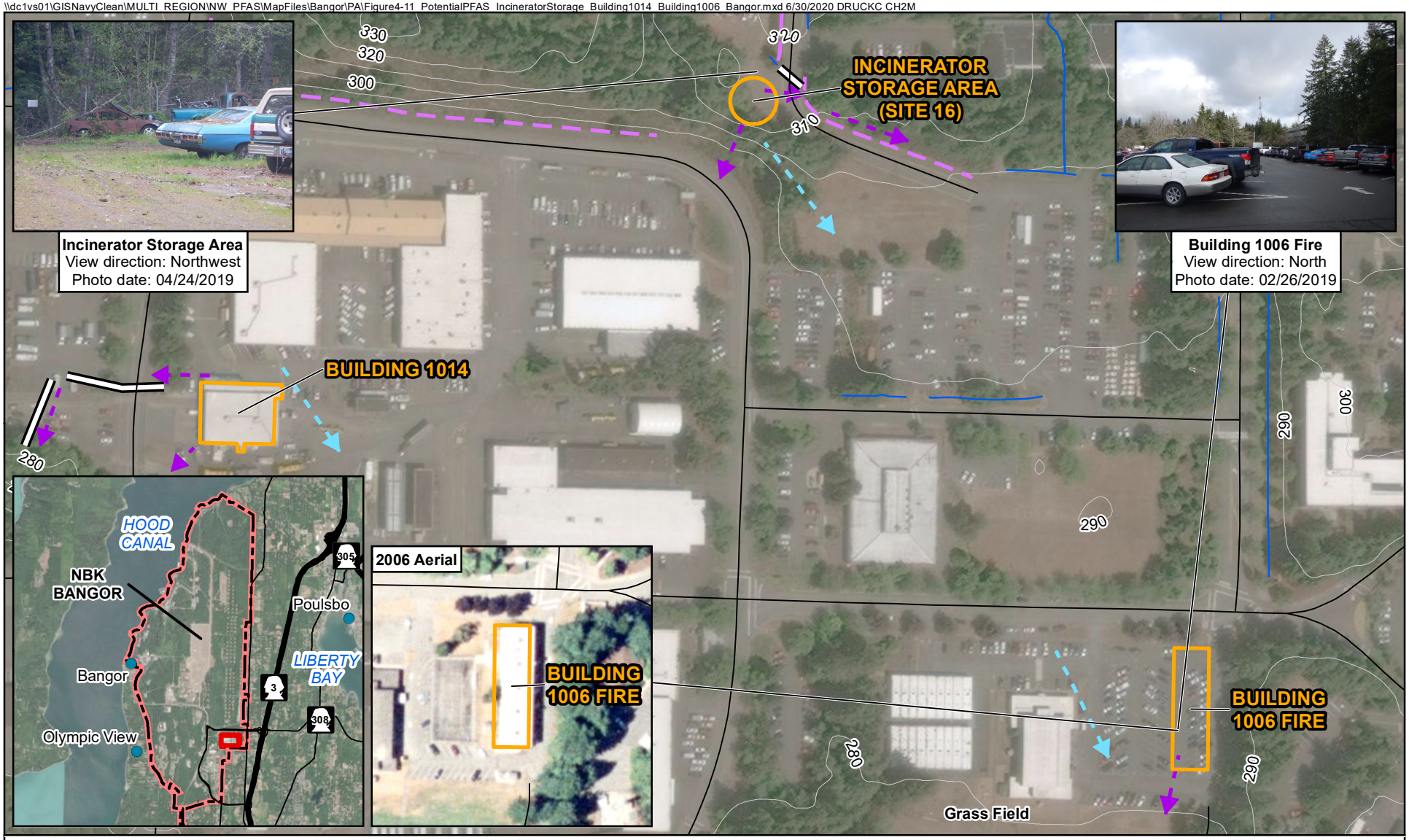
IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 75 150 Feet
1 inch = 150 feet

N

Figure 4-10
Potential PFAS Source Area: Brush Fire
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

\\dc1vs01\GISNavyClean\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-11_PotentialPFAS_IncineratorStorage_Building1014_Building1006_Bangor.mxd 6/30/2020 DRUCKC CH2M



LEGEND

- Culvert
- Unpaved Ditch
- Surface Waterbodies
- 10' Contour
- Local Road
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Potential PFAS Source Area

Figure 4-11
Potential PFAS Source Area: Incinerator Storage, Building 1014, Building 1006 Fire
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

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

FOUO

0 100 200 Feet
1 inch = 200 feet

N

\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-12_PotentialPFAS_Helipad_Bangor.mxd10/24/2019SJ063666CH2M

Helipad
View direction: East-Southeast
Photo date: 04/24/2019

Helipad
View direction: West-Northwest
Photo date: 04/24/2019

HELIPAD

Parking Lot

Building 6060

360

370

350

340

330

320

310

LEGEND

- Surface Waterbodies
- 10' Contour
- Local Road
- Potential PFAS Source Area
- Anticipated Upper Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

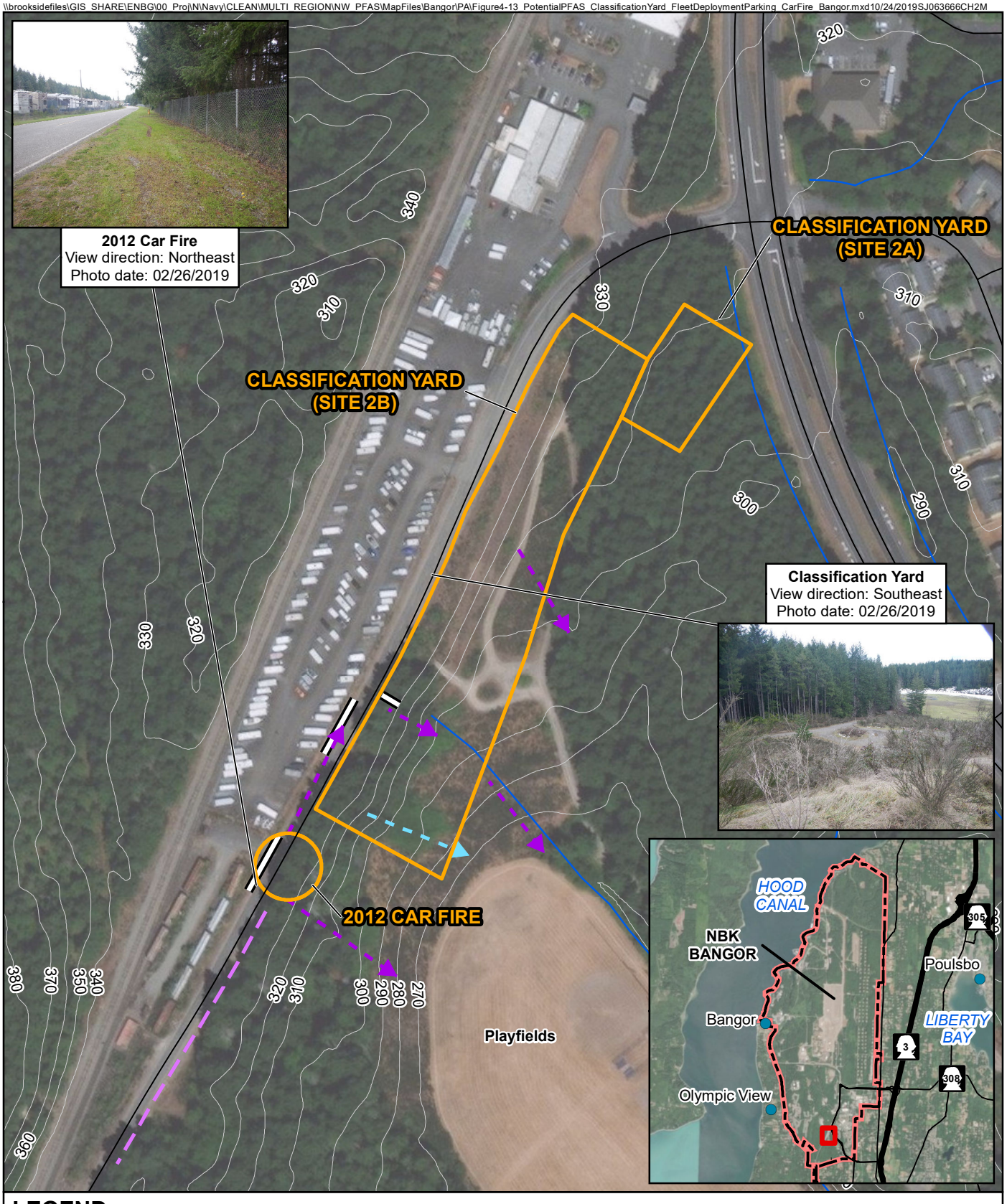
FOUO

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 75 150 Feet
1 inch = 150 feet

N

Figure 4-12
Potential PFAS Source Area: Helipad
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington



LEGEND

- Culvert
- Unpaved Ditch
- Surface Waterbodies
- 10' Contour
- Local Road
- Potential PFAS Source Area
- Anticipated Upper Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

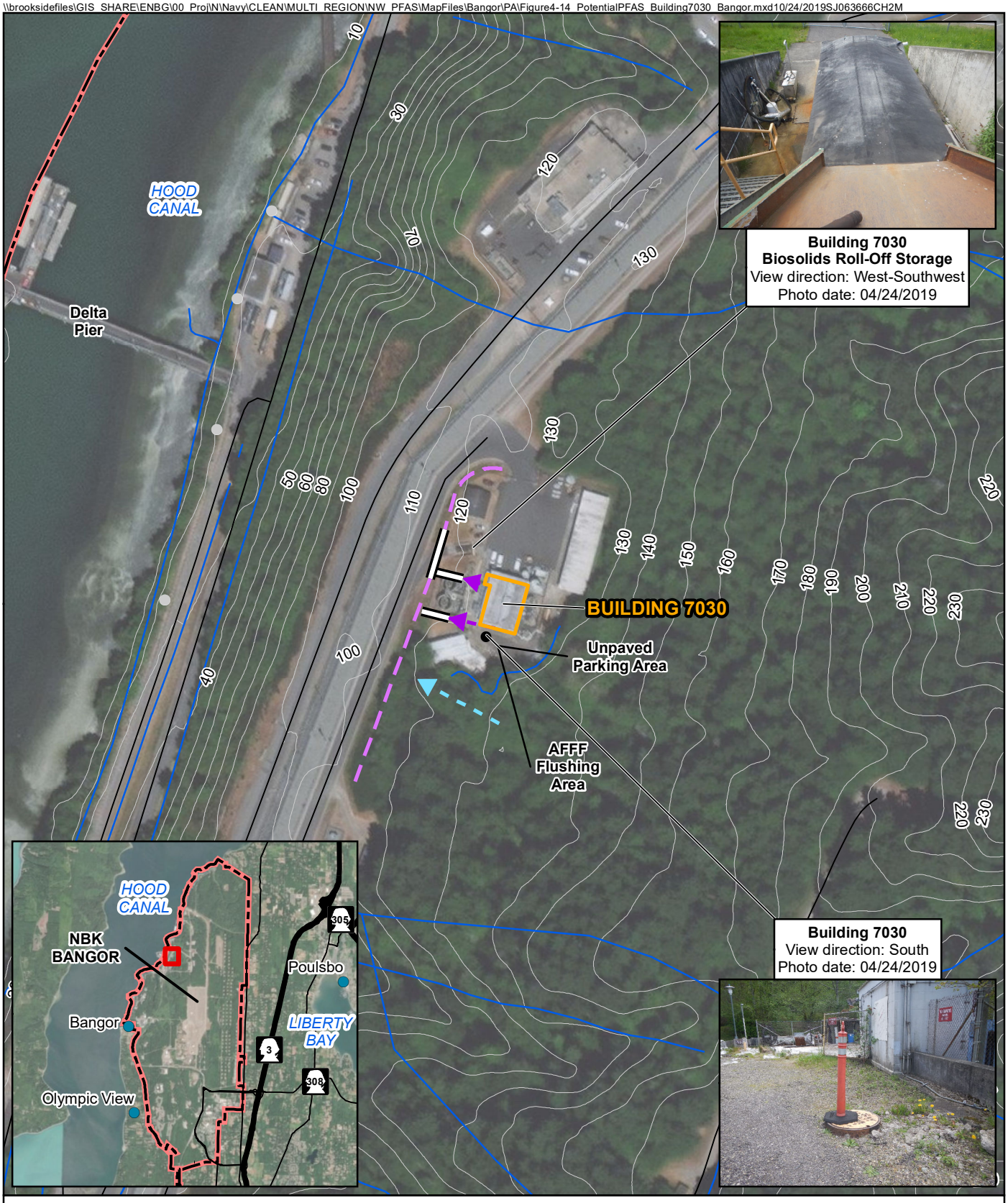
FOUO

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 100 200 Feet
1 inch = 200 feet

N

Figure 4-13
Potential PFAS Source Area: Car Fire and Classification Yard/Fleet Deployment Parking
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington



LEGEND

- Stormwater Catch Basin
- Discharge
- Culvert
- Unpaved Ditch
- Surface Waterbodies
- 10' Contour
- Local Road
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Potential PFAS Source Area
- Installation Boundary

Figure 4-14
Potential PFAS Source Area: Building 7030
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

FOUO

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 100 200 Feet
1 inch = 200 feet

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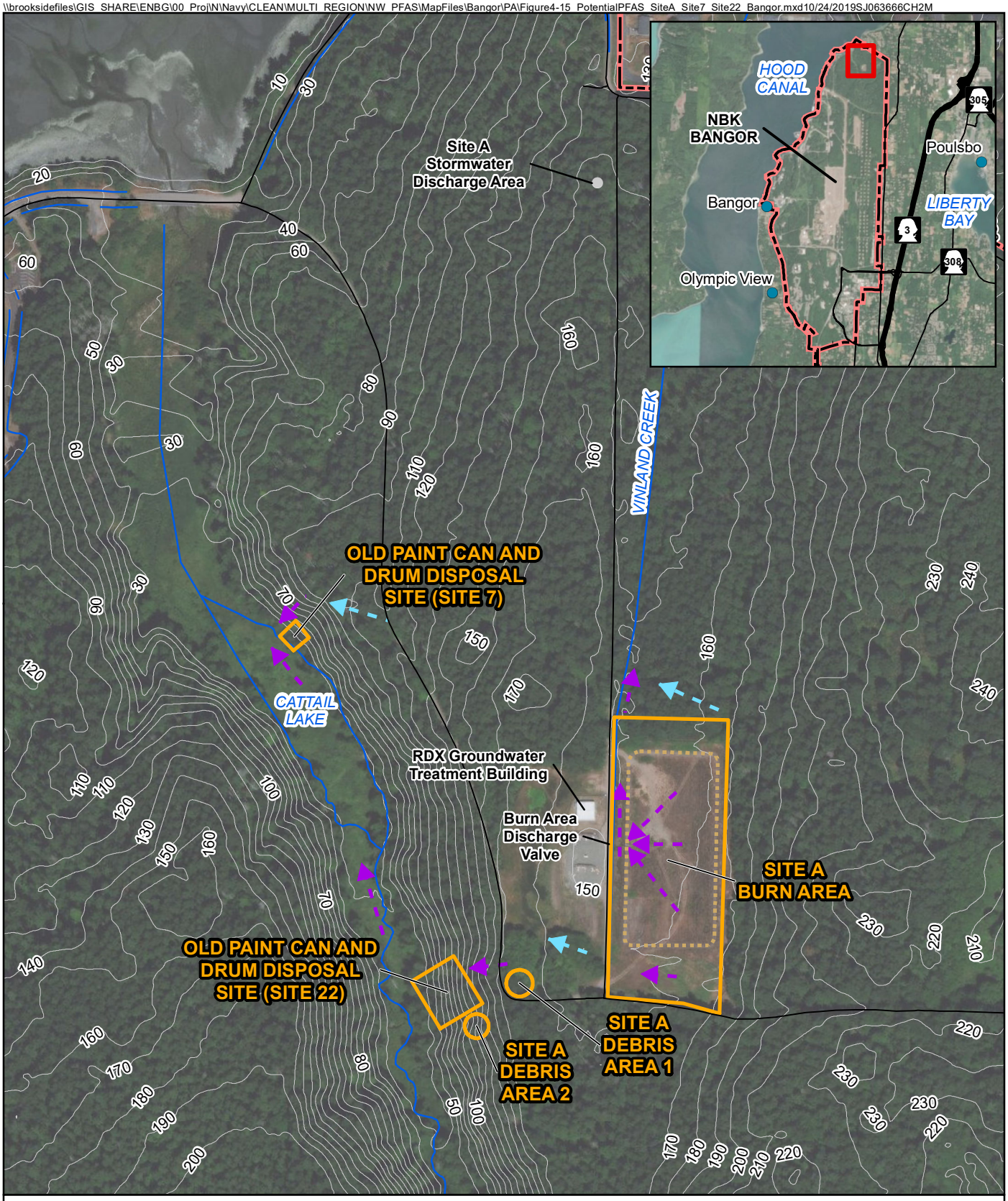


LEGEND

- Discharge
- Surface Waterbodies
- 10' Contour
- Local Road
- Earthen Berm
- Potential PFAS Source Area
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

FOUO

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 200 400 Feet
1 inch = 400 feet

N

Figure 4-15
Potential PFAS Source Area:
Site A, Site 7 and Site 22
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

LEGEND

- Discharge
- Surface Waterbodies
- 10' Contour
- Local Road
- Anticipated Upper Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Potential PFAS Source Area

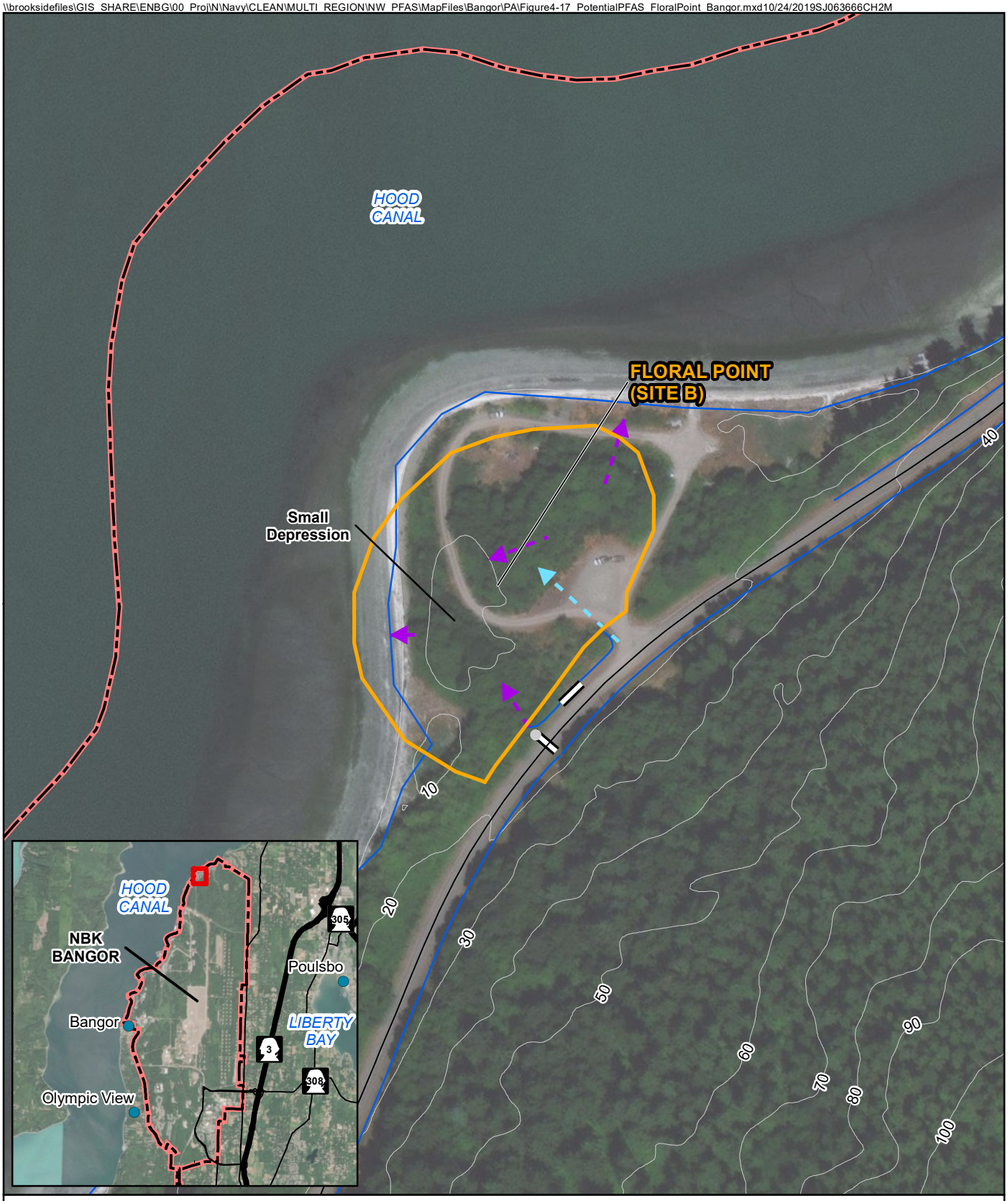
Figure 4-16
Potential PFAS Source Area: Dunnage Canyon
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

FOUO

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 100 200 Feet
1 inch = 200 feet

N



LEGEND

- Discharge
- Culvert
- Surface Waterbodies
- 10' Contour
- Local Road
- Potential PFAS Source Area
- Installation Boundary
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

FOUO

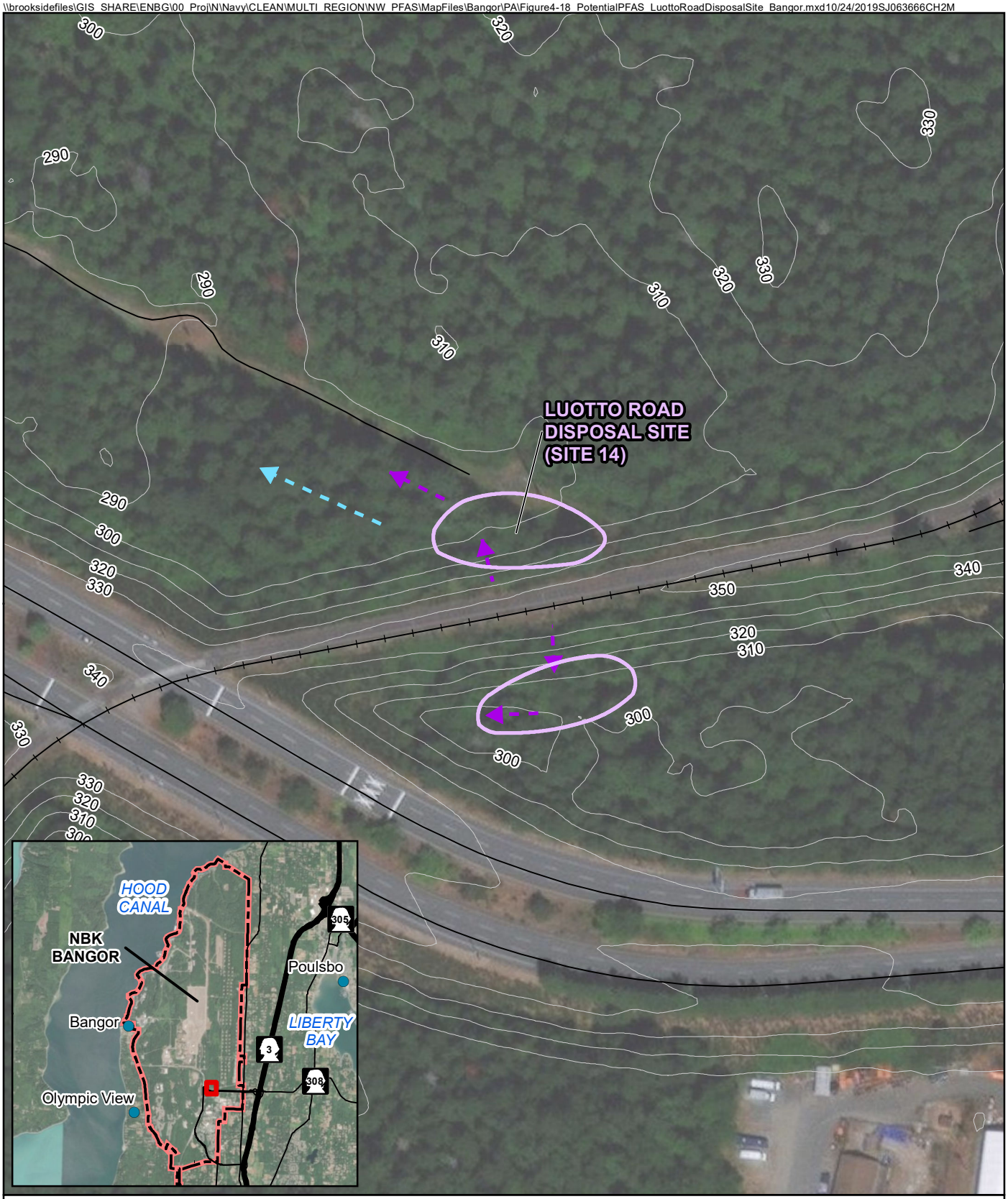
IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 100 200 Feet
1 inch = 200 feet

N

Figure 4-17
Potential PFAS Source Area: Floral Point
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-18_PotentialPFAS_LuottoRoadDisposalSite_Bangor.mxd10/24/2019SJ063666CH2M



LEGEND

- Surface Waterbodies
- 10' Contour
- Local Road
- Railroad
- Potential PFAS Source Area - Recommend for No Further Action
- Anticipated Upper Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

Figure 4-18
Potential PFAS Source Area: Luotto Road Disposal Site
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

FOUO

0 75 150 Feet
1 inch = 150 feet

N

\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-19_PotentialPFAS_OldBrassYard_Bangor.mxd 10/24/2019 SJ063666 CH2M

LEGEND

- Surface Waterbodies
- 10' Contour
- Local Road
- Potential PFAS Source Area
- Anticipated Shallow Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction

Figure 4-19
Potential PFAS Source Area: Old Brass Yard
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

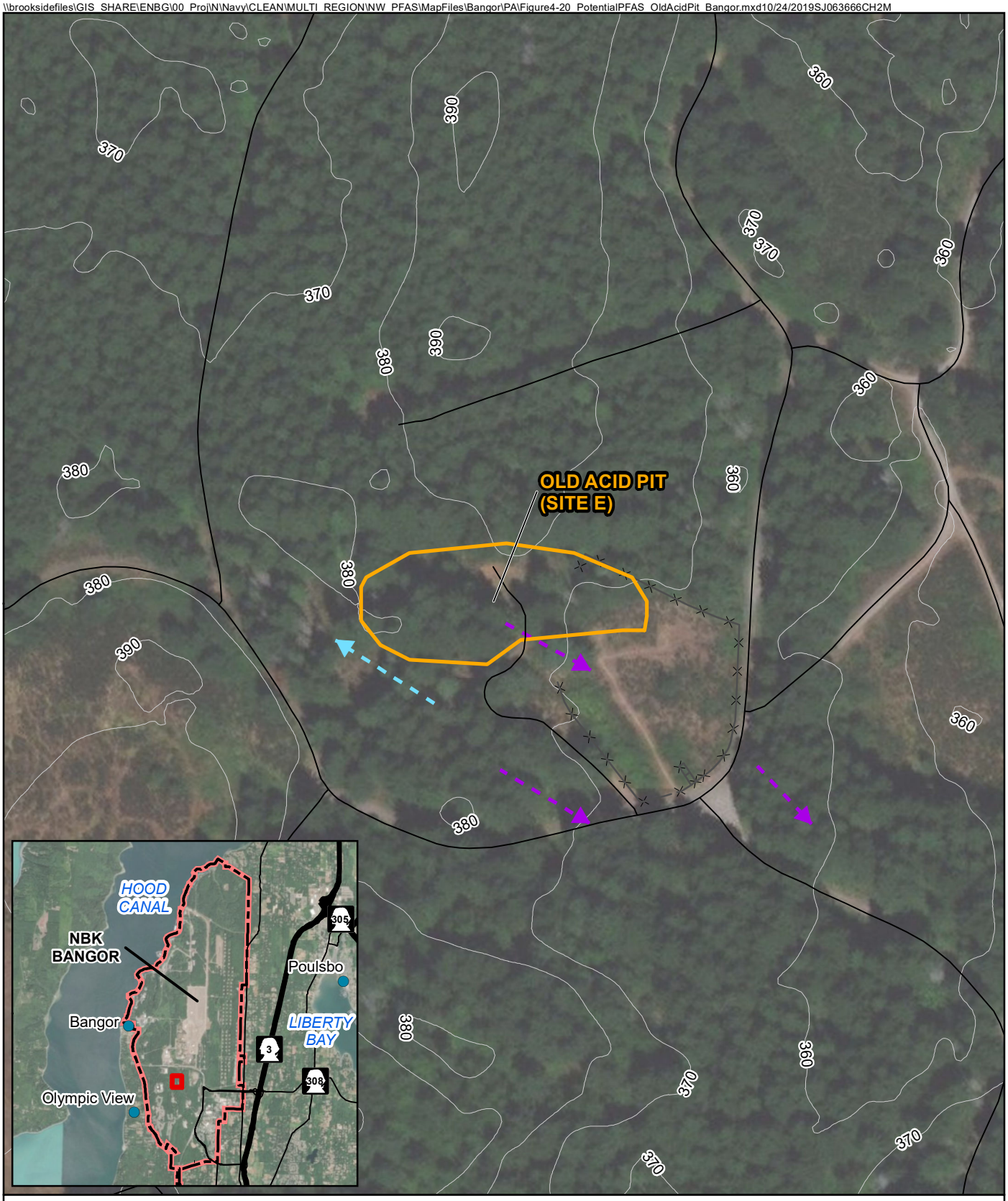
IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

FOUO

0 75 150 Feet
1 inch = 150 feet

N

\\brooksidefiles\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MULTI_REGION\NW_PFAS\MapFiles\Bangor\PA\Figure4-20_PotentialPFAS_OldAcidPit_Bangor.mxd10/24/2019SJ063666CH2M



LEGEND

- Surface Waterbodies
- 10' Contour
- Local Road
- Fence
- Anticipated Upper Aquifer Groundwater Flow Direction
- Anticipated Surface Water Flow Direction
- Potential PFAS Source Area

Figure 4-20
Potential PFAS Source Area: Old Acid Pit
Preliminary Assessment for PFAS
NBK Bangor, Silverdale, Washington

FOUO

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2016

0 75 150 Feet
1 inch = 150 feet

N

SECTION 5

Conclusions

This PA evaluated the potential for PFAS sources at NBK Bangor. Thirty-five areas were considered during the PA for PFAS at NBK Bangor. Based on the findings of this PA, 12 areas at NBK Bangor (**Table 4-1**) and the special area require no further action, as there is no evidence that PFAS containing materials, primarily AFFF, were used or released at these locations. If additional information becomes available that indicates the use or release of PFA-containing materials at these areas, the sites will be re-evaluated. Twenty-three potential PFAS source areas are recommended for additional investigation based on the potential for AFFF or PFAS-containing materials to have been stored, used, or released during Navy operations. Potential receptors and migration pathways for the sites with potential PFAS releases are discussed in **Section 4.1**. The recommended path forward and rationale for each location are provided in **Table 5-1**.

In accordance with DoD Instruction 4715.18 June 2009, incorporating change 2, 31 August, 2018, *Emerging Contaminants* (DoD, 2009), "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,N 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 (e.g., plating operations) that may have released PFAS.
>
> Based on recent Navy experience, sites at Naval and Marine Corps Air Stations, including outlying or auxiliary landing fields, or other applicable installations with potential repeated (for example, former firefighting training areas) or significant (such as, crashes) AFFF releases should be prioritized for investigation.

This PA has identified locations that meet the first or second 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. During the SI, if a release of PFAS-containing materials is confirmed, off-Base drinking water will be re-evaluated.

Table 5-1. Preliminary Assessment Report Summary and Findings

Preliminary Assessment for PFAS at NBK Bangor, Bremerton, Washington and Associated Special Areas

Areas Investigated	Rationale	Recommendation
Building 1301	• AFFF was sprayed into the woods at the west side of Building 1301 when flushing out equipment. • AFFF was used during fire training at this location.	Initiate site inspection
1986 Fire Training Facility	• AFFF was deployed during training in 1986 at the 1986 Fire Training Facility to put out oil fires.	Initiate site inspection
Building 1300	• Historically, fire trucks were washed with soap and water near the grassy area behind Building 1300, and the fire truck equipment would be flushed of AFFF behind the fire station by spraying water into the equipment, draining the flush water into the grassy area, or draining into a storm drain directly behind the apparatus bay. • As of the VSI on April 24, 2019, there is one 55-gallon drum stored on the grass beside the storage shed to the east of the Fire Station and there is approximately 35 gallons stored in the fire truck tank.	Initiate site inspection
Building 7600	• AFFF has the potential to be released by alternate fire trucks staged at Building 7600. • Operations at Building 7600 are unknown prior to 2018.	Initiate site inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

Preliminary Assessment for PFAS at NBK Bangor, Bremerton, Washington and Associated Special Areas

Areas Investigated	Rationale	Recommendation
2001 Car Fire (Intersection of Escolar Road Trigger Avenue)	• AFFF was deployed in emergency response activities at a car fire on-Base at the Intersection of Escolar Road and Trigger Avenue in 2001.	Initiate site inspection
Car Crash (Intersection of Trident Boulevard and Scorpion Avenue)	• AFFF was deployed in emergency response activities at a car crash on-Base at the Intersection of Trident Boulevard and Scorpion Avenue in 2001.	Initiate site inspection
2001 Agility Course Fire	• AFFF was deployed in emergency response activities at the agility course fire at the Marine Barracks in 2001.	Initiate site inspection
Brush Fire	• AFFF was deployed in emergency response activities at a brush fire at the end of Grampus Road between 2001 to 2005.	Initiate site inspection
Building 1006 Fire	• AFFF was deployed in emergency response activities at Building 1006 between 2001 to 2005.	Initiate site inspection
Helipad	• AFFF Emergency Response Training was frequently conducted at the helipad.	Initiate site inspection
2012 Car Fire	• AFFF was deployed in emergency response activities on the east side of Nautilus Avenue in 2012.	Initiate site inspection
Building 7030	• AFFF was trickled into the system via a manhole located outside of Building 7030. AFFF was flushed from a fire truck on the gravel located south of Building 7030.	Initiate site inspection
Site A	• Prior to 1981, AFFF was used in the flat open area at the north end of the Base, southeast of the wetland leading to Cattail Lake.	Initiate site inspection
Dunnage Canyon (Site 12)	• Dunnage from ships was burned and buried on site (NEESA, 1983a). It is unknown if AFFF was used to extinguish fires at this location. • Dunnage Canyon was used as a disposal site during the time that AFFF was used at NBK Bangor.	Initiate site inspection
Floral Point (Site B)	• A burn pit was located at Floral point in 1953, and trash was burned in the burn pit from 1963 through 1966 (NEESA, 1983a). It is unknown if AFFF was used to extinguish these fires. There is documented use of AFFF at the Base, which may have been disposed of at Floral Point. • Floral Point was used as a disposal site during the time that AFFF was used at NBK Bangor.	Initiate site inspection
Luotto Road Disposal Site (Site 14)	• The Luotto Road Disposal site was used for disposal prior to 1964. The contents of disposal include; old cans, barrels, and ammunition boxes.	No further action required
Classification Yard	• PFAS-containing material may have been disposed of at the Classification Yard. • The Classification Yard was used as a disposal site during the time that AFFF was used at NBK Bangor.	Initiate site inspection
Old Brass Yard (Site 13)	• Burning occurred at the Old Brass Yard, it is unknown if AFFF was used to extinguish these fires. • The Old Brass Yard was used as a disposal site during the time that AFFF was used at NBK Bangor.	Initiate site inspection
Old Paint Cans and Drum Disposal Site (Site 22)	• There is documented use of AFFF at the Base, which may have been disposed of at Site 22. • Site 22 was used as a disposal site during the time that AFFF was used at NBK Bangor	Initiate site inspection

Table 5-1. Preliminary Assessment Report Summary and Findings

Preliminary Assessment for PFAS at NBK Bangor, Bremerton, Washington and Associated Special Areas

Areas Investigated	Rationale	Recommendation
Old Paint Can and Drum Disposal Site (Site 7)	• There is documented use of AFFF at the Base, which may have been disposed of at Site 7. • Site 7 was used as a disposal site during the time that AFFF was used at NBK Bangor.	Initiate site inspection
Old Acid Pit (Site E)	• Approximately 1,500 to 2,000 gallons of high pH, high-metals-concentration-plating waste were transported to Site E twice yearly from NUWES Keyport and were disposed of quarterly. • Use of PFAS-containing materials may have occurred in the industrial operations at NUWES Keyport at the Former Metal Plating Shop located within NUWES Keyport's OU 2/Area 8. In September 2018, Eight PFAS were detected, including PFOA and PFOS, in groundwater samples collected near OU 2/Area 8. The storage location of the plating waste after transport to NBK Bangor and prior to disposal at Site E is unknown. • The Old Acid Pit was used as a disposal site during the time that AFFF was used at NBK Bangor.	Initiate site inspection
Incinerator Storage Area (Site 16)	• Site 16 currently operates as a vehicle impound lot and holds two cars that were known to have had AFFF deployed during emergency response.	Initiate site inspection
Building 1014	• The Fire Protection Specialist stated that fire trucks were taken to Building 1014 for cleaning and/or maintenance.	Initiate site inspection
Building 1460	• There is uncertainty whether handling and disposal of AFFF containers from other Bases could result in a PFAS release. • The short-term storage of vehicles that were sprayed with AFFF could have resulted in a PFAS release.	Initiate site inspection

SECTION 6

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Appendix A
Records Reviewed, Interview Contacts, and Area Coordinates

Appendix A-1
Summary of Records Reviewed

Appendix A-1. Records Reviewed

Author	Document Date	Document Type	Document Title	NIRIS Record No.
Pacific NW GeoReadiness Center	January 2018	Map Book	Jackson Park Housing Complex Naval Hospital Bremerton, Base Map Series, January 2018	N/A
Public Works Department	2/8/84	Report	Potential Hazardous Waste Site Preliminary Assessment, Site 101	N68095_000038
The Environmental Company	7/15/05	Report	Final Well Inventory Report, Jackson Park Housing Complex/Naval Hospital Bremerton	N68095_000053
Pacific NW GeoReadiness Center	1/1/18	Map Book	Naval Base Kitsap Bangor, Base Map Series, January 2018	N/A
Pacific NW GeoReadiness Center	1/1/18	Map Book	Naval Base Kitsap Bangor, Base Map Series, January 2018 - Reviewed	N/A
U.S.G.S.	8/20/98	Report	Geological Survey Letter to Bangor Naval Base 1998	N/A
HartCrowser	11/90-03/92	Scanned Maps	RDX Concentration Contour Map and Estimated Groundwater Capture Zone / Shallow Aquifer Water Table Elevation Contour Map	N/A
Unknown	3(15) - 7(14/15/24)/1998	Scanned Maps	Groundwater Well Locations, Bangor Naval Base	N/A
Engineering Field Activity, Northwest	5/8/95	Letter Correspondence	Bangor Naval Base Off Base and Private Wells, 1995	N/A
Western Division, Naval Facilities Engineering Command, Seattle Branch	1/1/81	Report	Bangor Naval Base Ordinance Burning Study	N/A
US Navy	Unknown	Report	Bangor Naval Base Information Sheet	N/A
Engineering Field Activity, Northwest	10/28/91	Report	Bangor Naval Base, OU5 Comments - Groundwater Wells and Hydrology	N/A
Unknown	Unknown	Document List	Bangor Naval Base, OU8 List of Documents	N/A
Patterson, Kenneth - Code 09E	5/25/95	Letter Correspondence	Building 1202 Cleaning Pit Investigation	N/A
Foster Wheeler	3/19/97	Scanned Maps	Groundwater Containment System Design	N/A
EPA/B&V Waste Science + Tech/EFA, NW/WA Dept. Eco	2/9/93	Report	Remedial Investigation of Site D at Naval Submarine Base Bangor, WA	N/A
US Navy	9/9/1994	Scanned Maps	Site 25 Well Iunvestigation, Bangor Naval Base	N/A
URS Consultants, Inc.	4/20/92	Report	Technical Memorandum Amendment to Work Plan OU 5, Site 5 CTO#0038	N68436_000003
Engineering Field Activity, Northwest	11/15/93	Report	Final Construction Plan, Interim Remedial Action, Bangor Submarine Base - Site F	N68436_000009
Robinson, Noble, & Carr, Inc.	7/1/81	Report	Ground Water Hydrology At The Naval Submarine Base, Bangor, Washington	N68436_000010
Naval Energy and Environmental Support Activity	6/1/83	Report	Navy Assessment and Control of Uinstallation Pollutants: Initial Assessment Study of Naval Submarine Base Bangor - Bremerton, Washington UIC: 68436	N68436_000012
EA Engineering, Science, and Technology	8/1/95	Report	Site Safety and Health Plan Soil Investigation at a Former Shotgun and Pistol Range	N68436_000014

Appendix A-1. Records Reviewed

Author	Document Date	Document Type	Document Title	NIRIS Record No.
Hart Crowser Inc.	12/1/86	Report	Subbase Bangor and NSCP5 Manchester Confirmation Study Field Sampling Procedures	N68436_000021
Engineering Field Activity, Northwest	7/1/92	Report	OU7, Site Characterization Report, Naval Submarine Base - Bangor, Washington CTO-0058	N68436_000041
Engineering Field Activity, Northwest	2/1/91	Report	CTO-003 OU5, Naval Submarine Base - Bangor, Washington, Final Work Plan	N68436_000069
Engineering Field Activity, Northwest	10/14/91	Report	CTO-0026 OU7, SUBASE Bangor - Bango, Washington, Project Work Plan	N68436_000070
Hart Crowser Inc.	1/28/91	Report	Final Management Plan, Remedial Investigation/Feasibility Study Site F, Naval Submarine Base Bangor, Washington	N68436_000071
Engineering Field Activity, Northwest	2/13/91	Report	CTO-003 OU3 Sites 16, 24, & 25, Naval Submarine Base Bangor, Washington, Final Work Plan	N68436_000072
Engineering Field Activity, Northwest	3/1/91	Report	CTO-006 OU6 Sites D & C-East, Naval Submarine Base Bangor, Washington Final Work Plan	N68436_000079
NAVFAC Northwest	10/26/06	Report	Programmatic Assessment and Well Decommissioning Work Plan for Long-Term Monitoring/Operations at Naval Base Kitsap at Bangor	N68436_000101
EBASCO Environmental	8/18/95	Report	Final Work Plan, Removal Action at OU8 Naval Submarine Base, Bangor, Washington	N68436_000106
Engineering Field Activity, Northwest	4/14/93	Letter Correspondence	Letter Delivering Project Specifications for Site 2 at Subase, Bangor	N68436_000139
EPA	4/15/88	Report	Potential Hazardous Waste Site Preliminary Assessment, Site 3 - Railroad Tracks Site	N68436_000147
Engineering Field Activity, Northwest	2/22/94	Report	Draft Record of Decision for OU6, Naval Submarine Base, Bangor, Washington	N68436_000209
EPA	7/1/93	Report	Naval Submarine Base, Bangor - OU4 - The Proposed Plan for OU4	N68436_000506
Engineering Field Activity, Northwest	12/10/91	Report	Declaration of the Record of Decision, Naval Submarine Base, Bangor Site A (OU1)	N68436_000563
Engineering Field Activity, Northwest	3/14/94	Report	Draft Declaration of the Record of Decision, Decision Summary, and Responsiveness Summary for Final Remedial Action, Naval Submarine Base Bangor Site F	N68436_000575
NAVFAC Northwest	4/10/07	Report	Operation and Maintenance Manual, Long-Term Monitoring/Operations at Site F	N68436_000628
Hart Crowser Inc.	12/20/91	Report	Final ROD for Site A, SUBASE, Bangor	N68436_000656
Hart Crowser Inc.	8/1/91	Report	Declaration of the Record of Decision, Decision Summary, Respnsiveness Summary, and Administrative Record Index for Interim Remedial Action, Naval Submarine Base Bangor Site F (OU2)	N68436_000657
Hart Crowser Inc.	9/1/94	Report	Declaration of the Record of Decision, Decision Summary, Respnsiveness Summary, and Administrative Record Index for Final Remedial Action, Naval Submarine Base Bangor Site F (OU2)	N68436_000659

Appendix A-1. Records Reviewed

Author	Document Date	Document Type	Document Title	NIRIS Record No.
Engineering Field Activity, Northwest	8/30/93	Report	Declaration of the Record of Decision, Naval Submarine Base, Bangor Site 16, 24, & 25 OU 3	N68436_000662
Engineering Field Activity, Northwest	3/28/99	Report	Declaration of the Record of Decision, Naval Submarine Base, Bangor Site 16, 24, & 25 OU 3	N68436_000665
Engineering Field Activity, Northwest	12/22/93	Report	Declaration of the Record of Decision, Naval Submarine Base, Bangor OU 4	N68436_000666
Engineering Field Activity, Northwest	1/6/94	Report	Declaration of the Record of Decision, Naval Submarine Base, Bangor Sites C-East & C-West OU 4	N68436_000670
Engineering Field Activity, Northwest	6/17/94	Report	Declaration of the Record of Decision, Naval Submarine Base, Bangor Sites C-East & C-West OU 4	N68436_000671
Engineering Field Activity, Northwest	9/24/93	Letter Correspondence	Letter delivering Record of Decision for Naval Submarine Base, Bangor OU 5	N68436_000676
Engineering Field Activity, Northwest	9/30/93	Report	Declaration of the Record of Decision, Naval Submarine Base, Bangor OU 5	N68436_000677
Engineering Field Activity, Northwest	7/19/94	Report	Declaration of the Record of Decision, Naval Submarine Base, Bangor OU 6	N68436_000682
Engineering Field Activity, Northwest	4/12/96	Letter Correspondence	Letter Detailing Delivery of Final Record of Decision for OU 7 for Naval Submarine Base, Bangor, Washington.	N68436_000684
Engineering Field Activity, Northwest	4/1/96	Report	Final Record of Decision OU 7, Naval Submarine Base, Bangor, Washington	N68436_000685
Engineering Field Activity, Northwest	4/26/94	Letter Correspondence	Letter Informing of Ground Water Well Installation and Testing Schedule	N68436_000811
Engineering Field Activity, Northwest	10/2/95	Report	Draft Final Record of Decision for OU 7 at Naval Submarine Base, Bangor	N68436_000916
NAVFAC Northwest	4/10/07	Report	Operation and Maintenance Manual, Long-Term Monitoring/Operations at Site A	N68436_000976
Groundwater Technology, Inc	8/5/96	Report	Addendum to Work Plan - Site F, Groundwater Sampling at Sites 10, E, & 11, Site A Leachate Treatment System & Site F Groundwater Pump and Treatment System, Naval Submarine Base, Bangor, Washington	N68436_001188
EPA/WA SDEco/Eng. Field Act. NW	9/1/00	Report	Final Record of Decision Naval Submarine Base Bangor OU 8	N68436_001221
Engineering Field Activity, Northwest	6/6/89	Report	Masterplan For Naval Submarine Base, Bangor, WA	N68436_001256
NAVFAC Northwest	12/19/14	Report	Groundwater Model Work Plan Site F Groundwater Flow and Fate & Transport Models	N68436_001260
USGS	1997	Report	Ambient Quality of Ground Water in the Vicinity of Naval Submarine Base Bangor, Kitsap County, Washington, 1995	N68436_001344
URS Consultants, Inc.	3/12/93	Report	Draft Removal Action Report Site 11 Naval Submarine Base SUBASE, Bangor, WA CTO-0038	N68436_001358
Foster Wheeler	7/30/96	Report	Groundwater Flow Model Report, Removal Action at OU 8	N68436_001376

Appendix A-1. Records Reviewed

Author	Document Date	Document Type	Document Title	NIRIS Record No.
NAVFAC Northwest	2/1/81	Report	Environmental Engineering Survey at Naval Submarine Base Bangor, Washington	N68436_001534
Sealaska Environmental	3/13/2015	Report	Final Fall 2014 LTM and O&M Letter Report for Site F, Task Order 82, '14 Bangor Long Term Monitoring And IC Inspection, Silverdale, Washington	N68436_001589
TEC LTM Team	Feb-2003	Report	Environmental Services Monitoring, Final Project Management Plan Site A Groundwater Monitoring Naval Submarine Base Bangor Silverdale, Washington	N68436_001746
Sealaska Environmental	2/5/2015	Report	Final 2014 Institutional Controls Inspection Letter Report, Task Order 82, Naval Base Kitsap Bangor, Silverdale, Washington	N68436_001751
Shannon & Wilson, Inc	May-2004	Report	Operations and Maintenance Manual Addendum No. 3 Site F Groundwater Remediation Systme	N68436_001779
NAVFAC Northwest	5/16/2005	Report	Operations & Maintenance Manual. Addendum No. 4, Site F Groundwater Remediation System, Volume 1	N68436_001833
NAVFAC Northwest	9/16/2005	Report	Second Five-Year Review of Record of Decision Naval Base Kitsap at Bangor Silverdale, Washington	N68436_001951
Twanoh Group, Sierra Club	4/10/1992	Report	Record of Decision for Remedial at Site A, Naval Submarine Base, Bangor	N68436_001978
EPA	8/3/1999	Report	Final ROD for OU 2, Site F, with Comments.	N68436_001979
Engineering Field Activity, Northwest	9/29/1995	Report	Declaration of the Record of Decision OU 7 Naval Submarine Base, Bangor Silverdale, Washington	N68436_001987
USGS	1998	Report	Hydrogeology of Naval Submarine Base Bangor and Vicinity, Kitsap County, Washington	N68436_002091
NAVFAC Northwest	9/17/2015	Report	Site Safety and Health Plan Addendum including Activity Hazard Analyses 2015 Site F Well Installation and Treatment System Upgrades	N68436_002152
Sealaska Environmental	12/15/2015	Report	Final Summer 2015 LTM and O&M Letter Report for Site F, '15 Bangor Long-Term Monitoring and IC Inspection, Silverdale, Washington, Task Order 18	N68436_002154
TEC LTM Team	Feb-2002	Report	Environmental Services Monitoring, Final Groundwater Monitoring Well Installation and Decommissionign Work Plan Site A Naval Submarine Base Bangor Silverdale, Washington	N68436_002449
NAVFAC Northwest	11/24/2004	Report	Point Paper Post-ROD Free Product Recovery OU 8 Naval Base Kitsap Bangor Silverdale, Washington	N68436_002500
NAVFAC Northwest	Jan-2016	Report	Military Munitions Response Program Preliminary Assessment Work Plan Naval Base Kitsap Bangor Silverdale, Washington	N68436_002528
NAVFAC Northwest	10/26/2006	Report	Programmatic Assessment and Well Decommissioning Work Plan for Long-Term Monitoring/Operations at Naval Base Kitsap at Bangor	N68436_002543
NAVFAC Northwest	9/3/2015	Report	Fourth Five-Year Review Naval Base Kitsap Bangor Silverdale, Washington	N68436_002552
NAVFAC Northwest	8/26/2008	Report	Site Work Plan Capping Parking Area at Site 10, Naval Base Kitsap Bangor	N68436_002588
NAVFAC Northwest	7/16/2010	Report	Operation and Maintenance Manual Long-Term Monitoring/Operations at Site F	N68436_002609
NAVFAC Northwest	Dec-2012	Fact Sheet	Fact Sheet: Soil Removal at Site EO 300 - Small Arms Range Naval Base Kitsap Bangor Silverdale, Washington	N68436_002646
NAVFAC Northwest	1/7/2011	Report	Well Installation Work Plan Long-Term Monitoring for Site F Naval Base Kitsap Bangor Silverdale, Washington	N68436_002656

Appendix A-1. Records Reviewed

Author	Document Date	Document Type	Document Title	NIRIS Record No.
NAVFAC Northwest	2/2/2009	Letter Correspondence	Remedial Project Manager for OU 1 Site A at Naval Base Kitsap Bangor Silverdale, Washington	N68436_002669
NAVFAC Northwest	7/11/2014	Report	Record of Decision for Site EO 300, Small Arms Range Naval Base Kitsap Bangor Silverdale, Washington	N68436_002674
E and E Inc.	Apr-84	Report	HRS Ordinance Disposal	NA
EPA	2/2/1984	Letter Correspondence	Delivery of IAS	NA
Dept. of Ecology	2/8/1984	Letter Correspondence	Delivery of IAS	NA
US Navy - Pacific Fleet	3/10/1989	Letter Correspondence	Technical Review Committees (TRC) in the Installation Restoration (IR) Program	NA
EPA	Sep-89	Report	National Priorities List - Bangor Naval Submarine Base	NA
Unknown	3/27/1983	Report	Environmental Pollution Report EFD…. WestDiv - Subase Bangor, WA	NA
NAVFAC Northwest	10/16/1984	Report	IAS Subase Bangor, Bremerton, WA	NA
Navy Energy and Environmental Support Activity	Jun-83	Report	Navy Assessment and Control of Installation Pollutants: Initial Assessment Study of Naval Submarine Base Bangor, Bremerton, WA Vol. 1	NA
Navy Energy and Environmental Support Activity	Jun-83	Report	Navy Assessment and Control of Installation Pollutants: Initial Assessment Study of Naval Submarine Base Bangor, Bremerton, WA Vol. 2 Appendices	NA
EPA	12/29/2005	Letter Correspondence/ Report	Acceptance of Second Five Year Review Report for Naval Base Kitsap at Bangor, Silverdale, Washington	NA
NAVFAC Northwest	11/10/2018	Report	Round 38 (Spring 2018) Monitoring Report, Monitored Natural Attenuation/OU 8	NA

Appendix A-2
Records Reviewed

Preliminary Assessment for
Per- and Polyfluoroalkyl Substances (PFAS)
Naval Base Kitsap Bangor and
Associated Special Areas
Silverdale, Washington

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

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Intra-agency Memoranda and Correspondence

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Appendix A-3
Interview Contacts

Preliminary Assessment for
Per- and Polyfluoroalkyl Substances (PFAS)
Naval Base Kitsap Bangor and
Associated Special Areas
Silverdale, Washington

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

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Appendix A-4
Area Coordinates

Preliminary Assessment for
Per- and Polyfluoroalkyl Substances (PFAS)
Naval Base Kitsap Bangor and
Associated Special Areas
Silverdale, Washington

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

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Appendix B
Interview Record

Communication Record	
Date 12/18/2018	Time
Name of Base, State: TRIDENT Training Facility, Bangor, WA	
Interviewer: CH2M	
Organization: CH2M	
Position/role on this project: Task Manager	
Interviewee: Director, Field Learning Standards Office	
Organization: United States Navy	
Position/Job Title: Director, Field Learning Standards Office	
How long in this position? 30 years of service	
How long in current and previous positions?	
Have you held similar positions at other Bases? N/A	
Which Base? N/A	
How long? N/A	
General Discussion Notes and Information:	
In Building 2014 there is a propane fire trainer that uses Calsoft (a simulated soap) in extinguishers. Water is captured in a treatment tank, which is handled through the WIS.	
TTF was built in 1977 with the addition a of the firefighting trainer. Records retention for TTF is two years, and longer for Hazardous Waste.	
An SDS is available for Calsoft, and WIS for treatment tank.	
Submarine crews use the fire trainer, not surface crews.	
Regarding use of AFFF on submarines, additional contact knowledgeable about submarines, although retired one year ago. They would have it on submarines, but it was rarely used. Firefighting training was done in Building 2014. When onboard a ship, used a trainer in a box (located near family housing), but AFFF was never used.	

(When asked if knowledge of other firefighting training on-Base) near medical there were simulated fires but no AFFF was used, only water in conex type structures. This area is immediately east of Building 2851.
Prior to 1977 only subs were coming in on occasion from PSNS.
Regarding subs, extinguishers would have AFFF but he had no recollection of use. If used, it would have gone to the bilge.
For the AUL, FLC (Fleet Logistics Center) has the AUL, a GUL (General Use List) is available from NRNW (Navy Region NW).
Prior to the meeting Dave Gagnon checked the TTF AUL for AFFF. None was found in the current or historic AUL's, he only found dry chemical surrogate.

Communication Record	
Date 6/6/2019	Time
Name of Base, State: Naval Base Kitsap Bangor, WA	
Interviewer: CH2M	
Organization: CH2M	
Position/role on this project: PA Author	
Interviewee: Building Manager	
Organization: Navy	
Position/Job Title: Building Manager	
How long in this position? N/A	
How long in current and previous positions? N/A	
Have you held similar positions at other Bases? N/A	
Which Base? N/A	
How long? N/A	
General Discussion Notes and Information:	
Paint used on Marine Service Craft for preservation and deck maintenance, process for disposal is to use it up completely, used outside in a semi-enclosed boathouse for painting, containment tarps are set up and old paint chips are collected in tarps and are bagged up and turned into BOSC.	
Used once per year, no painting with this paint in 2019.	
A satellite area in the boathouse is where paint is stored while painting, Hazardous Material Locker near Building 7101 holds material while waiting to paint. Clean housekeeping.	

Communication Record	
Date 2/25/2019	Time
Name of Base, State: Naval Base Kitsap Bangor, WA	
Interviewer: CH2M	
Organization: CH2M	
Position/role on this project: PA Author	
Interviewee: Environmental Services Crew Member	
Organization: Chugach Federal Solutions, LLC	
Position/Job Title: Environmental Services Crew Member	
How long in this position? N/A	
How long in current and previous positions? N/A	
Have you held similar positions at other Bases? N/A	
Which Base? N/A	
How long? N/A	
General Discussion Notes and Information: This is a follow-up call regarding email correspondence on February 4, 2019.	
The AFFF that was sprayed at the “queel” was north of Cattail Lake and is tied to the same work as Site A, prior to 1981.	
The 1976 car fire was off-Base located outside of the Trigger Avenue Gate past the blue boundary off-Base.	
Dates of training at the helipad are unknown.	
The spraying of AFFF behind the fire station and west of 1301 was done in 1988 or 1989.	

Communication Record	
Date 12/18/2019	Time
Name of Base, State: Naval Base Kitsap Bangor, WA	
Interviewer: CH2M	
Organization: CH2M	
Position/role on this project: Task Manager	
Interviewee: Remedial Project Manager	
Organization: NAVFAC NW	
Position/Job Title: Remedial Project Manager	
How long in this position? N/A	
How long in current and previous positions? N/A	
Have you held similar positions at other Bases? N/A	
Which Base? N/A	
How long? N/A	
General Discussion Notes and Information:	
Recalled a fire training facility that used AFFF and was active around 1986. Oil tanks were ignited in a metal structure for fire training and subsequently extinguished with AFFF.	
The location of the fire training was south of Tower Road in an open space. Could not recall exact location of the structure.	

Communication Record	
Date 4/24/2019	Time
Name of Base, State: Naval Base Kitsap Bangor, WA	
Interviewer: CH2M	
Organization: CH2M	
Position/role on this project: Task Manager	
Interviewee: Fire Captain	
Organization: Federal Fire	
Position/Job Title: Fire Captain	
How long in this position? N/A	
How long in current and previous positions? N/A	
Have you held similar positions at other Bases? N/A	
Which Base? N/A	
How long? N/A	
General Discussion Notes and Information:	
When AFFF was transferred to the trucks from the 55-gallon barrels a hand pump was used. Prior to hand pumps being used it was poured into the truck. AFFF transfers were performed on the pad behind the fire station. AFFF was removed from the fire station and given to the Forest Service approximately one year ago. One empty 55-gallon AFFF barrel remained at the Fire Station. Empty barrels were taken to the BOSC hazardous waste house.	
The ladder truck at lower Base has a small tank of AFFF. The fire truck at upper Base has a 70-gallon AFFF tank with approximately 35 gallons presently in the truck, which has been the same volume that can be recalled. The replacement for AFFF is called Novacool.	
The drain/containment system inside the Fire Station is a closed system, cleaned by the BOSC. An oil water separator intended to be installed to support fire truck cleaning, is sitting by the brush by the Fire Station as it was never installed and has been sitting in the brush for several years. Fire Trucks are taken to the car wash at the gas station, usually after-hours. The Fire Department has a key to access this car wash. Trucks are washed there to remove road grime.	

Recalled a car fire on Nautilus Avenue approximately 6-7 years ago. It was located just past the second fire hydrant on Nautilus Avenue on the left side, overlooking the softball fields. Also recalled the Building 1006 fire, a lot of foam was applied to that fire.

Communication Record	
Date 6/6/2019	Time
Name of Base, State: Naval Base Kitsap Bangor, WA	
Interviewer: CH2M	
Organization: CH2M	
Position/role on this project: PA Author	
Interviewee: Building Manager	
Organization: Navy	
Position/Job Title: Building Manager	
How long in this position? N/A	
How long in current and previous positions? N/A	
Have you held similar positions at other Bases? N/A	
Which Base? N/A	
How long? N/A	
General Discussion Notes and Information:	
Contacted Building Manager after they reviewed the buildings and chemicals located at each building.	
Stated that Building 6003 was a storage location for the chemicals, no chemicals are used at this location.	
The products are used within the buildings and it is believed that all buildings have secondary containment.	
After use chemicals are placed in Hazardous Materials lockers until picked up by BOSC for disposal.	
Confident that all chemicals are being used as intended and the instructions for use of the chemicals is adhered to. Unlikely to have releases to the environment.	

PFAS Preliminary Assessment Questionnaire

Environmental Staff

Title:	NBK Pollution Prevention Manager
Date of Interview:	1/23/2019

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.

Teflon process to be installed tentatively at building 7000 (paint shop location). Recent permit for Teflon coating at Bangor at Trident Refit Facility with contract in place to install at building 7000. Presently there is no place to fit the Teflon process.

Bremerton does have a teflon coating area.

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

Chromated items (primers, NUWC has alodine processes in repairing shops at Bangor, SWFPC has chromated processes for missile haulers, electroplating). There is small nickel plating.

In the future Trident Research Facility will be doing chromated electroplating. Not currently enough facility space.

In the past (1970s to 1980s) Keyport was the main chromate/electroplating facility. Building 72 at Keyport had electroplating. Discharge would be taken to Bangor. Discharge was taken to the Keyport Annex, near weapons handling building in lower base (currently doing alodine repairs). Keyport Annex contact would remember where they discharged. Torpedo's would have chromate finishes through 1970s and 1980s (stopped in 1994). Treatment facility at Keyport (Building 884) with overflows, spills prior to ship outs, this facility would stabilize.

Recommends visiting Nautical Museum at Keyport, knowledgeable people there for historical purposes.

Upper Base (near building 5000) is weapons handling, and lower base (between POF and SWFPAC) in the woods where current small scale alodine are still being done. Alodine used for small torpedo paint chips, will touch up the aluminum with alodine (a chromate product), essentially a protective surface coat.

As waste was taken onto Bangor, Keyport would manage their own waste. They had the say-so on what to do with the waste. PanAm was involved but unsure to what degree. Base Environmental may know about this.

Product would have been under some designator by Keyport, it would be archived under a separate type of designation (not WIS) at Keyport, Keyport Annex contact would know the system on that designation.

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

Interviewee has no knowledge.

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

The Navy personnel washed their vehicles all over the place, there wasn't any designated area. It became a huge issue with the storm water management process. Tried to build a wash rack at lower base, but it never succeeded. The CBMU (construction battalion and mechanics) would be used to wash dozers and construction equipment.

10 - 15 years ago they were told to stop washing their equipment and pumping into the wetland. CBMU left the base 2 years ago, they were located on the right-hand side passed the clinic on upper base. The wash rack is still in existence there near building 2800 at Construction Battalion and Mechanics Union at Upper Base.

The wash rack at the BOSC was poorly maintained and rarely used (near building 1204). The fire department would wash their vehicles in the grass behind the fire station.

Hobby shop was located on the next road to the left of the fire department (recycling center, now converted to offices).

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.

On-Base wells that pull from the aquifer. For PFAS sampling results contact the IWTP or drinking water program manager.
Aquifer that water is pulled from is considered a "reserve" for all of Kitsap County.

Keyport has a very deep well, issues are there.

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?

Not aware of any industrial wells. For PFAS sampling results contact the IWTP or drinking water program manager.

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.

There's so many that can't keep track. The CERCLA contacts would have a list of landfill/disposal sites. Concerned about the periodic EOD training location at lower base, it's near the fence line. EOD training and disposal location. Burn demolition pit in a forested area, secluded from public view, closest residents are 700 meters. Given contacts for the EOD Detachment.

Not aware of any fire response at EOD burn sites, but that doesn't mean it didn't happen.

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.

Base Environmental would be the best contact for monitoring wells. AFFF was stored mainly at the fire department. I know they would go to North Bend to the Regional Fire Training, but they would try to limit training with AFFF since it was a mess.

There was a fire training center located by the hobby shop on upper base. There was hearsay that they used foams there prior to the 2000s.

The fire station on lower base (62) is very little. They would occasionally wash their trucks in the backyard. It is too small for them to do any training. They are local response for Delta Pier. Contact the Fire Protection Specialist at Fire Station 62.

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.

Main pesticides location is the BOSC location. This goes back to the 1980s (PanAm at that time), pesticide application was contracted out. They used to hand spray, and vehicle spray on gravel roads, and railroad ties and lines. Provided a weed seeker spot spray system in the 1990s for application of pesticides, but it wasn't well received. Referred to pesticides contact.

2. How are unused or waste pesticides managed?

Managed through environmental office, Base Environmental can give information on how pesticides are managed. The Waste Program Manager can give information on it as well. Goes through the DLA contact (waste disposal contract).

3. How are unused or waste paints managed?

Same as above. Would recycle fire-proof paint (approximately 200 gallons has been reused and transferred). There is a group called Fire Supply and Logistics Program. The paint would be applied by Bangor personnel designated by NAVSEA that meets special criteria for inside the sub. Stored inside building 7089, used at 7000 and inside dry dock at Delta Pier. Suggested contact that would have a lot of info on fire-proof paint (including SDS). Bangor is the largest user of these paints.

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.

Training by the fire station upper base. HAZMAT/training/surplus contact for Station #61.

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?

Goes back into the 1960s for Upper Base. AFFF was used at the North Bend Training Facility. They would have car fire suppression, would train on Class D fire suppression. Unsure about if AFFF brought to training facility was from Bangor. Had to pay a fee to Washington State to train, doesn't remember if there were drums of AFFF handled.

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

The training by the fire station in upper base. Contact Hazmat Trainer and Fire Captain.

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?

Pan fire training using ignitable flammables was conducted, but no large training with fuels is recollected.

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?

Interviewee had no 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?

They avoided AFFF because of the cleanup requirement. If they had to, they would have to containerize anything. In North Bend they had catch basins to collect. Water from any car washing would just go into the ground. Equipment would be flushed into the woods. They would also flush out the equipment at a wash rack.

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

Flushing of equipment was performed at the Fire Department and confirmed that it would be likely it was sprayed into the woods behind the fire station. Assumed that it would have been done at wash racks, were they used by the Fire Department, recommends contacting Hazmat Trainer and Fire Captain.

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)?

The fire department was usually the first responders. Contacts at fire department would be a contact for this information. Every (spill and fire dept response) incident is supposed to go through Environmental Engineers. Base Environmental is another contact as spill response. The old Waste Program Manager at Building 1101 also has historical on spills, AFFF issues, trainings.

Any spills currently would be handled by BOSC. The fire dept and security would be first responders and would call in BOSC for cleanup.

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

    a. Fuel releases to prevent fires

One at Bangor that was a response of AFFF, Fire Captain can give location.

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

Fuel losses due to vehicle crashes happened frequently, but AFFF was not applied unless there was an actual fire. Absorbents would be the preferred method of containment. Fire Captain for information on this.

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

Interviewee had no knowledge.

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

Interviewee had no knowledge.

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?

Contact Fire Captain and BOSC.

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?

Contact Fire Captain and BOSC.

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

Wreckages are taken right by the recycling center in gravel parking area (historically), also might have been taken off-Base.

AFFF Pickup Locations: Waste AFFF would go to BOSC hazardous storage. AFFF supplies would go behind the fire station. There is the issue of visiting boats having small AFFF suppression (at service pier and Jimmy Carter), they are the ones that would use small quantities of AFFF. It wouldn't be used at Bangor, but they have the option of disposing it at Bangor. Base Environmental should be able to know more info about the pickup locations. Base Environmental would have any profiles that goes along with this waste.

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

One incident that Fire Captain should be able to give information on in the early 2000s, impacted a stormwater area. Does not recollect exact location. Possibly an electrical scenario, using wildland approved AFFF at a PCB/pole fire location.

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

See above.

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

Interviewee had no knowledge. Suggests Drinking Water Program Manager as a contact.

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

Interviewee had no knowledge. Suggests Drinking Water Program Manager as a contact.

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

Interviewee had no knowledge.

Keyport did red-water flush outs.

    f. Other

Incinerator near BOSC area. Was ½ mile from the Main Gate. Liquid waste incinerator would burn auto fuel, TCE waste, and solvents. Fired by fuel. Fire Captain can give specifics. Incinerator Inspector was savvy about the incinerator, located at Bangor, retired about 10 years ago. Part of the procedures were to inspect the incinerator for safety. Common practices would concern fire inspectors and waste managers. Incinerator Operator would be a good contact. The supervisors in the shops would not segregate waste that was burned. Shutdown by the EPA for "burning and producing cyanides".

There was no segregation of the waste to be burned, and most of the bulk waste was liquid.

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.

Waste Manager and reserve fire chief (Keyport and Bangor).
Contact Historical Records.

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

BOSC and Fire Department.

AUL handled out of office, contact Operations Supervisor (previously Stormwater Manager)

PFAS Preliminary Assessment Questionnaire

Fire Chief or Designees

Title:	Fire Protection Specialist
Date of Interview:	2/20/2019

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.

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.

Interviewee had no 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)?

Interviewee had no knowledge.

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).

Interviewee had no knowledge.

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

The Fire Protection Specialist stated that Ladder 62, cleaned inside apparatus bay, water flush out. Containment system, taken to Building 1014 for cleaning. Chugach in charge of pumping out containment system (fuel/water separator).

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

The Fire Protection Specialist stated at Building 1014, and a facility in Tacoma, WA.

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.

The Fire Protection Specialist stated I believe that they use 1301 for training. No AFFF Fire Suppression systems. More EMT than fire response.

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?

Interviewee had no knowledge.

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

Interviewee had no 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?

Interviewee had no 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?

Interviewee had no 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?

Interviewee had no knowledge.

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

Interviewee had no knowledge.

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?

Interviewee had no knowledge.

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).

Interviewee had no knowledge.

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

Interviewee had no 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)?

Interviewee had no 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)?

Interviewee had no 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?

Interviewee had no 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).

Interviewee had no knowledge.

Trucks and Trailers

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

The Fire Protection Specialist stated trucks are parked in the bay, morning checks are conducted in parking in front of apparatus bay.

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?

Interviewee had no knowledge.

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

Interviewee had no knowledge.

a. Where does/did this resupply occur?

Interviewee had no knowledge.

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

Interviewee had no knowledge.

c. What happens to the empty AFFF containers?

Interviewee had no knowledge.

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)?

Interviewee had no knowledge.

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)?

Interviewee had no knowledge.

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

a. Fuel releases to prevent fires

Interviewee had no knowledge.

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

Interviewee had no knowledge.

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

Interviewee had no knowledge.

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

Interviewee had no knowledge.

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?

Interviewee had no knowledge.

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?

Interviewee had no knowledge.

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

Interviewee had no knowledge.

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

The Fire Protection Specialist stated there is a storm drain ~75ft away to apparatus bay, Fish ladder built there, pond by parking lot, ditches.

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

Interviewee had no knowledge.

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

Interviewee had no knowledge.

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

Interviewee had no knowledge.

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

Interviewee had no knowledge.

f. Other

Interviewee had no knowledge.

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.

Interviewee had no knowledge.

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

The Fire Protection Specialist stated that there is Fire Retardant paint stored on Delta Pier – Suggested contacting Delta Pier contact.

PFAS Preliminary Assessment Questionnaire

Fire Chief or Designees

Title:	Regional Fire Chief, Fire Department Personnel
Date of Interview:	12/17/2018

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.

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.

The Regional Fire Chief stated yes, currently at fire station, the amounts are always fluctuating, all AFFF is being replaced with C6 foam. As of April 2018: Station 61 (built 1976), building 1300: no storage of AFFF. 1 engine has 50 gallons of foam (Engine 61). Ladder 62 does not carry any foam.

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)?

The Regional Fire Chief stated every truck is different, foam is not used a lot. 5-gallon buckets would but just poured into the tanks. 2010 and newer trucks have a drafting system. Doing some of the morning checks the foam would leak through the fire hoses and water would be pumped out to clear it. Historically it has been sent to grass or storm drains.

The Regional Fire Chief stated no training facility where foam was flowing freely. Across the train tracks at Bangor, Rivereens, right hand side before Sam Houston, there is an old structure that the contractor from 1978 to 2001 would train on, foam could have flowed there.

The Regional Fire Chief called previous contractor: ~1982, don't remember doing any live fire in the building, they couldn't use it. No recollection of any AFFF foam training at Bangor. Any fire hose leaks would flush out behind station 61. The system would be tested to see if oxblood system worked and would flush out behind station 61. Between standpipe and gravel parking area, spray northwest. Also filled on that back apron. Spray would go out about 50 yards into the trees.

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).

Mr. Wooard stated at fire stations. Bangor: 1300, 7600. At Bangor morning rig checks would occur, pump would be run, check primer, usually just water but if there are leaks AFFF could have been deployed. Empty containers historically were put into the dumpster, now it is treated like hazardous waste, sent to hazardous waste facility. If used on car fires, the trucks are pumped out at the scene.

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

The Regional Fire Chief stated soap and water was used on the pads. If AFFF was used at Bangor it would have been rinsed off into the storm drain or the grass behind the fire station.

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

The Regional Fire Chief stated fire trucks taken to "Roundhouse" for maintenance, building 1014. At Bremerton - Historically the Transportation building, now to Bangor Roundhouse.

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.

The Regional Fire Chief stated there is strict instruction to not flow foam. Trident Training Facility (TTF) is set up for ship fires, no foam is flowed there. Only use propane set ups and water. Suggested contacting TTF Facility.

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?

Interviewees had no knowledge.

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

The Regional Fire Chief stated there are 2 training facilities are currently active: TTF and pad next to station 61 (in operation approx. 5 years). May potentially have another lower base fire station prior to 1970s.

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?

The Regional Fire Chief stated historically it was simulated. No foam used.

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?

No knowledge of any AFFF trainings.

The Regional Fire Chief stated cleaning the tanks out - Flow the foam, fill it with water, drive it around, drain it into 55-gallon drums, fill it ¾ and do it again.

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?

Interviewees had no knowledge.

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

Interviewees had no knowledge.

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?

The Regional Fire Chief stated that nothing at Bangor has AFFF suppression. Suggested contacting the fire protection engineer (360-362-6894).

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).

Interviewees had no knowledge.

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

Interviewees had no 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)?

Interviewees had no 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)?

Interviewees had no 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?

Fire Protection Engineer

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).

Interviewees had no knowledge.

Trucks and Trailers

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

See question above.

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?

Interviewees had no knowledge.

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

    a. Where does/did this resupply occur?

The Regional Fire Chief stated usually occurred in apparatus bay.

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

Interviewees had no knowledge.

    c. What happens to the empty AFFF containers?

Interviewees had no knowledge.

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)?

See questions above.

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)?

The Regional Fire Chief stated no foam usage was documented.

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

    a. Fuel releases to prevent fires

The Regional Fire Chief stated potentially with car crashes, AFFF foam would be used.

Fire Department Personnel stated Olympic Transfer Station fire, AFFF usage occurred in 2013, approximately 50-60 gallons

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

Fire Department Personnel stated Bangor used AFFF for car fires, house fires, brush fires. Brush fire at the end of Thresher, approximately ½ acre foam response. Building 1009 fire AFFF response.

The Regional Fire Chief stated across marine barracks at agility course, approximately ½ acre foam response.

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

Interviewees had no knowledge.

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

Interviewees had no knowledge.

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?

Fire Department Personnel stated when foam was deployed at a response they would leave it in place. Any wreckage would be taken off-base.

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?

Interviewees had no knowledge.

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

The Regional Fire Chief stated that wreckage is taken off-Base.

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

Interviewees had no knowledge.

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

The Regional Fire Chief stated on Bangor (2001-2005) there was a car fire at Escolar & Trigger that required AFFF response. The AFFF rolled right into the ditch at the SE corner, area is now a parking lot.

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

Interviewees had no knowledge.

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

Interviewees had no knowledge.

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

Interviewees had no knowledge.

f. Other
   g. Interviewees had no knowledge.

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.

See above contact information

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

Interviewees had no knowledge.

PFAS Preliminary Assessment Questionnaire

Public Works Staff

Title:	Industrial Waste Treatment Plant Operators
Date of Interview:	4/24/2019

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.

Interviewees had no knowledge.

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

The Lead Operator stated yes, approximately 24 years ago (contact Base Environmental), unsure of which building or operation status, used to have a high metals treatment at IWTP but waste was never received from operations.

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

Interviewees had no knowledge.

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

The Lead Operator stated upper base gas station has a hobby shop and car wash. Used to paint personal vehicles there approximately 34 years ago when in the Navy.

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

Interviewees had no knowledge. They do not deal with any wells.

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

Interviewees had no knowledge.

Industrial Wastewater Treatment Plant (IWTP) or Sanitary Wastewater Treatment Plant (WWTP)

1. Does the Base currently have (or has the Base historically had) an IWTP or WWTP? If yes, what are/were the years of use and where is effluent from the IWTP and WWTP discharged to?

The Lead Operator stated yes, dates of use unknown (contact Base Environmental). Discharge to the sewer which goes to Brownsville Sewer Plant run by Kitsap County.

2. Does the facility utilize oil water separators (OWSs) for the collection and separation of petroleum, and where AFFF might have been used for operations (such as, Fire Training Areas, Hangers, Maintenance Operations)? If so, where did the OWSs discharge to (such as WWTP, outfalls) and are there drawings available for the construction of these systems?

The Lead Operator stated that trickling of AFFF into the sewer system may have happened. If AFFF went into a bilge it would go to SOD tanks, but it would have been covered by oil so AFFF would not have been noticed.

3. How are/have sludges and biosolids from the IWTP, WWTP, and OWS been disposed of (such as, land application, discharge to municipal sewer system, irrigation)?

The Lead Operator stated that some biosolids are shipped off-base as hazardous waste through WIS and Base Environmental, but most go to the Olympic View Landfill.

    a. If known, where are any current or historical drying beds/spray fields/sludge lagoons? Please identify the approximate location/s of such features on the facility map provided.

The Lead Operator stated no. The drying bed is shipped to the landfill, water gets captured and retreated. Used to spray the fields back behind SWFPCC but cannot confirm. Some sewage ponds were up there a long time ago (contact Waste Water Supervisor).

    b. If known, has any sludge been land-applied on base for fertilizer or for use as landfill cover? If so, please identify the approximate location/s of such features on the facility map attached?

The Lead Operator stated it's under a permit, so they may have a specific spot for it at the landfill (contact Base Environmental).

4. Are there any current or historical diversionary flow valves that would allow for waste to bypass the base's treatment plant(s)?

The Lead Operator stated there is an overflow tube in tank which goes to the sewer, it has overflowed (during 100-year storm), they do keep track of it.

5. Has a reverse osmosis system been used in the IWTP and/or WWTP? If so, where/how is the waste

concentrate disposed?

The Lead Operator stated no.

6. Which buildings and drainage features, including OWSs, discharge to the IWTP and/or WWTP?

The Lead Operator stated drydock floor drainage, all bilge water from the boats/subs come to the OWS, tankers with phosphate water and oily water, marginal EHW, KB docks, pump outs from all OWS on-base (on Bangor), received spill response oily water.

The IWTP Operator stated any spill cleanup from crashes fires would have come to IWTP.

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.

Interviewees had no knowledge.

2. How are unused or waste pesticides managed?

Interviewees had no knowledge.

3. How are unused or waste paints managed?

Interviewees had no knowledge.

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)?

The Lead Operator stated no documentation. Keep records for about 3 years by requirement. Not seen any AFFF trickling in in the last 3 years.

The IWTP Operator stated the last time they dealt with AFFF was about 6 years ago from rinsing out fire tank out on the gravel pad.

The Lead Operator stated that they found oil under parking lot and may have AFFF (see map for location). There is a sewer discharge line that is damaged (see map for location).

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

a. Fuel releases to prevent fires

Interviewees had no knowledge.

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

Interviewees had no knowledge.

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

Interviewees had no knowledge.

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

The Lead Operator stated that foam that would come inside the plant and overflow, it would get sprayed down. It would go back into the (220,000 gal) tank which go back into the system. Inspected yearly (tank cleanout, go inside, remove sludge, spray down), haven't needed to seal it or anything.

The IWTP Operator stated that there are 2 vehicles sitting at impound lot that used to sit at recycle cage for years. Cars may have been burnt in approximately 2001. Impound lot near main gate, where incinerator storage is.

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.

Interviewees had no knowledge.

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 have not already been previously discussed?

Interviewees had no knowledge.

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

See question above.

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

Interviewees had no knowledge.

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

The Lead Operator stated no.

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

See map.

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

Interviewees had no knowledge.

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

The Lead Operator stated Olympic View Landfill, potential spraying applications at SWFPCC

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.

See contacts mentioned above.

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

Interviewees had no knowledge.