Naval Facilities Engineering Systems Command Northwest
Silverdale, Washington

Final

Site Inspection Report for Per- and Polyfluoroalkyl Substances

Naval Station Everett
Everett, Washington

Naval Radio Station Jim Creek
Arlington, Washington

Naval Recreation Complex Pacific Beach
Pacific Beach, Washington

October 2023

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Prepared for NAVFAC Northwest
by CH2M HILL, Inc.
Seattle, Washington
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Executive Summary

This report presents the Site Inspection (SI) for per- and polyfluoroalkyl substances (PFAS) at Naval Station (NAVSTA) Everett in Everett, Washington and two associated facilities: Naval Radio Station (NRS) Jim Creek in Arlington, Washington and Naval Recreation Complex (NRC) Pacific Beach in Pacific Beach, Washington.

Background

NAVSTA Everett occupies approximately 117 acres in western Snohomish County adjacent to Port Gardner Bay, within the City of Everett, Washington. NAVSTA Everett was constructed in the early 1990s under the Department of the Navy (Navy) Strategic Homeport Initiative and is currently the home port for six Navy destroyers and two United States Coast Guard vessels (Navy, 2018a). The installation includes buildings and facilities that support ship operations and maintenance, and provide housing and support to homeported sailors.

NRS Jim Creek occupies approximately 3,854 acres in northern Snohomish County approximately 13 miles east of Arlington, Washington. NRS Jim Creek operates and maintains a communication system (Navy, 2018a). The Navy acquired land at NRS Jim Creek in 1949 and constructed the communication system and associated support facilities between 1949 and 1953 (NEESA, 1990). In addition to communication system operations, the Navy currently uses NRS Jim Creek as an outdoor recreational facility for activities such as camping, fishing, boating, hiking, and biking. Current-day buildings include a communication system, outdoor recreational facilities such as cabins and campsites, and supporting facilities.

NRC Pacific Beach occupies approximately 53 acres in western Grays Harbor County adjacent to the Pacific Ocean approximately 36 miles northwest of Aberdeen, Washington. The installation was initially developed by the Navy at the start of World War II as a communications center and a range for training purposes (NEESA, 1991). By 1956, the Navy moved training operations closer to Puget Sound and Seattle. Defense equipment and associated infrastructure, such as gun mounts, ammunition magazines, and related buildings, were demolished and replaced with more conventional structures (NEESA, 1991). By the late 1970s, military housing was no longer required, and the installation was converted into a recreational facility with single-family homes and dormitory-type buildings. In 1984, a 1-acre recreational vehicle and motor home park was built along the northern boundary of the installation which exists to this day. There are currently no active military operations at NRC Pacific Beach.

Preliminary Assessment

A Preliminary Assessment (PA) for PFAS at NAVSTA Everett and associated facilities, including NRS Jim Creek and NRC Pacific Beach (CH2M, 2021), was conducted to identify potential PFAS release areas. [1] The PA evaluated a total of 50 areas including 22 areas at NAVSTA Everett, 22 areas at NRS Jim Creek, and 6 areas at NRC Pacific Beach. Of these 50 areas, the following 9 were identified as potential PFAS release areas:

- NAVSTA Everett (1 area)
  - Building 2114 (Fire Station)
- NRS Jim Creek (7 areas)
  - Building 6 (Former Fire Station)
  - Site 1 (Building 11 Landfill)
  - Site 6 (Blue Campground Landfill)
  - Site 7 (Pit Road Landfill)
  - Site 4 (Metal Burial Pit)
  - Site 5 (Mixed Waste Landfill)
  - Bio Pit Disposal Area

[1] PFAS release areas were previously referred to as PFAS source areas in the PA report (CH2M, 2021).

- NRC Pacific Beach (1 area)
  - Building 106 (Former Fire Station)

Eight of the nine potential PFAS release areas (all except the Bio Pit Disposal Area at NRS Jim Creek) were recommended in the PA for further investigation as part of an SI. A no further investigation at this time recommendation for the Bio Pit Disposal Area at NRS Jim Creek, which received sludge from stormwater catch basins at the facility, was deferred until the SI pending PFAS sampling results at Building 6.

Site Investigation

The objectives of the SI were identified in the *Final Sampling and Analysis Plan, SI for PFAS, NS Everett, Everett, Washington, NRS Jim Creek, Arlington, Washington, and NRC Pacific Beach, Pacific Beach, Washington* (SAP) (CH2M, 2022):

- For areas identified for an SI during the PA, determine whether PFAS are present in groundwater and soil at concentrations warranting further investigation.
- Refine the understanding of the hydrogeologic characteristics at potential PFAS release areas identified for an SI during the PA and, for NRS Jim Creek only, evaluate the potential for PFAS migration, if present, to on- and off-installation drinking water wells.

Groundwater and soil samples were analyzed for the 18 PFAS compounds listed in Method 537.1 via liquid chromatography tandem mass spectrometry compliant with the Department of Defense and Department of Energy Consolidated Quality Systems Manual for Environmental Laboratories, Version 5.3, in accordance with the laboratory's Environmental Laboratory Accreditation Program Accreditation letters.

Subsequent to the finalization of the Basewide PFAS SI SAP, USEPA regional screening levels (SLs) for perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) were released, and USEPA SLs for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) were updated. The SL for perfluorobutanesulfonic acid (PFBS) has not been updated since the Basewide PFAS SI SAP was finalized.

In accordance with the June 2022 ASD memorandum (DoD, 2022), groundwater and soil data were screened against the updated SLs (USEPA, 2022). Groundwater data were screened against residential scenario tap water SLs for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA presented in the November 2022 Regional Screening Level (RSL) Table (USEPA, 2022). Soil data were screened against residential scenario soil SLs for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA presented in the November 2022 RSL Table (USEPA, 2022). RSLs for perfluorobutanoic acid (PFBA) and perfluorohexoanoic acid (PFHxA) were added in the May 2023 RSL update and will be considered in the Remedial Investigation (RI) planning.

The SLs are as follows:

- PFOA – Soil SL: 19 micrograms per kilogram (µg/kg), Groundwater SL: 6.0 nanograms per liter (ng/L)
- PFOS – Soil SL: 13 µg/kg, Groundwater SL: 4.0 ng/L
- PFBS – Soil SL: 1,900 µg/kg, Groundwater SL: 600 ng/L
- PFHxS – Soil SL: 130 µg/kg, Groundwater SL: 39 ng/L
- PFNA – Soil SL: 19 µg/kg, Groundwater SL: 5.9 ng/L
- HFPO-DA – Soil SL: 23 µg/kg, Groundwater SL: 6.0 ng/L

Surface and subsurface soil samples were collected during the installation of the monitoring wells and two soil boring locations at the eight potential PFAS release areas (except at the Bio Pit Disposal Area at NRS Jim Creek as described above). PFAS were detected in surface and subsurface soil samples; however, only PFOS was detected in surface soil above the SLs at Building 2114 (Fire Station) NAVSTA Everett.

Groundwater samples were collected from the newly installed monitoring wells after well development. PFAS were detected in groundwater samples. Groundwater exceedances were detected at Building 2114 (Fire Station) at NAVSTA Everett in two wells for PFOA, PFOS, and PFHxS; at Building 6 (Former Fire Station) at NRS Jim Creek in four wells for PFOS and one well for PFHxS; and at Building 106 (Former Fire Station)/NRC Pacific Beach in two wells for PFOS. All other PFAS detections in groundwater were below the SLs.

The Human Health Risk Screening identified the chemicals of potential concern (COPCs) at Building 2114 (Fire Station) as PFOS and PFHxS for groundwater and at Building 6 (Former Fire Station) as PFOS for groundwater. COPCs were not identified at the other sites for groundwater, and COPCs were not identified for soil.

At this time, no further investigation is recommended for the following areas:

NRS Jim Creek

- Site 1 (Building 11 Landfill)
- Site 6 (Blue Campground Landfill)
- Site 7 (Pit Road Landfill)
- Site 4 (Metal Burial Pit)
- Site 5 (Mixed Waste Landfill)
- Bio Pit Disposal Area

NRC Pacific Beach

- Building 106 (Former Fire Station)

A Remedial Investigation is recommended for Building 2114 (Fire Station) at NAVSTA Everett and Building 6 (Former Fire Station) at NRS Jim Creek to obtain additional data to update the conceptual site model and further evaluate potential human health risks from exposure to PFAS.

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Acronyms and Abbreviations

°F	degree(s) Fahrenheit
ng/L	nanogram(s) per liter
µg/kg	microgram(s) per kilogram
9Cl-PF3ONS	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid
11Cl-pF3OudS	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
ADONA	4,8-dioxa-3H-perfluorononanoic acid
AFFF	aqueous film-forming foam
APE	Area of Potential Effect
bgs	below ground surface
btoc	below top of casing
CH2M	CH2M HILL, Inc.
COPC	chemical of potential concern
CSM	Conceptual Site Model
DoD	Department of Defense
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
EPP	Environmental Protection Plan
GW	groundwater
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
HHRS	Human Health Risk Screening
IDW	investigation-derived waste
MS	matrix spike
MSD	matrix spike duplicate
NAVFAC	Naval Facilities Engineering Systems Command
NAVSTA	Naval Station
ND	not detected
Navy	Department of the Navy
NEtFOSAA	N-ethyl perfluorooctanesulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
NRC	Naval Recreation Complex
NRS	Naval Radio Station
NTU	nephelometric turbidity unit
PA	Preliminary Assessment

PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexoanoic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFTA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnA	perfluoroundecanoic acid
PFHxS	perfluorohexanesulfonic acid
ppt	part(s) per trillion
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RI	Remedial Investigation
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SB	subsurface soil
SCH	Schedule
SL	screening level
SI	Site Inspection
SOP	standard operating procedure
SOSUS	Sound Surveillance System
SS	surface soil
UMCR3	Third Unregulated Contaminant Monitoring Rule
USEPA	United States Environmental Protection Agency
WMP	Waste Management Plan
WQP	water quality parameter

SECTION 1

Introduction

This Site Inspection (SI) report presents the data and findings obtained from a per- and polyfluoroalkyl substances (PFAS) investigation conducted at Naval Station (NAVSTA) Everett in Everett, Washington and two associated facilities: Naval Radio Station (NRS) Jim Creek in Arlington, Washington, and Naval Recreation Complex (NRC) Pacific Beach in Pacific Beach, Washington. This report was prepared by CH2M HILL, Inc. (CH2M), a wholly owned subsidiary of Jacobs, for the Department of the Navy (Navy), Naval Facilities Engineering Systems Command Northwest, under the Comprehensive Long-term Environmental Action—Navy 9000, Contract N62470-16-D-9000, Contract Task Order N4425518F4117.

The objectives of the SI were defined in the *Final Sampling and Analysis Plan, SI for PFAS, NS Everett, Everett, Washington, NRS Jim Creek, Arlington, Washington, and NRC Pacific Beach, Pacific Beach, Washington* (SAP) (CH2M, 2022). The objectives were as follows:

- For areas identified for an SI during the Preliminary Assessment (PA), determine whether PFAS are present in groundwater and soil at concentrations warranting further investigation.
- Refine the understanding of the hydrogeologic characteristics at potential PFAS release areas identified for an SI during the PA and, for NRS Jim Creek only, evaluate the potential for PFAS migration, if present, to on- and off-installation drinking water wells.

This SI report outlines the approach taken to achieve the listed objectives, describes results and conclusions regarding data collected, and provides recommendations.

SECTION 2

Site Backgrounds and Physical Settings

This section presents background information on NAVSTA Everett, NRS Jim Creek, and NRC Pacific Beach, including site history, potential sources of PFAS, and relevant information on the physical and hydrogeologic setting at the site.

2.1 Background

2.1.1 Naval Station Everett

NAVSTA Everett occupies approximately 117 acres in western Snohomish County adjacent to Port Gardner Bay, within the City of Everett, Washington (**Figures 2-1 and 2-2**). NAVSTA Everett was constructed in the early 1990s under the Navy's Strategic Homeport Initiative and is currently the home port for six Navy destroyers and two United States Coast Guard vessels (Navy, 2018a). The installation includes buildings and facilities that support ship operations and maintenance and provide housing and support to homeported sailors.

Before Navy acquisition, the first development of the property was around 1900, by the timber product industry. The property historically housed a sawmill, shingle mill, and other wood products manufacturing facilities (NEESA, 1992). In 1942 and 1943, the Navy purchased land at the current-day location of NAVSTA Everett for the development of the Naval Industrial Reserve Shipyard (CH2M, 2021) (**Figure 2-2**). The shipyard supported the repairing and outfitting of Navy ships and included docking facilities, drydock areas, ship building platforms, storage facilities, and fabrication and assembly facilities (including machine shop and paint shops) (CH2M, 2021). Shipyard operations ended in 1949, and the Navy continued to use the property in part to support the Military Sea Transportation Service Reserve Fleet (CH2M, 2021). Between 1947 and 1949, the Navy built a Naval Reserve Center on a portion of the Naval Industrial Reserve Shipyard property south of the current NAVSTA Everett installation boundary (Landau Associates, 1993). In 1984, the location of the former Naval Industrial Reserve Shipyard was selected as a location for the Navy's Strategic Homeport Initiative (Navy, 2018b). Through a series of property disposals and sell-offs and land acquisitions, NAVSTA Everett was developed for its current use.

During construction of NAVSTA Everett, the Navy demolished existing structures, completed cleanup activities including the excavation of petroleum hydrocarbon impacted soil, and placed a 3- to 5-foot clean fill cap over the entire property (NEESA, 1992). Building construction began in the early 1990s (NEESA, 1992) and the installation was dedicated in April 1994 (Navy, 2018b). A PA to evaluate potential releases of chemicals not including PFAS on the NAVSTA Everett property was conducted during installation improvement and construction (NEESA, 1992). Based on analytical data available at the time of the PA, it was concluded that no chemicals were detected at NAVSTA Everett at levels warranting additional actions (NEESA, 1992). However, sampling for PFAS was not conducted during this investigation.

In 2021, a PA was conducted to identify potential PFAS release areas [2] at NAVSTA Everett and associated facilities, including NRS Jim Creek and NRC Pacific Beach (CH2M, 2021). The PA evaluated 22 areas at NAVSTA Everett and 1 area (Building 2114), was recommended for additional investigation (**Figure 2-2**).

Building 2114 (Fire Station)

Building 2114 (Fire Station) is in the central portion of NAVSTA Everett near the intersection of Spruance Boulevard and Fletcher Way (**Figure 2-3**). Building 2114 is the current and only fire station that has operated at NAVSTA Everett. The station was built in 1993 and is 14,082 square feet (Navy, 2018b). Five fire trucks are stationed at Building 2114. Installed foam tanks on three of these fire trucks were observed to contain aqueous film-forming foam (AFFF) during a December 2018 site visit. The fire department does not currently store AFFF

[2] PFAS release areas were previously referred to as PFAS source areas in the PA report (CH2M, 2021).

outside of the fire engine tanks; however, AFFF concentrate has historically been stored in Building 2114. AFFF concentrate was stored at Building 2114 in an upper-floor, ladder-access storage room; the NAVSTA Everett Fire Chief confirmed that 50 to 100 gallons of AFFF, in 5-gallon containers, was previously stored at Building 2114. (CH2M, 2021)

The PFAS PA (CH2M, 2021) identified Building 2114 as a potential PFAS release area. There were no reported spills or releases of AFFF associated with Building 2114; however, large quantities of AFFF were stored throughout its operating history as a fire station and satellite storage area. At similar facilities, firefighters historically filled the fire trucks by directly transferring AFFF from 5-gallon containers into fire trucks. Based on similar practices of AFFF transfer at other Navy installations during the same time period and the lack of available information for the handling and training practices, there is the potential for spills or leaks to have occurred during the transfer of AFFF into fire trucks. Previous environmental investigations have not been performed at Building 2114.

2.1.2 Naval Radio Station Jim Creek

NRS Jim Creek occupies approximately 3,854 acres in northern Snohomish County approximately 13 miles east of Arlington, Washington (**Figure 2-1**). NRS Jim Creek operates and maintains a communication system (Navy, 2018a). The Navy acquired land at NRS Jim Creek in 1949 and constructed the communication system and associated support facilities between 1949 and 1953 (NEESA, 1990). In addition to communication system operations, the Navy currently uses NRS Jim Creek as an outdoor recreational facility for activities such as camping, fishing, boating, hiking, and biking. Current-day buildings include a communication system, outdoor recreational facilities such as cabins and campsites, and supporting facilities.

The PFAS PA (CH2M, 2021) identified seven areas as potential PFAS release areas at NRS Jim Creek. These areas are Building 6 (Former Fire Station), Site 1 (Building 11 Landfill), Site 6 (Blue Campground Landfill), Site 7 (Pit Road Landfill), Site 4 (Metal Burial Pit), Site 5 (Mixed Waste Landfill), and the Bio Pit Disposal Area (**Figure 2-4**). Six of the seven areas were recommended for further investigation in an SI.

Building 6 (Former Fire Station)

Building 6 (Former Fire Station) is in the northwestern portion of NRS Jim Creek on the west side of Jim Creek Road (**Figure 2-5**). The former fire truck ramps are on the east side of Building 6. Building 6 is a 5,780-square-foot building built in 1952 (Navy, 2018b). Building 6 was originally an active fire station staffed by a permanent fire crew. The station was converted to a volunteer crew in the mid-1980s, and firefighting operations ceased in 1999 (CH2M, 2021).

The PFAS PA (CH2M, 2021) identified Building 6 as a potential PFAS release area. Based on historical knowledge, AFFF containers that leaked were stored at Building 6 and were rinsed off outside of Building 6. Previous environmental investigations have not been performed at Building 6.

Site 1 (Building 11 Landfill)

Site 1 (Building 11 Landfill) is in the northwestern portion of NRS Jim Creek on the west side of Building 11 (**Figure 2-6**). Site 1 is an approximately 1,000-square-foot abandoned landfill (NEESA, 1990). The area was used as an unlined landfill from the mid-1950s until 1984 when it was covered with an approximately 2-foot-thick uncompacted soil cover (NEESA, 1990). Site 1 was reportedly used for disposal of steel “bulldozer” parts, asphalt, concrete, and soil (NEESA, 1990), but this has not been confirmed.

The PFAS PA (CH2M, 2021) identified Site 1 as a potential PFAS release area. Because waste did not leave the installation prior to 1991, it is possible that AFFF containers from Building 6 were disposed of at Site 1. Site 1 was previously evaluated for potential releases of chemicals not including PFAS during the 1990 PA (NEESA, 1990) but was not recommended for further investigation at the time.

Site 6 (Blue Campground Landfill)

Site 6 (Blue Campground Landfill) is in the northern part of NRS Jim Creek on Power Line Road near the west bank of Jim Creek (**Figure 2-7**). Site 6 is an approximately 160-square-foot abandoned landfill that is believed to have been in use prior to 1976. The composition and quantity of waste disposed of at Site 6 are unknown. An approximately 2-foot-thick uncompacted soil cover was placed over Site 6 in 1984 (NEESA, 1990).

The PFAS PA (CH2M, 2021) identified Site 6 as a potential PFAS release area. Because waste did not leave the installation prior to 1991, it is possible that the AFFF containers from Building 6 were disposed of at Site 6. Site 6 was previously evaluated for potential releases of chemicals not including PFAS during the 1990 PA (NEESA, 1990) as a site that warranted further investigation at the time. The results of field activities indicated that no visible evidence of chemicals was detected at Site 6 (URS, 1991).

Site 7 (Pit Road Landfill)

Site 7 (Pit Road Landfill) is in the northern part of NRS Jim Creek along Pit Road on the west side of Jim Creek (**Figure 2-7**). Site 7 is an approximately 4,200-square-foot abandoned landfill (NEESA, 1990) that is believed to have been in use prior to 1976. In 1984 it was covered with an approximately 2-foot-thick uncompacted soil cover (NEESA, 1990). Material identified in the landfill include plastic cable casings, concrete fragments, tires, asphalt fragments, empty metal 10-gallon containers, furniture, lumber, scrap metal, and steel cable (NEESA, 1990).

The PFAS PA (CH2M, 2021) identified Site 7 as a potential PFAS release area. Because waste did not leave the installation prior to 1991, it is possible that the AFFF containers from Building 6 were disposed of at Site 7. Site 7 was previously evaluated for potential releases of chemicals not including PFAS during the 1990 PA (NEESA, 1990) but was not recommended for further investigation at the time.

Site 4 (Metal Burial Pit)

Site 4 (Metal Burial Pit) is in the northern part of NRS Jim Creek near the intersection of Hatchery Road and Jim Creek Road (**Figure 2-8**). Site 4 is an approximately 3,600-square-foot abandoned disposal area. Site 4 was an unlined natural depression that was reportedly in use prior to 1976 until 1984 when it was covered with an approximately 2-foot-thick uncompacted soil cover. The type and quantity of material disposed of at this location are unknown (NEESA, 1990).

The PFAS PA (CH2M, 2021) identified Site 4 as a potential PFAS release area. Because waste did not leave the installation prior to 1991, it is possible that the AFFF containers from Building 6 were disposed of at Site 4. Site 4 was previously evaluated for potential releases of chemicals not including PFAS during the 1990 PA (NEESA, 1990) but was not recommended for further investigation at the time.

Site 5 (Mixed Waste Landfill)

Site 5 (Mixed Waste Landfill) is in the northern part of NRS Jim Creek on the south side of Burma Road. Site 5 is an approximately 20,000-square-foot abandoned landfill (**Figure 2-8**). Site 5 was an unlined landfill historically used for the disposal of NRS Jim Creek's waste material during 1976 to 1984 when it was covered by 2-foot-thick soil cover (NEESA, 1990). While the type and quantity of material that was disposed of at this location is unknown, it is believed to include oils, greases, solvents, and paint sludges because these materials were historically generated at NRS Jim Creek in small quantities (NEESA, 1990). Empty 55-gallon drums (potentially herbicide storage containers) and electrical transformers were identified in the fill material during final cover operations in 1984 (NEESA, 1990).

The PFAS PA (CH2M, 2021) identified Site 5 as a potential PFAS release area. Because waste did not leave the installation prior to 1991, it is possible that the AFFF containers from Building 6 were disposed of at Site 5. Site 5 was previously evaluated for potential releases of chemicals not including PFAS during the 1990 PA (NEESA, 1990) as a site that warranted further investigation at the time. The results of field sampling activities indicated no chemicals were detected at Site 5 at levels warranting additional actions (URS, 1991). However, sampling for PFAS was not conducted during this investigation.

Bio Pit Disposal Area

The "Bio Pit" Disposal Area at NRS Jim Creek (**Figure 2-7**) is an active disposal area for grass clippings and other plant debris. Initial timeframe of use of this area for disposal is unknown. Sludge removed from stormwater catch basins at NRS Jim Creek is also disposed in this area (CH2M, 2021).

The PFAS PA (CH2M, 2021) identified the Bio Pit Disposal Area as a potential PFAS release area but the area was recommended for no further investigation. The Bio Pit Disposal Area was to be investigated only if SI results indicate that the catch basin near Building 6 has been impacted by PFAS and there was evidence that PFAS-containing vegetative debris or sediment was transported to the Bio Pit Disposal Area (**Figure 2-5**).

2.1.3 Naval Recreation Complex Pacific Beach

NRC Pacific Beach occupies approximately 53 acres in western Grays Harbor County adjacent to the Pacific Ocean approximately 36 miles northwest of Aberdeen, Washington (**Figure 2-1**). The installation was initially developed by the Navy at the start of World War II as a communications center and range for training purposes (NEESA, 1991). By 1956, the Navy moved training operations closer to Puget Sound and Seattle. Defense equipment and associated infrastructure, such as gun mounts, ammunition magazines, and related buildings, were demolished and replaced with more conventional structures (NEESA, 1991). By the late 1970s, military housing was no longer required, and the installation was converted into a recreational facility with single-family homes and dormitory-type buildings. In 1984, a 1-acre recreational vehicle and motor home park was built along the northern boundary of the installation and exists to this day. There are currently no active military operations at NRC Pacific Beach.

The PFAS PA (CH2M, 2021) identified one area at NRC Pacific Beach as a potential PFAS release area, and the area was recommended for further investigation in an SI. This area is Building 106 (Former Fire Station) (**Figure 2-9**).

Building 106 (Former Fire Station)

Building 106 (Former Fire Station) is in the east-central part of NRC Pacific Beach along 1st Street North (**Figure 2-10**). Building 106 is a 3,929-square-foot building built in 1958 (Navy, 2018b) and was originally constructed as part of the Sound Surveillance System (SOSUS) facilities and served as the Boiler Plant, Garage, and Fire Station. Building 106 is no longer a functioning fire station and is now used as a recycling center and for storage and maintenance of grounds keeping equipment and some flammable storage (CH2M, 2021). It is presumed that Building 106 was operational as a fire station soon after it was constructed in 1958. The SOSUS facility at NRC Pacific Beach was decommissioned in 1987; most of the facility, including Building 106, was turned over to NAVSTA Everett for management at that time (NAVFAC, 2017).

The PFAS PA (CH2M, 2021) identified Building 106 as a potential PFAS release area. There was no known storage, use, or release of AFFF at this site. However, the operational timeframe of Building 106 as a fire station, from the late 1950s through the 1980s, overlaps with the timeframe in which AFFF has been in use by the Navy. If AFFF transfer or washing of fire trucks occurred on fire truck ramps east and west of Building 106, AFFF or AFFF residual could have been splashed or washed onto the pavement and migrated to nearby unpaved areas with overland drainage. Previous environmental investigations have not been performed at Building 2114.

2.2 Environmental Setting

This section provides the environmental setting of NAVSTA Everett, NRS Jim Creek, and NRC Pacific Beach.

2.2.1 Climate

The climate near NAVSTA Everett and NRS Jim Creek is characterized by cool, dry summers, and wet, cool winters (NEESA**,** 1984). Average high temperatures during the summer months range from 65 to 80 degrees Fahrenheit (°F)**,** while winter highs are typically in the 40°F range (Weatherbase, 2019a). Average annual precipitation is

approximately 36 inches, approximately three-fourths of which falls between October and April. The Everett area receives approximately 7 inches of snowfall annually (Weatherbase, 2019b).

The climate at NRC Pacific Beach is characterized by, cool, dry summers and mild winters. Based on available data for Taholah, Washington, approximately 10 miles north on the coast and the closest area with historical weather data, average temperatures during the summer months range from 50 to 60°F, with winter temperatures ranging from 35 to 50°F. The average annual precipitation is approximately 88 inches, with the greatest amount of precipitation falling in November through February. The area receives approximately 3 inches of snow per year (Weatherbase, 2023).

2.2.2 Topography and Hydrologic Setting

Naval Station Everett

Marine or brackish water bodies on and near the site include Port Gardner Bay and East Waterway. The East Waterway is south of NAVSTA Everett and flows into Port Gardner Bay which is an inlet of Possession Sound (**Figure 2-2**). Port Gardner Bay and Possession Sound are part of Puget Sound. The Snohomish River discharges into Port Gardner Bay through a channel between the mainland including the western boundary of NAVSTA Everett and Jetty Island (**Figure 2-2**). The overall surface water flow direction at NAVSTA Everett is to the west toward the Snohomish River and Port Gardner Bay (**Figure 2-2**).

Much of NAVSTA Everett is covered in low-permeability surfaces (extensive paved areas and low-permeability soil) with stormwater infrastructure to capture and control surface water. Stormwater catchments collect and divert water to Puget Sound (NEESA, 1992).

Naval Radio Station Jim Creek

The primary water bodies at or near NRS Jim Creek are Jim Creek, Little Jim Creek, Big Jim Creek, and Cub Creek (**Figure 2-4**). Jim Creek flows northwesterly through the installation. Little Jim Creek and Big Jim Creek flow into Jim Creek near the eastern boundary of the installation. The on-Base reach of Cub Creek begins at the southwestern boundary of NRS Jim Creek in a wetland area south of Twin Lakes. From Twin Lakes, Cub Creek flows north to Cub Creek Reservoir and then into Jim Creek (Malcolm Pirnie, 2006). Jim Creek and Cub Creek are fed by numerous small spring and snow-fed streams (NEESA, 1990).

Naval Recreation Complex Pacific Beach

There are no perennial streams, lakes or other surface water bodies at NRC Pacific Beach (**Figure 2-9**). The nearest major freshwater body is Joe Creek, which empties to the Pacific Ocean approximately half a mile to the south. Surface runoff is drained west toward the Pacific Ocean along two ravines referred to as the Northern and Southern Drainage Ravines. The poor drainage of the soil has contributed to the slope destabilization as subsurface flow is concentrated in the porous soil layers and finer material is gradually washed away. As a result, slope failure has been and continues to be a problem at Pacific Beach (NAVFAC, 2017).

2.2.3 Geologic Setting

Naval Station Everett

Everett is in the Puget Lowland, a large structural trough between the Cascade Range and the Olympic Mountains. The site vicinity is bounded by active fault zones in the Everett Basin. The geology of the region surrounding NAVSTA Everett is the result of glaciation. The most recent glacial action occurred between 15,000 and 13,500 years ago during the Vashon State of the Fraser Glaciation (URS, 1992a).

NAVSTA Everett is within the historic tidal zone of the East Waterway (**Figure 2-2**). The geologic setting of NAVSTA Everett has been altered by import and placement of dredged and fill materials from the East Waterway, demolition and woody debris from former sawmill operations, and hydraulic fill from the Snohomish River channel (NEESA, 1992; AECOM, 2011). Fill material thickness ranges from 20 to 27 feet below ground surface (bgs)

(AECOM, 2011). Native soils beneath the fill consist of marine and deltaic sediments extending to depths in excess of 180 feet.

Beneath the fill and native soils are Pleistocene glacial outwash deposits and till deposits. Outwash sediments consist of well-bedded fine to medium sands and gravel with occasional silt lenses. Till sediments consist of compact, unsorted sand, gravel, and cobbles in a matrix of silt and clay. East of NAVSTA Everett, Holocene fluvial sands and gravels cut into the glacial sediments. Tertiary bedrock underlies the glacial and fluvial sediments. The average depth to bedrock in western Snohomish County is about 500 feet, but it can be more than 1,200 feet near the Puget Sound coastline (Thomas et al., 1997).

Naval Radio Station Jim Creek

NRS Jim Creek is within a U-shaped valley that trends northwest-southeast (**Figure 2-4**). The valley is bordered by Ebey Hill to the northwest, Wheeler Mountain to the northeast, and Blue Mountain to the southwest (TEC, 2001). The geomorphology of the valley is the result of Pleistocene glacial activity. Bedrock is composed of metamorphic and igneous rocks, including slate, phyllite, and graywacke (TEC, 2001). Cross sections of nearby areas to the north and south of NRS Jim Creek indicate that maximum depth to bedrock is 300 feet (Thomas et al., 1997). Valley fill sediments consist of talus, glacial moraine, landslide debris, and alluvial sand and gravel deposits with interbedded silt and clay. Landslides are common because of the low soil stability that is due in part to the presence of glacial sediments. However, there is no evidence of large-scale seismic activity (Malcolm Pirnie, 2006).

Naval Recreation Complex Pacific Beach

NRC Pacific Beach is at the northernmost extent of the Willapa Hills physiographic province of southwestern Washington (**Figure 2-9**). The basement rocks of the Willapa Hills are composed mainly of Eocene to Miocene pillow basalts and oceanic sedimentary rocks that accreted onto North America. Unconsolidated Pliocene and Pleistocene costal sediments and glacial debris overlay the basement rocks (PWCSD, 1996). The Pacific Beach Annex is situated on a bluff comprised of silty glaciolacustrine sediments overlying glacial outwash plains (NAVFAC, 2017). The stratigraphy of the subsurface consists of an organic-rich surface layer approximately 1 to 2 feet thick underlain by alternating layers of silt/clay and sand/gravel, which continue to a few 100 feet bgs. Because of development at the site, much of the topsoil has been removed and replaced with sandy gravel fill (URS, 1992b; Foster Wheeler, 1997). During the installation of new monitoring wells for this investigation, sand or gravel with silt was observed in the upper 5 to 10 feet underlain by primary sand/gravel with some clay/silt.

2.2.4 Hydrogeologic Setting

Naval Station Everett

Available hydrogeologic information for the immediate vicinity of NAVSTA Everett is minimal; however, United States Geological Survey published a general study of the regional hydrogeology of western Snohomish County (Thomas et al., 1997). The Pleistocene and Holocene sediments in western Snohomish County are classified into six hydrostratigraphic units consisting of four aquifers and two confining units:

- Alluvium aquifer (Qal) – Unconfined, 40 to 120 feet thick where present. Qal consists of fine to coarse sands with lenses of silt and gravel. Qal is often vertically contiguous and hydraulically connected with other lower aquifer units. In such cases, multiple aquifer units function as one aquifer rather than independent aquifers. Qal does not appear to be prominent locally at NAVSTA Everett.
- Vashon recessional outwash aquifer (Qvr) – Unconfined, 40 to 250 feet thick where present. Qvr consists of well sorted sand and gravel with minor silt beds. Qvr does not appear to be prominent locally at NAVSTA Everett.
- The Vashon till confining unit (Qvt) – 70 to 250 feet thick. Qvt consists of unsorted sand, gravel, and boulders in a silt and clay matrix with some lenses of sand and gravel.

- Vashon advance outwash aquifer (Qva) – 120 to 350 feet thick. Qva consists of fine sand and gravel with some silt lenses. Qva is the source of most potable groundwater supply in the area and is the most aerially extensive aquifer unit.
- Transitional beds confining unit (Qtb) – 100 to 400 feet thick. Laminated sand and silty clay. Although Qtb is classified as a confining unit, it can yield usable amounts of water.
- Undifferentiated sediments aquifer (Qu) – 500 to 1,000 feet thick. Qu is not well defined, but generally consists of coarse-grained materials.
- Bedrock confining unit (Tb) – Although Tb is classified as a confining bed, it can yield small amounts of water from fractures and joints.

Based on previous reports and the 2022 SI data, depth to groundwater at NAVSTA Everett is tidally influenced and ranges from 5.5 to 14 feet bgs (NEESA, 1992). Groundwater generally flows toward the Snohomish River channel and Port Gardner Bay (URS, 1993). Shallow groundwater flow is influenced by the consistency of the fill materials (URS, 1993). Shallow lithology encountered during the SI is shown in **Table 4-1** and in **Appendix B**. Based on this investigation, groundwater in the unconfined aquifer is confirmed to flow west toward the Snohomish River channel (**Figure 2-2**).

Naval Radio Station Jim Creek

Available site-specific hydrogeologic information for NRS Jim Creek does not mention specific regionally recognized hydrostratigraphic units; however, cross sections of nearby areas to the north and south of NRS Jim Creek indicate that several hydrogeologic units present at NRS Jim Creek, including the Qal aquifer, Qvr aquifer, Qvt confining unit, the Qva aquifer, and the Tb confining unit (Thomas et al., 1997), are likely present near Jim Creek.

Water bearing formations near NRS Jim Creek are considered highly permeable and consist of coarse to medium sands (NEESA, 1990). Shallow groundwater is found at approximate depths ranging from 4.5 to 20 feet bgs (TEC, 2001). The shallow groundwater is in hydraulic communication with Jim Creek and other surface water bodies (TEC, 2001). Lithology from boring logs of wells near NRS Jim Creek indicate the presence of three hydrostratigraphic units described as follows:

- Upper aquifer – Silty sand with some gravel generally between 0 and 30 feet thick along the valley floor but can be over 250 feet thick in elevated areas above the valley floor. These soils likely represent the Qal and Qvr aquifer units.
- Middle confining unit – Silt and clay up to 100 feet thick. These soils likely represent the Qvt confining unit.
- Lower aquifer – Fine sand with some silt and gravel. These soils likely represent the Qva aquifer.

The shallow groundwater gradient is assumed to mimic topography and flow toward one of the three primary perennial streams that exist at NRS Jim Creek: Jim Creek, Little Jim Creek, or Cub Creek (**Figure 2-4**). Site-specific groundwater elevations collected during this SI across the seven sites at the installation generally supports this flow system. The groundwater flow direction in the developed northwest portion of NRS Jim Creek is to the northwest and west toward Jim Creek (**Figure 2-4**). Based on the 2022 SI data, depth to groundwater at NRS Jim Creek ranges from 4 to 240 feet bgs, and water level measurements collected at each site support the flow directions indicated above. Site-specific lithology and hydrogeology are presented in **Tables 4-2** through **4-7** and Appendix B. During the wet season (November through May), perched groundwater can be found above a hardpan layer that is present between 20 and 40 inches bgs (Malcolm Pirnie, 2006). A deeper aquifer is present below depths of approximately 114 feet bgs (Malcolm Pirnie, 2006). Information is not available on groundwater flow directions in the deeper aquifer.

Naval Recreation Complex Pacific Beach

The glacial soils at Pacific Beach are poorly drained resulting in a water table that is relatively high (URS, 1992a). During the wet season (October to May), the water table can range from 6 inches deep to above the surface

(URS, 1992b). Some evidence exists indicating this high water table may actually represent seasonal perched water rather than the regional water table; some investigations at the site did not encounter groundwater until below 14 feet in depth (PWCSD, 1996). A shallow aquifer is present between 10 and 25 feet below the surface, and several monitoring wells are screened within this interval. Static water levels at these wells indicate that water table is between 10 and 15 feet bgs and that the groundwater flow direction is to the west toward the Pacific Ocean (**Figure 2-9**) (Foster Wheeler, 1997). Historically, two on-Base water supply wells (now decommissioned) were both screened from 163 to 168 feet deep (NEESA, 1991; Lukjanowicz, 1984), which indicates the presence of at least one deeper aquifer. However, additional information on deeper aquifers was not available. Based on the 2022 SI data, depth to groundwater at NRC Pacific Beach is approximately 12 to 13 feet bgs. Site-specific lithology and hydrogeology are presented in **Table 4-8** and **Appendix B.**

2.3 On-Base and Off-Base Drinking Water Source Evaluation

This section discusses the sources of drinking water at the installation and in the adjacent off-Base areas and whether on-Base or off-Base drinking water could have been impacted by the potential PFAS release areas investigated as part of the SI.

2.3.1 Naval Station Everett

- **Public Drinking Water Sources –** On-Base drinking water at NAVSTA Everett is supplied by the City of Everett. The City of Everett's water supply source is Spada Lake Reservoir that is approximately 25 miles east of NAVSTA Everett. One public water supply well was confirmed to have been abandoned. No active public supply wells are identified within 1 mile of the installation boundary. PFAS were not detected in the City of Everett's drinking water. Therefore, there are no known PFAS exposure pathways to human receptors through public drinking water sources.
- **Private Drinking Water Sources –** Based on data obtained from the Washington State Department of Ecology (Ecology) (2018) and Washington State Department of Health (DOH), several wells may exist within 1 mile to the north-northeast and south of NAVSTA Everett; however, the exact number of wells and their locations, current operational status (active or abandoned), depth, and usage are not well documented. Some of these wells are suspected to be monitoring wells because of depth, location, and Navy contractor affiliation. During visual reconnaissance of the approximate monitoring well locations and the general Everett area, no drinking water or groundwater monitoring wells were observed. Because potential private drinking water wells are not located downgradient of PFAS release areas, exposure to PFAS in groundwater used as drinking water is unlikely.

2.3.2 Naval Radio Station Jim Creek

- **Public Drinking Water Sources –** Drinking water at NRS Jim Creek is supplied by an on-Base water supply well that is centrally located. The total depth of the well is approximately 126 feet bgs and is screened from 116 to 126 feet bgs in the lower aquifer unit. The well is not downgradient of potential PFAS release areas. The well was sampled for PFAS in November 2020, and perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) were not detected. Based on available information (Ecology/DOH, 2018), no public drinking water sources are within a 1-mile radius of NRS Jim Creek.
- **Private Drinking Water Sources –** Based on data obtained from Ecology (2018) and DOH, at least nine private drinking water wells (total depths ranging from 25 to 320 feet bgs) are within 1 mile of NRS Jim Creek, north/northwest of NRS Jim Creek. Groundwater in the northwestern portion of NRS Jim Creek flows to the northwest and west toward Jim Creek, while Jim Creek flows to the west away from the northwest corner of the installation, and away from these wells. Shallow groundwater is assumed to mimic topography and flow toward one of primary surface water bodies at NRS Jim Creek. As stated in **Section 2.2.4** based on regional stratigraphy, evidence of a middle confining unit of silt and clay are present at a depth of 100 feet, separating

the shallow and deeper aquifers. Therefore, vertical migration of PFAS constituents to the deeper regional aquifer is unlikely. Transport via surface water of PFAS to downstream off-Base human receptors, if present in Jim Creek, is possible. Because the identified private drinking water wells are north of NRS Jim Creek and Jim Creek flows west from the northwest corner of NRS Jim Creek, exposure to PFAS in groundwater used as drinking water is unlikely.

2.3.3 Naval Recreation Complex Pacific Beach

- **Public Drinking Water Sources –** Drinking water at NRC Pacific Beach is supplied by the Grays Harbor County Pacific Beach Water System (Gibbs & Olson, 2016). NRC Pacific Beach drinking water was sampled for PFAS in September 2016, and PFOS and PFOA were not detected. The source of the Grays Harbor Pacific Beach Water system consists of three production wells, which are within 1 mile of the installation boundary to the east. These wells are screened at depths ranging from 166 to 222.5 feet bgs (Gibbs & Olson, 2016). The three wells are upgradient of NRC Pacific Beach. Other public drinking water sources were not identified within 1 mile of the installation boundary. Because the identified public drinking water wells are upgradient, exposure to PFAS in groundwater used as drinking water is unlikely.
- **Private Drinking Water Sources –** Based on data obtained from the Ecology (2018) and DOH, no private drinking water wells exist within 1 mile of NRC Pacific Beach. Therefore, there are no known PFAS exposure pathways to human receptors through private drinking water sources.

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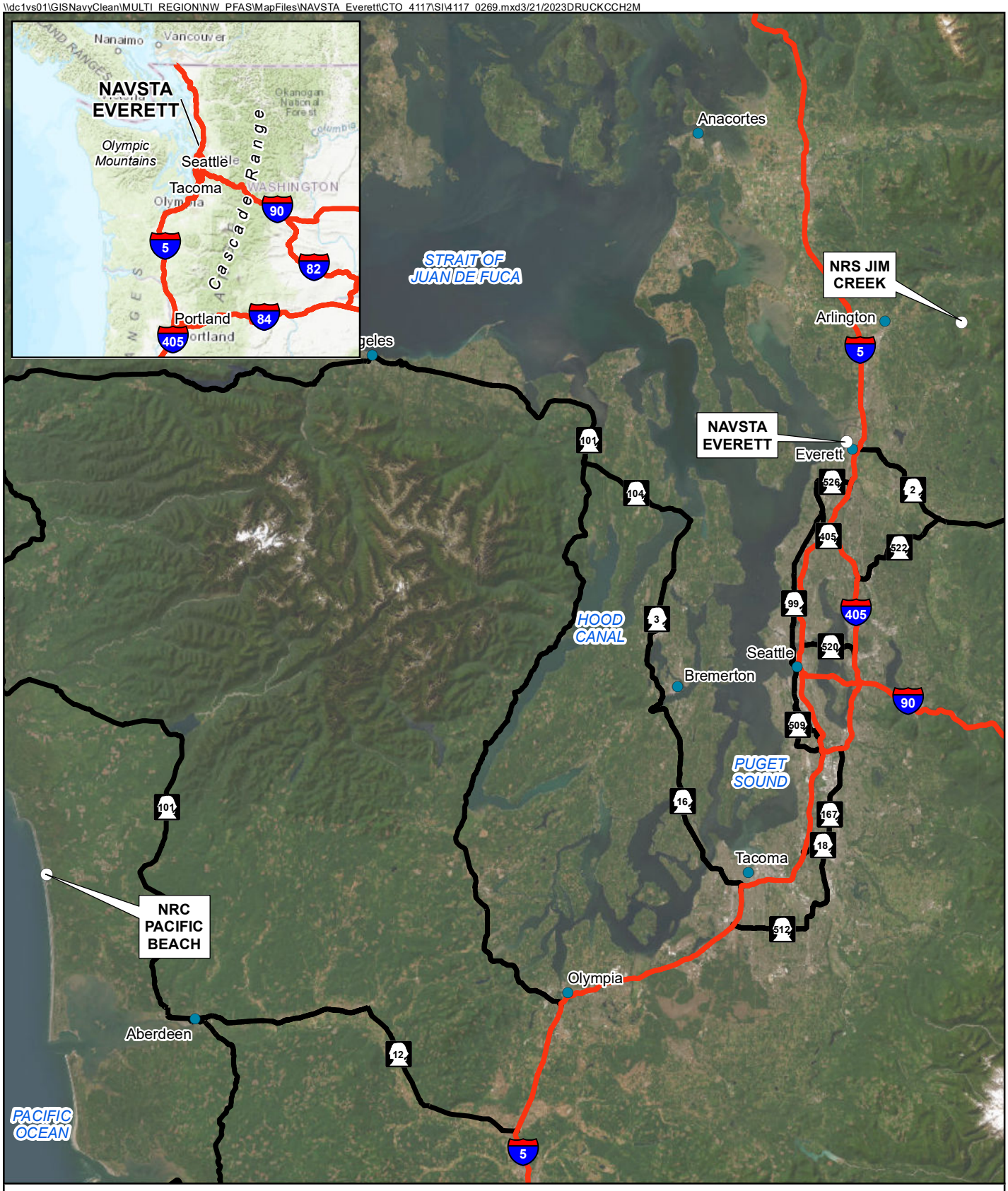

LEGEND

- Installation Location
- City
- Freeway
- State Route

NOTES:
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Imagery, 2022

Figure 2-1
Installation Locations
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek, NRC Pacific Beach, Washington

0 8 16 Miles
1 inch = 16 miles

N

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LEGEND

- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Potential PFAS Release Area
- Installation Boundary

NOTES:
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances
Easements granted to the Navy/United States not shown.

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, Maxar, 2022

Figure 2-2
Potential PFAS Release Areas: NAVSTA Everett
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek, NRC Pacific Beach, Washington

0 425 850 Feet
1 inch = 850 feet
N

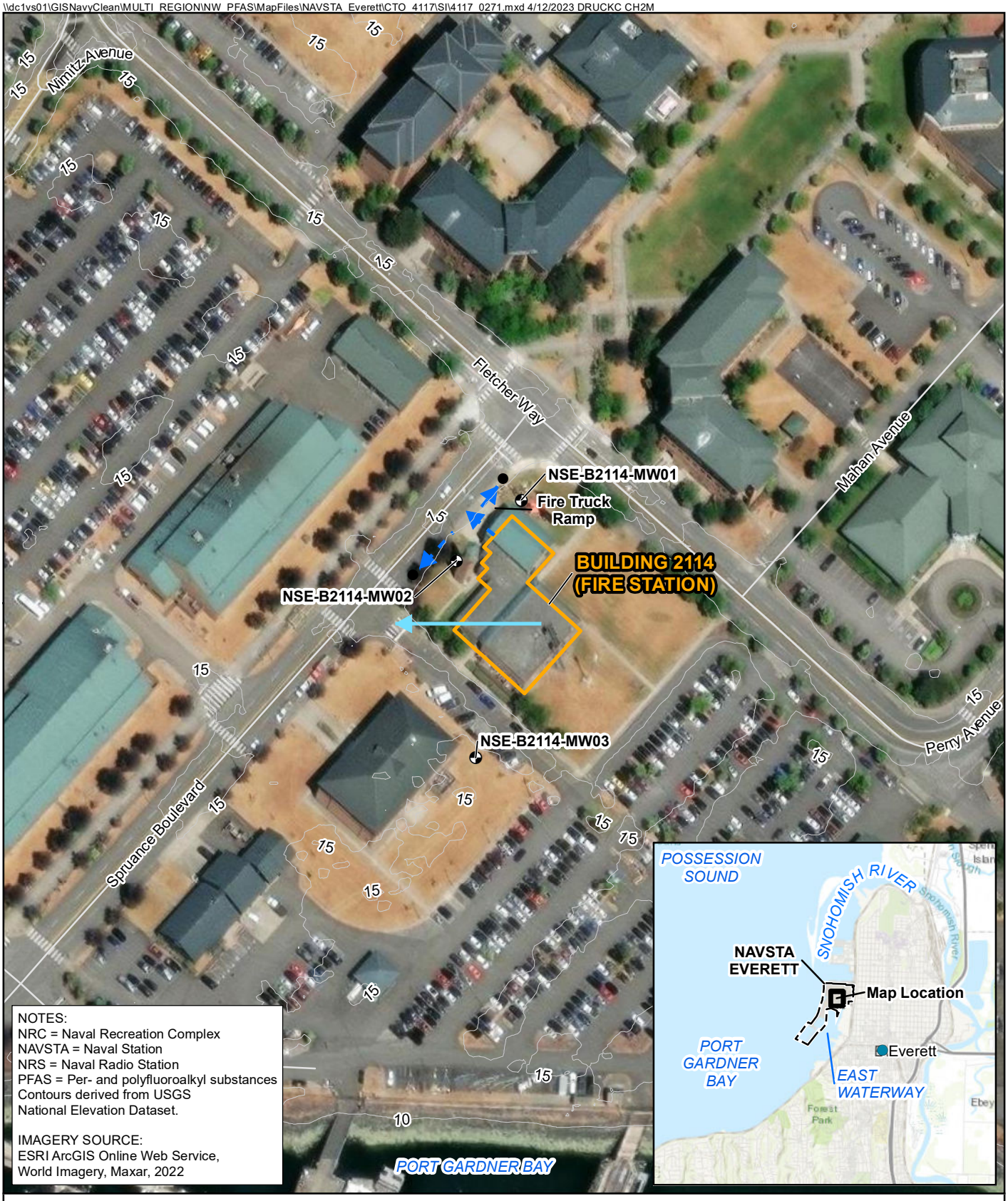

Figure 2-3
Site Layout and Sampling Locations: NAVSTA Everett, Building 2114
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

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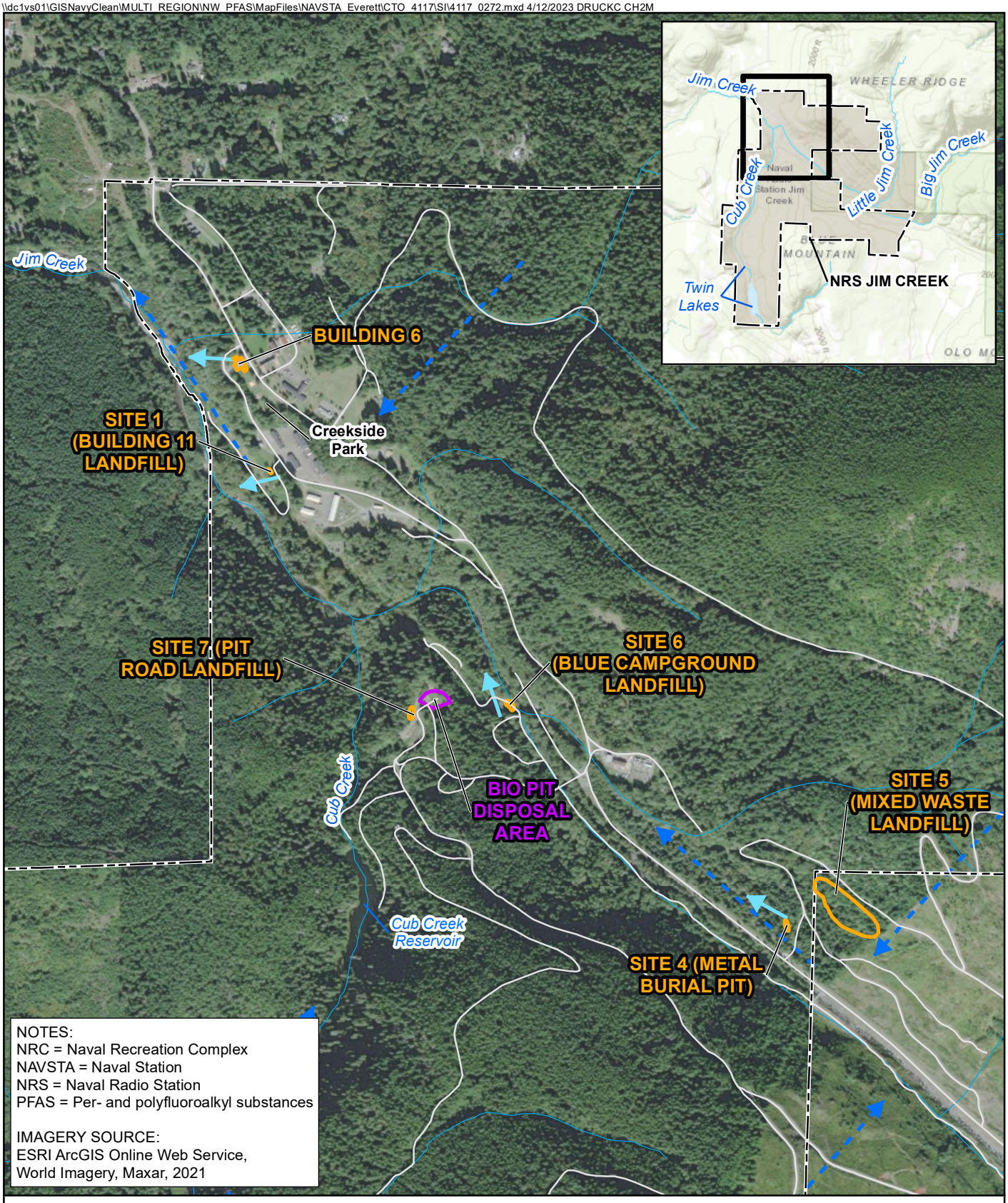

NOTES:
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Imagery, Maxar, 2021

LEGEND

- Surface Waterbodies
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Potential PFAS Release Area
- Potential PFAS Release Area (No Further Action Determination Deferred in Preliminary Assessment)
- Installation Boundary

Figure 2-4
Potential PFAS Release Areas: NRS Jim Creek
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 0.1 0.2 Miles

1 inch = 0.2 mile

N

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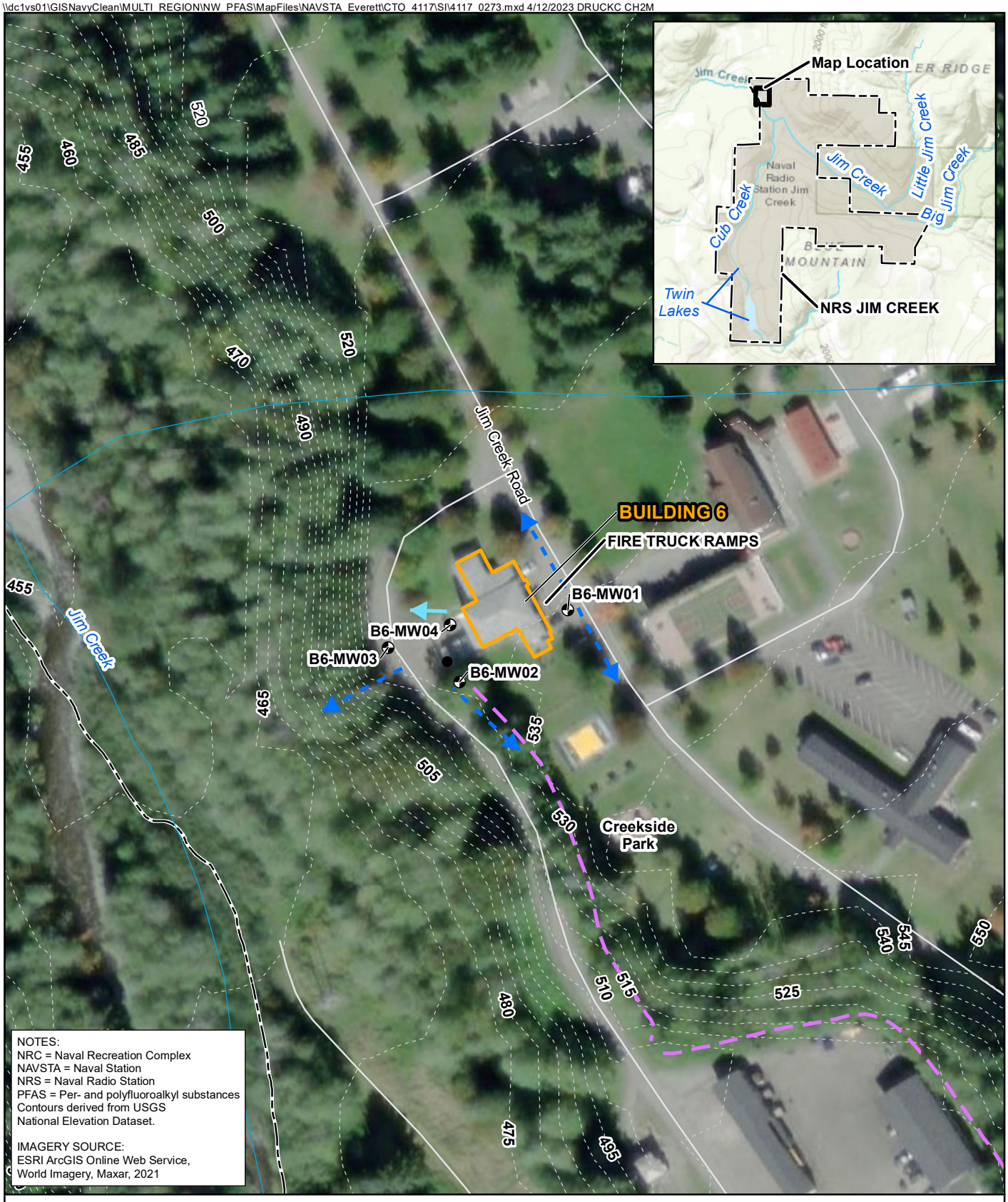

Figure 2-5
Site Layout and Sampling Locations: NRS Jim Creek, Building 6
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

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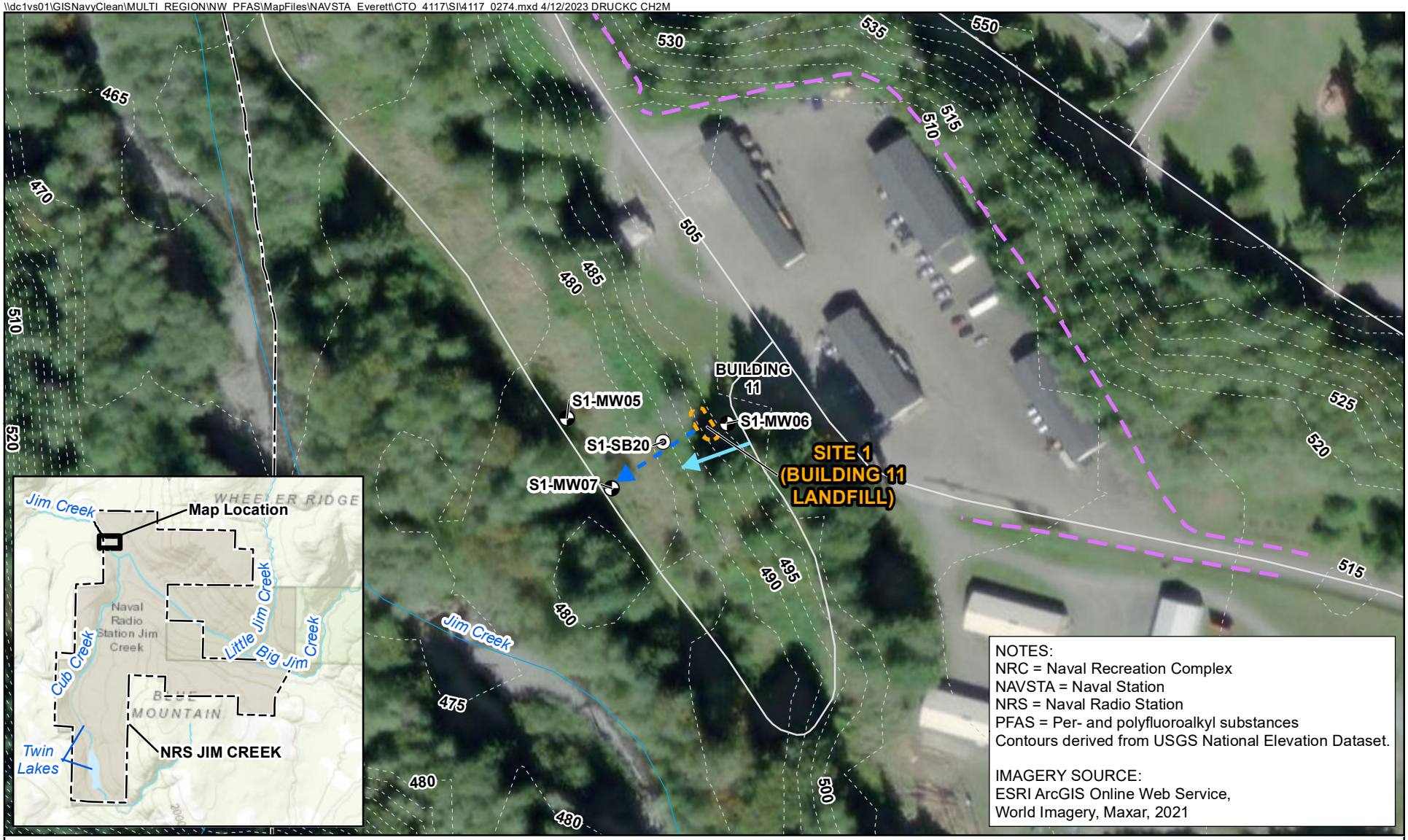

LEGEND

- Monitoring Well and Soil Sampling Location
- Shallow Subsurface Soil Sample Location
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Unpaved Ditch
- 5' Topographic Contours
- Surface Waterbodies
- Potential PFAS Release Area (assumed boundary)
- Installation Boundary

Figure 2-6

Site Layout and Sampling Locations: NRS Jim Creek, Site 1

Site Inspection for PFAS

NAVSTA Everett, NRS Jim Creek,

NRC Pacific Beach, Washington

0 75 150 Feet

1 inch = 150 feet

N

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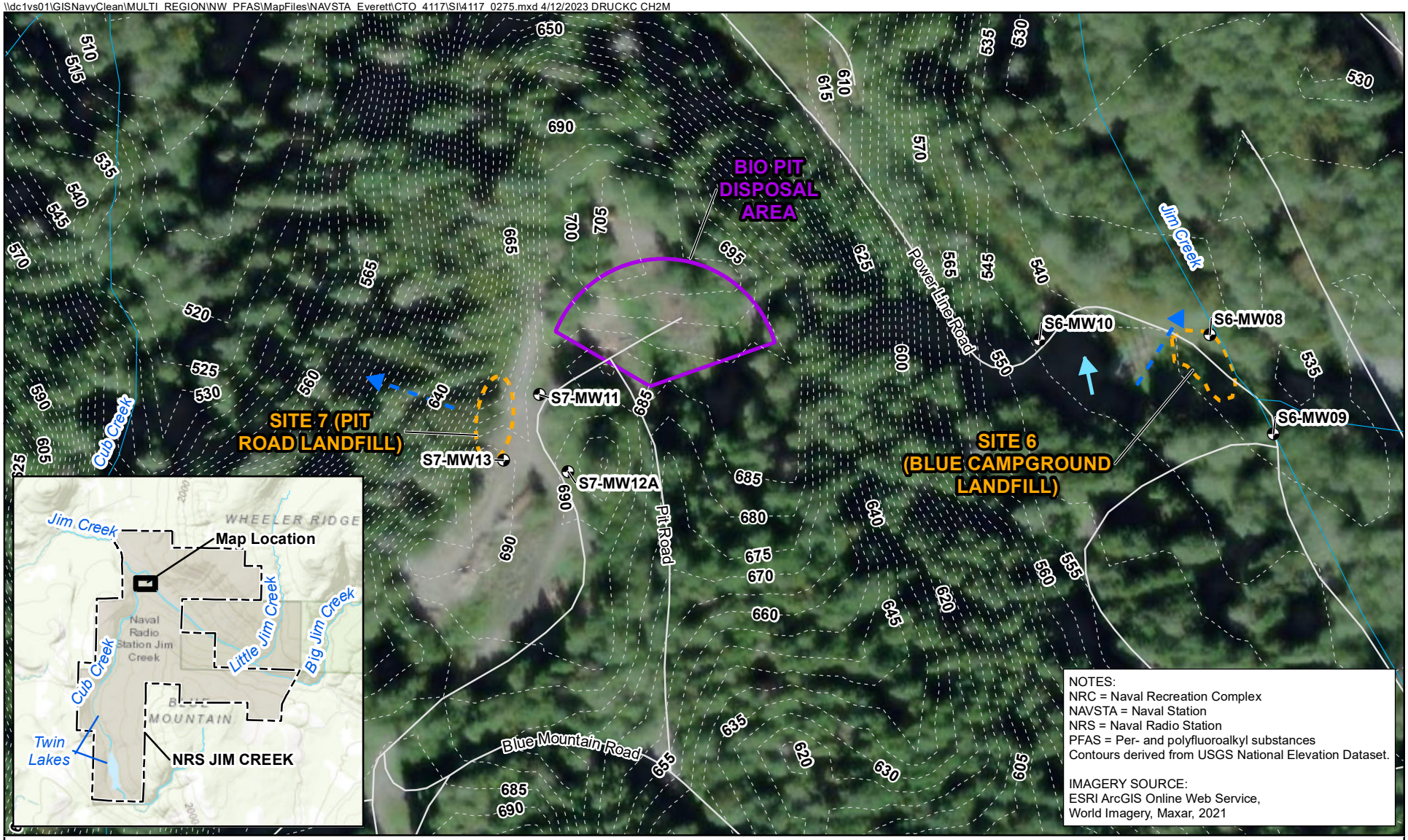

LEGEND

- Monitoring Well and Soil Sample Location
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Surface Waterbodies
- 5' Topographic Contours
- Potential PFAS Release Area (assumed boundary)
- Potential PFAS Release Area (No Further Action Determination Deferred in Preliminary Assessment)
- Installation Boundary

Figure 2-7

Site Layout and Sampling Locations: NRS Jim Creek, Sites 6 and 7

Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 75 150 Feet

1 inch = 150 feet

N

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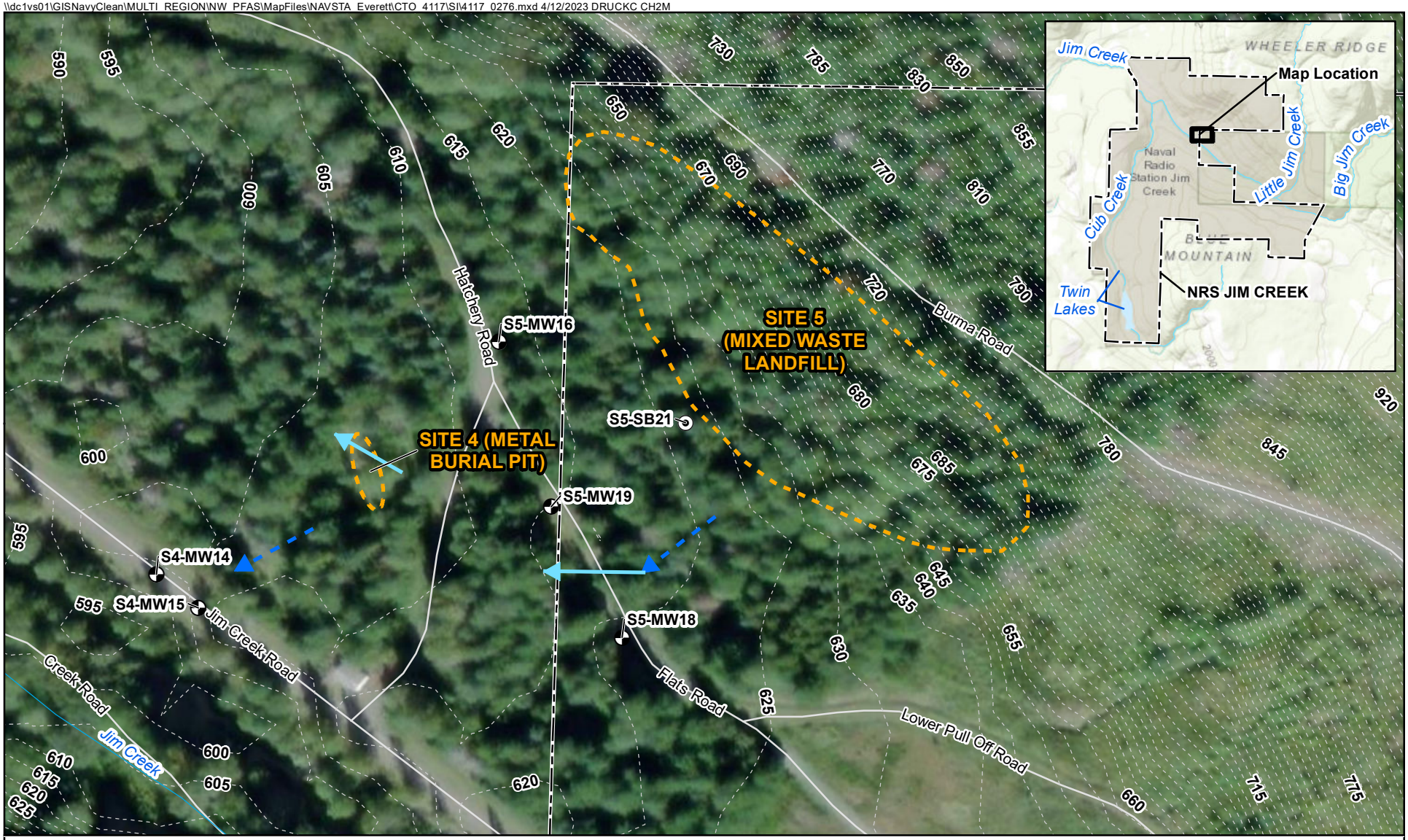

LEGEND

- Monitoring Well and Soil Sampling Location
- Shallow Subsurface Soil Sample Location
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- 5' Topographic Contours
- Surface Waterbodies
- Potential PFAS Release Area (assumed boundary)
- Installation Boundary

NOTES:
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances
Contours derived from USGS National Elevation Dataset.

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Imagery, Maxar, 2021

Figure 2-8
Site Layout and Sampling Locations: NRS Jim Creek, Sites 4 and 5
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 75 150 Feet
1 inch = 150 feet
N

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NOTES:
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Imagery, Maxar, 2019

LEGEND

- Major Road
- Surface Waterbodies
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Potential PFAS Release Area
- Installation Boundary

Figure 2-9
Potential PFAS Release Areas: NRC Pacific Beach
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 0.05 0.1 Miles
1 inch = 0.1 mile

N

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LEGEND

- Monitoring Well and Soil Sample Location
- Important Local Road
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Surface Waterbodies
- 20' Topographic Contours
- Potential PFAS Release Area
- Installation Boundary

Figure 2-10

Site Layout and Sampling Locations: NRC Pacific Beach, Building 106

Site Inspection for PFAS

NAVSTA Everett, NRS Jim Creek,

NRC Pacific Beach, Washington

0 75 150 Feet

1 inch = 150 feet

N

SECTION 3

Field Investigation Methodology

This section describes the field activities, which were performed in accordance with the SAP (CH2M, 2022) except where noted. Field activities were conducted in multiple mobilizations from May 2022 to March 2023 and included site reconnaissance preparation, utility clearance, drilling and installation of monitoring wells, soil sampling, monitoring well sampling, synoptic groundwater elevation measurements, and investigation-derived waste (IDW) removal. Field notes are provided in **Appendix A**.

3.1 Site Preparation and Utility Clearance

Prior to intrusive investigation activities, a third-party utility clearance subcontractor clearly marked subsurface utilities with spray paint near proposed boring locations. Subsurface utilities were marked within 5 feet of the proposed boring locations. In addition, utility locate tickets were submitted to Washington 811 and private and state entities marked their respective utilities near the proposed drilling locations. Conductive and nonconductive utility locate techniques were applied to mark all utilities present.

3.2 Archaeological Monitoring

Five discontiguous Areas of Potential Effect (APEs) at NRS Jim Creek were identified for SI activities. Limited cultural resource investigations have been completed within NRS Jim Creek, and the five discontiguous APEs are along or near streams that are considered to have a moderate to high potential for buried archaeological deposits. Given these factors, archaeological monitoring was conducted by a CH2M professional archaeologist for ground disturbing activities at the SI locations within the five discontiguous APEs. Archaeological monitoring at Jim Creek followed the methods, protocols, and guidance described in the NAVSTA Everett Inadvertent Discovery Plan. Archaeological resources or evidence of buried resources were not encountered during archaeological monitoring of SI activities.

3.3 Monitoring Well Installation

Three monitoring wells were constructed at NAVSTA Everett at Building 2114 (Fire Station). Eighteen monitoring wells were constructed at NRS Jim Creek: four at Building 6 (Former Fire Station), three at Site 1 (Building 11 Landfill), three at Site 6 (Blue Campground Landfill), three at Site 7 (Pit Road Landfill), two at Site 4 (Metal Burial Pit), and three at Site 5 (Mixed Waste Landfill). Three monitoring wells were constructed at NRC Pacific Beach at Building 106 (Former Fire Station). The monitoring wells were installed in accordance with the State of Washington well construction standards by a Washington-licensed driller. Well construction reports were submitted to Ecology following construction. Borehole advancement was conducted using a rotosonic drill rig, and continuous soil cores were extruded and collected in plastic sleeves and logged for lithology. Borehole advancement and soil logging were conducted in accordance with the SAP (CH2M, 2022). The locations of the monitoring wells installed are shown on **Figures 3-1** through **3-6**.

Most of the monitoring wells were constructed with 2-inch-inside-diameter Schedule (SCH) 40 polyvinyl chloride (PVC) risers connected to 2-inch inside diameter factory slotted 0.020-inch SCH 40 PVC screen with a bottom cap. NRSJC-S7-MW11, NRSJC-S7-MW12, and NRSJC-S7-MW13 were constructed with 2-inch-inside-diameter SCH 80 PVC risers connected to 2-inch-inside-diameter factory slotted 0.020-inch SCH 80 PVC screen with a bottom cap; additional information on this deviation is provided in **Section 3.13**. SCH 80 PVC was selected due to the greater depth and pressure on these three wells (greater than 200 feet bgs) compared to other wells installed. The depth of the screened intervals varied at each well to screen across the groundwater table, as described in the SAP (CH2M, 2022). Monitoring wells were constructed with 10-foot screens except for monitoring wells NRSJC-S7-MW11 and NRSJC-S7-MW13, which were installed with a 20-foot screened interval. The annular space between the borehole wall and well screen was backfilled with a 2/12 silica sand filter pack placed around the annular space of the well screen extending from the bottom of the boring to a minimum height of 2 feet above the top of

the well screen. For wells screened from 4 to 14 feet bgs (NRSJC-S6-MW-05, NRSJC-S6-MW-07, NRSJC-S6-MW-08, and NRSJC-S6-MW-09), the filter pack sand was placed to only 1 to 1.5 feet above the top of the well screen due to limited available annular space above the screened interval to emplace the sanitary seal. A bentonite seal, at least 2 feet thick, was placed above the top of the sand pack, except for wells NRSJC-S6-MW-08 and NRSJC-S6-MW-09 where the seal was only 1.5 feet thick due to limited depth. After the bentonite had been hydrated, either a cement-bentonite grout or neat cement was placed in the remaining annular space. Well heads were completed as flush-mount manholes or stick-up wells. Monitoring well construction information is provided in **Table 3-1**. Well completion diagrams are provided in **Appendix B**.

To avoid introducing PFAS during the well installation process, drill tooling and well development equipment did not have PFAS-containing components (such as parts or o-rings containing Teflon, Viton, polytetrafluoroethylene and all other fluorinated compounds). In addition, thread lubricant used on the drilling tools and well materials (such as riser, screen, sand, and grout) did not contain polytetrafluoroethylene or other fluorine-containing substance. Coated bentonite pellets were not used to avoid possible introduction of PFAS.

3.4 Monitoring Well Development

After completion of the well installation, each newly installed monitoring well was developed by the drilling subcontractor using a combination of surging, bailing, and pumping. Development did not begin until at least 24 hours after cement or bentonite installation. During monitoring well development, the CH2M field personnel measured water quality parameters (WQPs), including pH, temperature, conductivity, and turbidity with a water quality meter. Development continued until turbidity was below 10 nephelometric turbidity units (NTUs) or at least three well volumes of groundwater were removed.

Development information, including turbidity, pH, specific conductivity, temperature, and gallons of water removed, were recorded as field notes. In addition, the water quality meter was calibrated daily (at a minimum). Well development logs are provided in **Appendix C**. Surge blocks, bailers, and pumps used during development did not contain PFAS.

3.5 Groundwater Level Measurements

A synoptic groundwater elevation survey was conducted at newly installed monitoring wells using a water level indicator. The survey was conducted on August 9, 2022, at NRC Pacific Beach, on August 11, 2022, at NAVSTA Everett, and on December 15, 2022, at NRS Jim Creek, more than 24 hours after well installation and development had been completed. Water levels were remeasured at Building 6 wells on March 1, 2023, to reevaluate groundwater contours that suggested groundwater flows north-northwest based on the December 2022 data. The March 2023 data suggest that groundwater flow at the site is to the west, which is consistent with the anticipated flow direction toward nearby Jim Creek and align more closely with the topographic slope near Building 6. An accurate water level measurement and groundwater sample could not be collected at NRSJC-S7-MW-13 due to insufficient water in the well casing. Depth to water was measured from the top of the PVC riser and recorded to the nearest 0.01 foot. Potentiometric surface maps are presented on **Figures 3-1** through **3-6.** Synoptic groundwater elevations are presented in **Table 3-2**. As shown on **Figure 3-4**, a potentiometric surface map could not be produced using well data from Site 7 due to the lack of a third congruent water level measurement.

3.6 Groundwater Sampling

Groundwater samples were collected from the 23 newly installed monitoring wells under low flow/low stress conditions with a PFAS-free bladder pump, peristaltic pump, or bailer constructed of high-density polyethylene (HDPE). The pump intake was placed at the middle of the well screen interval. Prior to collecting the sample, depth-to-water readings and WQPs were measured and recorded (approximately every 5 minutes) using a depth-to-water meter and water quality meter, which was calibrated daily (at a minimum). For samples collected using a

bailer, either one round of parameters was collected immediately before sampling, or readings were not collected. No sample was collected at NRSJC-S7-MW-13 due to insufficient water in the well casing. Sampling began when three well volumes had been purged or when minimal water level drawdown requirements were met (less than 0.33 foot), and WQPs had stabilized for three consecutive readings in accordance with the SAP (CH2M, 2022), as follows:

- Temperature within 3 percent
- pH within 0.1 pH unit
- Conductivity within 3 percent
- Dissolved oxygen within 10 percent for values greater than 0.5 milligram per liter; if three DO values are less than 0.5 milligram per liter, consider the values stabilized
- Oxidation-reduction potential within 10 millivolts
- Turbidity measurements are less than 5 NTU; if three turbidity values are less than 5 NTU, consider the values stabilized

Once met, depth to water, WQPs, and total well depth measurements were recorded; groundwater sampling data sheets are provided in **Appendix D** and field parameters are presented in **Table 3-3.**

Groundwater was collected in laboratory-supplied HDPE bottles and placed into coolers containing enough ice to keep the samples 0 to 6°C (but not frozen) until they were received by the laboratory. Field quality assurance (QA) and quality control (QC) samples and frequencies are discussed in **Section 3.8**.

To avoid introducing PFAS during groundwater sampling, PFAS-containing equipment and components were not used. The use of PFAS-containing clothing and sunscreen, insect repellant, and other personal hygiene products that may contain PFAS were avoided. Sample tubing was HDPE.

3.7 Soil Sampling

Soil samples were collected at the surface (0 to 1 foot bgs) or near surface if there was nonnative material present (1 to 5 feet bgs) and within the capillary fringe at the 24 newly installed monitoring well boring locations and 2 soil boring-only locations (**Figures 3-1** through **3-6**). Subsurface soil samples were collected within the capillary fringe where lithologic conditions allowed. Additional soil samples were collected at NRSJC-S7-MW-11, NRSJC-S7-MW-12, and NRSJC-S7-MW-13 at approximately every 50 feet until groundwater was encountered. The following are subsurface soil sample depth ranges:

- NAVSTA Everett – Building 2114: 9-10 feet bgs to 19-20 feet bgs
- NRS Jim Creek – Building 6: 27-28 feet bgs to 36-37 feet bgs
- NRS Jim Creek – Site 1: 3-4 feet bgs to 25-26 feet bgs
- NRS Jim Creek – Site 6: 3.5-4 feet bgs to 14-15 feet bgs
- NRS Jim Creek – Site 7: 38-39 feet bgs to 231-232 feet bgs
- NRS Jim Creek – Site 4: 3.5-5 feet bgs to 17-18 feet bgs
- NRS Jim Creek – Site 5: 7-8 feet bgs to 14-15 feet bgs
- NRC Pacific Beach – Building 106: 5-6 feet bgs to 13-14 feet bgs

Surface samples were collected from a stainless-steel hand auger with 4-inch-inside-diameter basket or stainless-steel hand trowel, and subsurface soil samples were collected from the extruded soil core recovered from the sonic tooling in PFAS-free 4-inch core bags.

Soil was collected in laboratory-supplied HDPE jars using single-use dedicated equipment. Soil samples were placed into coolers containing enough ice to keep the samples 0 to 6°C (but not frozen) until they were received by the laboratory. Field QA/QC samples and frequencies are discussed in **Section 3.8**.

3.8 Quality Assurance and Quality Control

To avoid introducing PFAS during soil sampling, PFAS-containing equipment and components were not used. The use of PFAS-containing clothing and sunscreen, insect repellant, and other personal hygiene products that may contain PFAS were avoided.

Field QA/QC samples were collected during sampling, in accordance with the SAP (CH2M, 2022). Field QA/QC samples were used to:

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

Field QA/QC samples were collected as follows:

- Equipment rinsate blank samples were collected from decontaminated sampling equipment during soil and groundwater sampling. Eighteen equipment blanks were collected during sampling.
- Field blank samples were collected at each investigation area during sampling at each SI investigation area. Eighteen field blanks were collected during sampling.
- Field duplicate samples were collected at the frequency of one per 10 normal field samples of similar matrix. Fifteen field duplicate samples were collected during sampling.
- Matrix spike (MS) and matrix spike duplicate (MSD) samples were collected for every 20 environmental samples collected (or greater than or equal to 5 percent of the samples collected) per medium, including field duplicates. Fourteen MS/MSD samples were collected during sampling.

3.9 Sample Packaging and Shipping

Samples were stored in coolers on ice following collection with a corresponding chain-of-custody. Coolers were then managed, secured, and shipped on ice via FedEx to Battelle Norwell Operations, Norwell, Massachusetts for analysis. During shipment, precautions were taken to monitor and track the shipments and coordinate arrival with the lab.

3.10 Decontamination Procedures

Decontamination activities including decontaminating nondisposable equipment were conducted in accordance with the standard operating procedures (SOPs) provided in the SAP (CH2M, 2022).

Water generated while decontaminating sampling equipment was collected and disposed as IDW as described in **Section 3.12**. Disposable sampling equipment and personal protective equipment, such as HDPE tubing and nitrile gloves, were also disposed of as IDW.

Reusable heavy equipment, such as drilling rods and augers, were decontaminated before and after the collecting each sample. The fluid generated was disposed as IDW. Heavy equipment decontamination procedures were conducted in accordance with the Decontamination of Drilling Rigs and Equipment SOP provided in the SAP (CH2M, 2022).

3.11 Surveying

Newly installed permanent monitoring well locations were horizontally and vertically located by a Washington-licensed surveyor in January 2023. The surveyor provided coordinates of horizontal points X, Y, to the nearest

0.5 foot and vertical point Z to the nearest 0.01 foot (0.1 foot for unpaved ground surface elevations). The survey report is provided as **Appendix E**.

3.12 Investigation-derived Waste Management

IDW generated during the SI included drill cuttings generated during monitoring well installations, purge water from well development and groundwater sampling, decontamination fluids, disposable sampling equipment, and personal protective equipment. At NAVSTA Everett, solid IDW was contained in four 55-gallon drums, and aqueous IDW was containerized into three new 275-gallon United States Department of Transportation-approved intermediate bulk container totes. Containers were properly sealed, labeled, and staged within a Navy-approved staging area within the parking lot south of Building 2114 (Fire Station). At NRS Jim Creek, solid IDW was contained in two 20-yard roll off dumpsters, and aqueous IDW was containerized into three new 275-gallon United States Department of Transportation-approved intermediate bulk container totes. Containers were properly sealed, labeled, and staged within a Navy-approved staging area near the maintenance shops near Site 1 (Building 11 Landfill). At NRC Pacific Beach, solid IDW was contained in three 55-gallon drums, and aqueous IDW was containerized into two new 275-gallon United States Department of Transportation-approved intermediate bulk container totes. Containers were properly sealed, labeled, and staged within a Navy-approved staging area along the edge of the Building 104 parking lot.

Upon completion of sampling activities and prior to disposal, CH2M field personnel collected waste characterization samples from the IDW containers. Solid and aqueous IDW samples were analyzed for volatile organic compounds, semivolatile organic compounds, pH, Resource Conservation and Recovery Act metals, total petroleum hydrocarbons, and ignitability as well as the 18 PFAS compounds listed in USEPA Method 537.1 in accordance with the Environmental Protection Plan (EPP)/Waste Management Plan (WMP) (CH2M, n.d.). All IDW was characterized as nonhazardous. However, the sum of PFOA and PFOS concentrations measured in one of the aqueous IDW totes was greater than the USEPA lifetime health advisory of 70 nanograms per liter (ng/L). Aqueous IDW was transported to an approved disposal facility and solidified prior to disposal. Weekly inspections to monitor staging area and container integrities were conducted from date of generation until transport and removal from the NAVSTA Everett on October 14, 2022, NRS Jim Creek on March 1, 2023, and NRC Pacific Beach on November 22, 2022.

IDW management activities were conducted in accordance with the EPP/WMP (CH2M, n.d). IDW analytical profiles and waste handling manifests are provided in **Appendix F**.

3.13 Laboratory Analysis and Data Usability Assessment

Groundwater and soil samples were submitted to Battelle Norwell Operations, Norwell, Massachusetts, a DoD Environmental Laboratory Accreditation Program accredited laboratory, in accordance with chain-of-custody procedures. Raw analytical data are provided in **Appendix G**. The following samples were analyzed for the 18 PFAS compounds listed in Method 537.1 via liquid chromatography tandem mass spectrometry compliant with Quality Systems Manual 5.1 Table B-15, in accordance with the SAP (CH2M, 2022):

- Perfluorobutanesulfonic acid (PFBS)
- PFOS
- PFOA
- Perfluorodecanoic acid (PFDA)
- Perfluorododecanoic acid (PFDoA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluorohexanoic acid (PFHxA)
- Perfluorononanoic acid (PFNA)
- Perfluorotetradecanoic acid (PFTA)
- Perfluorotridecanoic acid (PFTrDA)

- Perfluoroundecanoic acid (PFUnA)
- 4,8-dioxa-3H-perfluorononanoic acid (ADONA)
- 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)
- 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)
- N-Ethyl Perfluorooctanesulfonamidoacetic acid (NEtFOSAA)
- N-Methyl Perfluorooctanesulfonamidoacetic acid (NMeFOSAA)
- Hexafluoropropylene oxide dimer acid (HFPO-DA)

After laboratory analysis of samples was complete, data usability was assessed. Data validation was conducted by an independent third-party data validator. Complete validation findings are presented in the data validation reports included in **Appendix H**. Data were then verified and prepared for upload to the Naval Installation Restoration Information Solution database, and a Data Quality Assessment was completed (**Appendix I**). The data validation review demonstrated that the analytical systems were generally in control, and data results can be used in the project decision-making process.

3.14 Deviations from the Sampling and Analysis Plan

The following field procedures deviated from the SAP (CH2M, 2022):

- Building 2114 (Fire Station)
  - Monitoring well NSE-B2114-MW-03 was moved approximately 100 feet south due to utilities.
- Site 1 (Building 11 Landfill)
  - Two subsurface soil samples were collected at NRSJC-S1-SB06. One from 7 to 8 feet bgs and one from 25 to 26 feet bgs.
  - Monitoring wells NRSJC-S1-MW-05 and NRSJC-S1-MW-07 had the filter pack sand placed to extend 1 foot above the top of the well screen due to limited annular space available to install the sanitary seal (screen set from 4 to 14 feet bgs).
- Site 6 (Blue Campground Landfill)
  - Monitoring well NRSJC-S7-MW-09 was moved about 75 feet southeast due to a conflict with a site gate and to protect the well from potential damage. The objective to evaluate the potential release area was still met.
  - Monitoring wells NRSJC-S6-MW-08 and NRSJC-S6-MW-09 had the filter pack sand placed to extend 1.5 feet above the top of the well screen due to limited annular space available to install the sanitary seal (screen set from 4 to 14 feet bgs). These wells also only had a 1.5-thick bentonite seal due to the limited depth.
- Site 7 (Pit Road Landfill)
  - Groundwater was not encountered within 140 feet bgs during the initial drilling of NRSJC-S7-MW-12. The well was subsequently abandoned because the drill crew did not have enough drill rod to extend the boring deeper. A decision was made to return to Site 7 to redrill the wells at a later date with a more efficient drill rig for depths greater than 200 feet. NRSJC-S7-MW-12 was redrilled approximately 75 feet southeast from the original location.
  - Monitoring wells NRSJC-S7-MW-11, NRSJC-S7-MW-12, and NRSJC-S7-MW-13 were completed with SCH 80 PVC pipe and well screen due to the greater depth and pressure on these three wells (greater than 200 feet bgs) compared to other wells installed. This deviation did not impact the performance of the well.

  - Monitoring wells NRSJC-S7-MW11 and NRSJC-S7-MW13 were constructed with 20-foot well screens to increase the likelihood of producing groundwater in the well. NRSJC-S7-MW13 only had 0.5 foot of water in the well and was not developed because it did not produce water. It had trace water measured in the well during the synoptic water level event, suspected to be residual water in the bottom well cap. A groundwater sample was not collected at NRSJC-S7-MW13.
  - NRSJC-S7-MW11 and NRSJC-S7-MW12 were collected with a bailer due to challenges with setting the submersible pump at the screen depth. WQPs were not collected.
  - Subsurface soil samples were collected approximately every 50 feet at NRSJC-S7-SB-11, NRSJC-S7-SB-12, and NRSJC-S7-SB-13 to provide additional data regarding PFAS concentrations with depth.
- Site 4 (Metal Burial Pit)
  - Monitoring wells NRSJC-S4-MW-14 and NRSJC-S4-MW-15 were relocated approximately 150 feet southwest of the proposed locations due to accessibility issues. The wells were placed in the road due to a utility corridor on the shoulder of the road.
  - A shallow soil sample could not be collected at NRSJC-S4-SS-15 due to large boulders and rocks present underneath the surficial asphalt.
- Site 5 (Mixed Waste Landfill)
  - Monitoring wells NRSJC-S7-MW-17 was not drilled due to accessibility issues (proximity to unstable slope). Samples were not collected from this location.
- Building 106 (Former Fire Station)
  - The pump control box was broken for the bladder pump during sampling of NRCPB-B106-GW01 and NRCPB-B106-GW02. Wells were sampled using a bailer. Only one set of WQPs was collected at each well.

Table 3-1. Monitoring Well Construction Summary

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington,
Naval Radio Station Jim Creek, Arlington, Washington, and
Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

Monitoring Well	Installation Date	Ground Surface Elevation (ft amsl)	Top of PVC Casing Elevation (ft amsl)	Total Well Depth (ft btoc)	Length of Screen (ft)	Depth of Top of Screen (ft btoc)	Depth of Bottom of Screen (ft btoc)	Elevation of Top of Screen (ft amsl)	Elevation of Bottom of Screen (ft amsl)	Northing [a]	Easting [a]
NSE-B2114-MW-01	7/27/2022	15.7470	15.4607	20	10	9.0	19.0	6.5	-3.5	364590.94	1300907.31
NSE-B2114-MW-02	7/28/2022	16.3350	15.9932	29	10	19.0	29.0	-3.0	-13.0	364524.59	1300836.69
NSE-B2114-MW-03	7/28/2022	15.7930	15.5715	25	10	15.0	25.0	0.6	-9.4	364308.56	1300857.56
NRSJC-B6-MW-01	6/2/2022	535.2200	534.8124	40	10	30.0	40.0	504.8	494.8	447300.36	1369819.24
NRSJC-B6-MW-02	6/3/2022	532.9000	532.5842	35	10	25.0	35.0	507.6	497.6	447221.82	1369701.01
NRSJC-B6-MW-03	6/8/2022	534.0401	533.7138	39	10	28.5	38.5	505.2	495.2	447259.23	1369622.51
NRSJC-B6-MW-04	6/13/2022	534.1270	533.8097	40	10	30.0	40.0	503.8	493.8	447284.04	1369690.57
NRSJC-S1-MW-05	6/19/2022	476.1501	476.2639	14	10	4.0	14.0	472.3	462.3	446488.54	1369835.45
NRSJC-S1-MW-06	6/21/2022	504.5267	507.3127	39	10	28.5	38.5	478.8	468.8	446483.13	1370007.10
NRSJC-S1-MW-07	6/20/2022	477.1628	476.9678	14	10	4.0	14.0	473.0	463.0	446413.21	1369883.15
NRSJC-S6-MW-08	6/15/2022	536.1630	538.8229	14	10	4.0	14.0	534.8	524.8	444709.24	1371835.73
NRSJC-S6-MW-09	6/19/2022	538.5814	541.3364	14	10	4.0	14.0	537.3	527.3	444603.13	1371904.00
NRSJC-S6-MW-10	6/13/2022	543.7300	546.2790	24	10	14.0	24.0	532.3	522.3	444703.88	1371653.42
NRSJC-S7-MW-11	11/7/2022	686.1040	688.5152	255	20	234.0	254.0	454.5	434.5	444645.17	1371117.40
NRSJC-S7-MW-12 [b]	10/12/2022	686.5450	689.1984	247	10	233.0	243.0	456.2	446.2	444562.41	1371147.54
NRSJC-S7-MW-13	10/27/2022	689.6260	692.3657	237	20	217.0	237.0	475.4	455.4	444574.39	1371078.67
NRSJC-S4-MW-14	7/8/2022	609.9010	609.5543	27	10	17.0	27.0	592.6	582.6	442870.92	1373735.05
NRSJC-S4-MW-15	7/8/2022	611.4160	611.1053	27	10	17.0	27.0	594.1	584.1	442835.11	1373780.14
NRSJC-S5-MW-16	7/8/2022	612.5220	615.3177	27	10	16.5	26.5	598.8	588.8	443119.83	1374102.53
NRSJC-S5-MW-18	7/8/2022	618.2660	621.0970	24	10	14.0	24.0	607.1	597.1	442803.59	1374234.34
NRSJC-S5-MW-19	7/8/2022	612.5870	615.4512	21	10	11.0	21.0	604.5	594.5	442943.50	1374158.17
NRCPB-B106-MW-01	8/4/2022	119.7947	119.4122	21	10	11.0	21.0	108.4	98.4	707361.01	720211.25
NRCPB-B106-MW-02	8/4/2022	118.5179	118.1027	20	10	10.0	20.0	108.1	98.1	707320.95	720105.48
NRCPB-B106-MW-03	8/8/2022	117.1624	116.8947	16	10	6.0	16.0	110.9	100.9	707311.18	720036.02

[a] Northing and Easting in U.S. survey feet, North American Datum 1983 Washington State Plane North for Naval Station Everett and Naval Radio Station Jim Creek wells.
Northing and Easting in U.S. survey feet, North American Datum 1983 Washington State Plane South for Naval Recreation Complex Pacific Beach.
[b] MW-12 was redrilled. Data are for the redrilled well.
amsl = above mean sea level. Vertical elevation references the North American Vertical Datum of 1988 (NAD88)
btoc = below top of casing
ft = feet
ID = identification
PVC = polyvinyl chloride
WA = Washington

Table 3-2. Groundwater Elevations

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington, Naval Radio Station Jim Creek, Arlington, Washington, and Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

Monitoring Well	Date Measured	Ground Surface Elevation (ft amsl)	Top of Casing Elevation (ft amsl)	Depth to Water (ft btoc)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
NSE-B2114-MW-01	8/11/2022	15.7470	15.4607	5.81	5.52	9.65
NSE-B2114-MW-02	8/11/2022	16.3350	15.9932	7.82	7.48	8.17
NSE-B2114-MW-03	8/11/2022	15.7930	15.5715	6.60	6.38	8.97
NRSJC-B6-MW-01	3/1/2023	535.2200	534.8124	30.80	30.39	504.01
NRSJC-B6-MW-02	3/1/2023	532.9000	532.5842	24.36	24.04	508.22
NRSJC-B6-MW-03	3/1/2023	534.0401	533.7138	30.81	30.48	502.90
NRSJC-B6-MW-04	3/1/2023	534.1270	533.8097	26.40	26.08	507.41
NRSJC-S1-MW-05	12/15/2022	476.1501	476.2639	14.57	14.68	461.69
NRSJC-S1-MW-06	12/15/2022	504.5267	507.3127	42.02	44.81	465.29
NRSJC-S1-MW-07	12/15/2022	477.1628	476.9678	14.56	14.37	462.41
NRSJC-S6-MW-08	12/15/2022	536.1630	538.8229	17.5	20.16	521.32
NRSJC-S6-MW-09	12/15/2022	538.5814	541.3364	17.53	20.29	523.81
NRSJC-S6-MW-10	12/15/2022	543.7300	546.279	27.6	30.15	518.68
NRSJC-S7-MW-11	12/15/2022	686.1040	688.5152	257.35	259.76	431.17
NRSJC-S7-MW-12[a]	12/15/2022	686.5450	689.1984	246.37	249.02	442.83
NRSJC-S7-MW-13[b]	12/15/2022	689.6260	692.3657	240.25	242.99	452.12
NRSJC-S4-MW-14	12/15/2022	609.9010	609.5543	27.43	27.08	582.12
NRSJC-S4-MW-15	12/15/2022	611.4160	611.1053	27.31	27.00	583.80
NRSJC-S5-MW-16	12/15/2022	612.5220	615.3177	28.89	31.69	586.43
NRSJC-S5-MW-18	12/15/2022	618.2660	621.097	26.95	29.78	594.15
NRSJC-S5-MW-19	12/15/2022	612.5870	615.4512	23.52	26.38	591.93
NRCPB-B106-MW-01	8/9/2022	119.7947	119.4122	12.24	11.86	107.17
NRCPB-B106-MW-02	8/9/2022	118.5179	118.1027	11.98	11.56	106.12
NRCPB-B106-MW-03	8/9/2022	117.1624	116.8947	12.47	12.20	104.42

[a] MW-12 was redrilled. Data are for the redrilled well.

[b] Insufficient water to obtain an accurate water level measurement and sample.

amsl = above mean sea level. Vertical elevation references the North American Vertical Datum of 1988

bgs = below ground surface

btoc = below top of casing

ft = feet

Table 3-3. Water Quality Parameters

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington,
Naval Radio Station Jim Creek, Arlington, Washington, and
Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

Monitoring Well	Sample Date	Sample Time	Depth to Water (ft btoc)	pH (SU)	Specific Conductivity (mS/cm)	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	Turbidity (NTU)	PID Readings (ppm)	Comments
NSE-B2114-MW01	8/11/2022	17:40	6.07	6.77	0.894	17.53	0	-123.0	6.67	0.0	Clear
NSE-B2114-MW02	8/11/2022	19:30	7.48	5.86	5.19	20.77	0	-86.0	391	0.0	Cloudy
NSE-B2114-MW03	8/11/2022	18:45	6.79	7.4	0.636	15.43	1.99	-6.3	7.77	0.0	Clear
NRSJC-B6-MW01	6/30/2022	10:20	31.2	6.18	0.076	11.90	11.51	185.2	202	0.0	Cloudy
NRSJC-B6-MW02	6/30/2022	12:55	22.58	6.29	0.076	10.50	8.73	178.1	25.9	0.0	Clear
NRSJC-B6-MW03	6/30/2022	14:55	31.2	5.93	0.161	12.20	8.56	203.6	9.64	0.0	Clear
NRSJC-B6-MW04	7/1/2022	9:45	28.46	5.47	0.088	11.60	7.84	154.3	163	0.0	Cloudy
NRSJC-S1-MW05	7/11/2022	17:00	5.59	5.35	0.193	12.00	2.14	175.8	9.08	0.0	Clear
NRSJC-S1-MW06	7/11/2022	14:45	30.1	5.31	0.181	11.10	6.84	157.4	6.16	0.0	Clear
NRSJC-S1-MW07	6/30/2022	14:50	4.41	5.66	0.144	12.60	3.42	115.1	1.55	0.0	Clear
NRSJC-S6-MW08	7/13/2022	13:05	9.88	6.04	0.104	10.80	2.59	174.4	7.39	0.0	Clear
NRSJC-S6-MW09	7/12/2022	12:50	8.95	5.62	0.092	12.10	2.51	149.6	3.56	0.0	Clear
NRSJC-S6-MW10	7/13/2022	12:00	19.22	4.85	0.056	9.70	5.56	229.7	12.4	0.0	Clear
NRSJC-S7-MW11[a]	11/9/2022	15:15	NM	NM	NM	NM	NM	NM	NM	NM	NA
NRSJC-S7-MW12[ab]	11/10/2022	13:35	NM	NM	NM	NM	NM	NM	NM	NM	NA
NRSJC-S7-MW13[c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NRSJC-S4-MW14	7/13/2022	14:20	18.55	6.74	0.194	11.70	7.07	164.5	0.46	0.0	Clear
NRSJC-S4-MW15	7/13/2022	15:15	18.22	6.63	0.177	12.00	9.26	159.0	0.22	0.0	Clear
NRSJC-S5-MW16	7/12/2022	15:30	22.52	5.93	0.096	10.00	11.11	165.4	9.10[d]	0.0	Clear
NRSJC-S5-MW18	7/13/2022	9:40	18.41	6.09	0.108	9.40	8.4	157.6	0.34	0.0	Clear
NRSJC-S5-MW19	7/12/2022	10:40	14.89	6.14	0.115	10.80	9.17	166.7	1.38	0.0	Clear
NRCPB-B106-MW01	8/9/2022	11:40	12.24	6.05	0.307	15.65	7.15	139.0	>1000	NM	Light brown
NRCPB-B106-MW02	8/9/2022	12:40	11.98	6.15	0.159	15.85	11.22	123.0	>1000	NM	Light brown
NRCPB-B106-MW03	8/10/2022	10:30	12.7	5.29	0.102	15.88	5.55	197.0	5.25	0.0	Clear

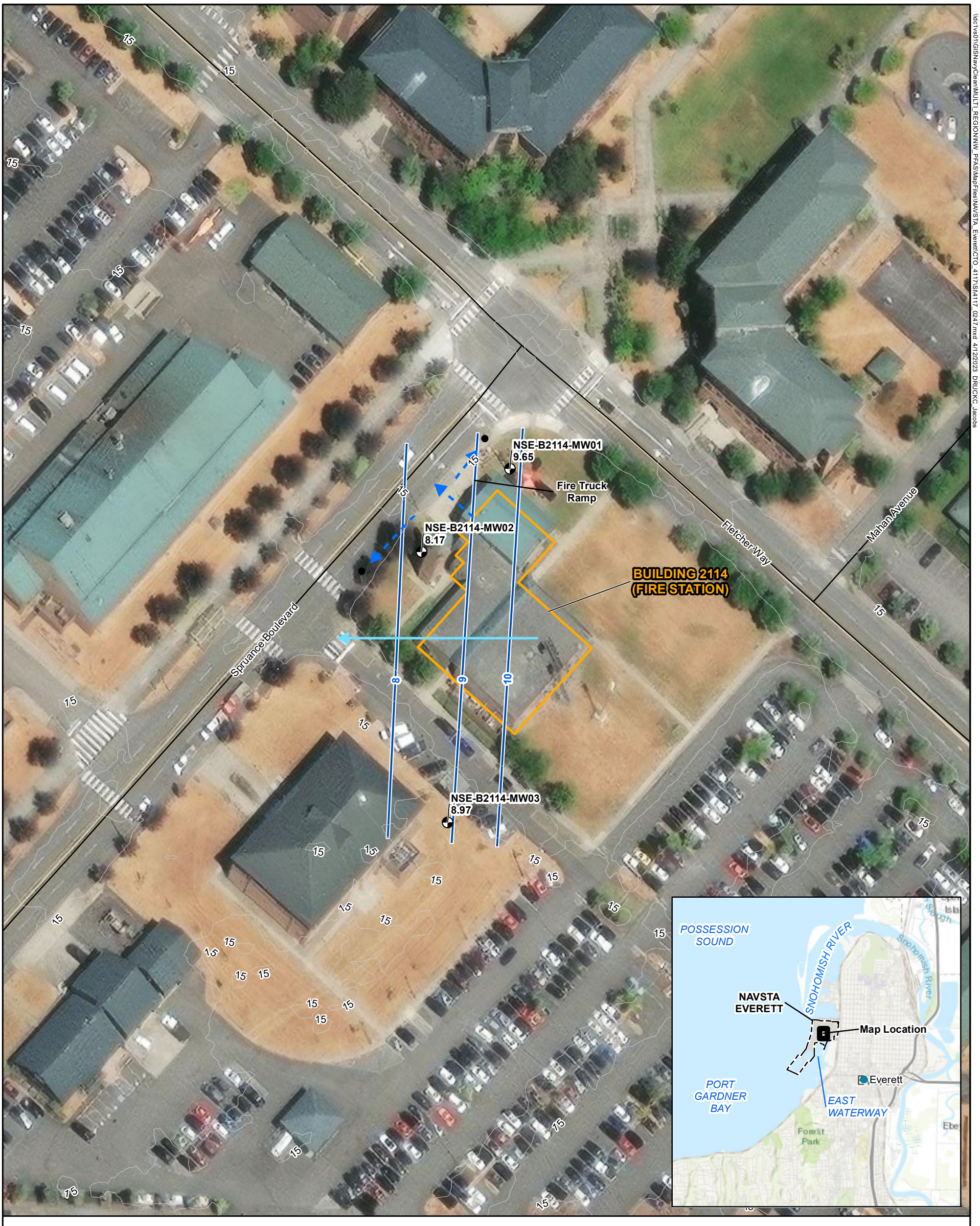
[a] Well sampled using a bailer. No parameters collected during sampling.

[b] MW-12 was redrilled. Data are for the redrilled well.

[c] Well was dry. No groundwater sample collected.

[d] Turbidity reading not taken during last sample. Turbidity measurement is from second-to-last reading.

°C = degrees Celsius
btoc = below top of casing
ft = feet
mg/L = milligrams per liter
mS/cm = milliseimens per centimeter
mV = millivolts
NA = not applicable
NM = not measured
NTU = nephelometric turbidity units
PID = photo ionization detection
ppm = parts per million
SU = standard units



LEGEND

- Monitoring Well and Soil Sample Location
- Stormwater Catch Basin
- 5' Topographic Contours
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Groundwater Elevation Contour
- Road Centerline
- Potential PFAS Release Area
- Installation Boundary

NSE-B2114-MW03 = well ID
8.97 = groundwater elevation - ft amsl

NOTES:
ft amsl = feet above mean sea level
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2021
Contours derived from USGS National Elevation Dataset

0 37.5 75
1 inch = 75 feet
N

Figure 3-1
Potentiometric Surface Map: NAVSTA Everett Building 2114 (Fire Station)
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

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LEGEND

- Monitoring Well and Soil Sample Location
- Stormwater Catch Basin
- Unpaved Ditch
- Surface Waterbodies
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Groundwater Elevation Contour
- 5' Topographic Contours
- Road Centerline
- Potential PFAS Release Area
- Installation Boundary

NSE-B2114-MW03 = well ID
8.97 = groundwater elevation - ft amsl

NOTES:
ft amsl = feet above mean sea level
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances
B6-MW01 water level is considered anomalous and not used to generate groundwater elevation contours

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2021
Contours derived from USGS National Elevation Dataset

0 25 50
1 inch = 50 feet
N

Figure 3-2
Potentiometric Surface Map: NRS Jim Creek Building 6
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

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LEGEND

- Monitoring Well and Soil Sampling Location
- Unpaved Ditch
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Groundwater Elevation Contour
- 5' Topographic Contours
- Surface Waterbodies
- Road Centerline
- Potential PFAS Release Area (assumed boundary)
- Installation Boundary

NSE-B2114-MW03 = well ID
8.97 = groundwater elevation - ft amsl

NOTES:
ft amsl = feet above mean sea level
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2021
Contours derived from USGS National Elevation Dataset

Figure 3-3
Potentiometric Surface Map: NRS Jim Creek Site 1
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 37.5 75
1 inch = 75 feet
N

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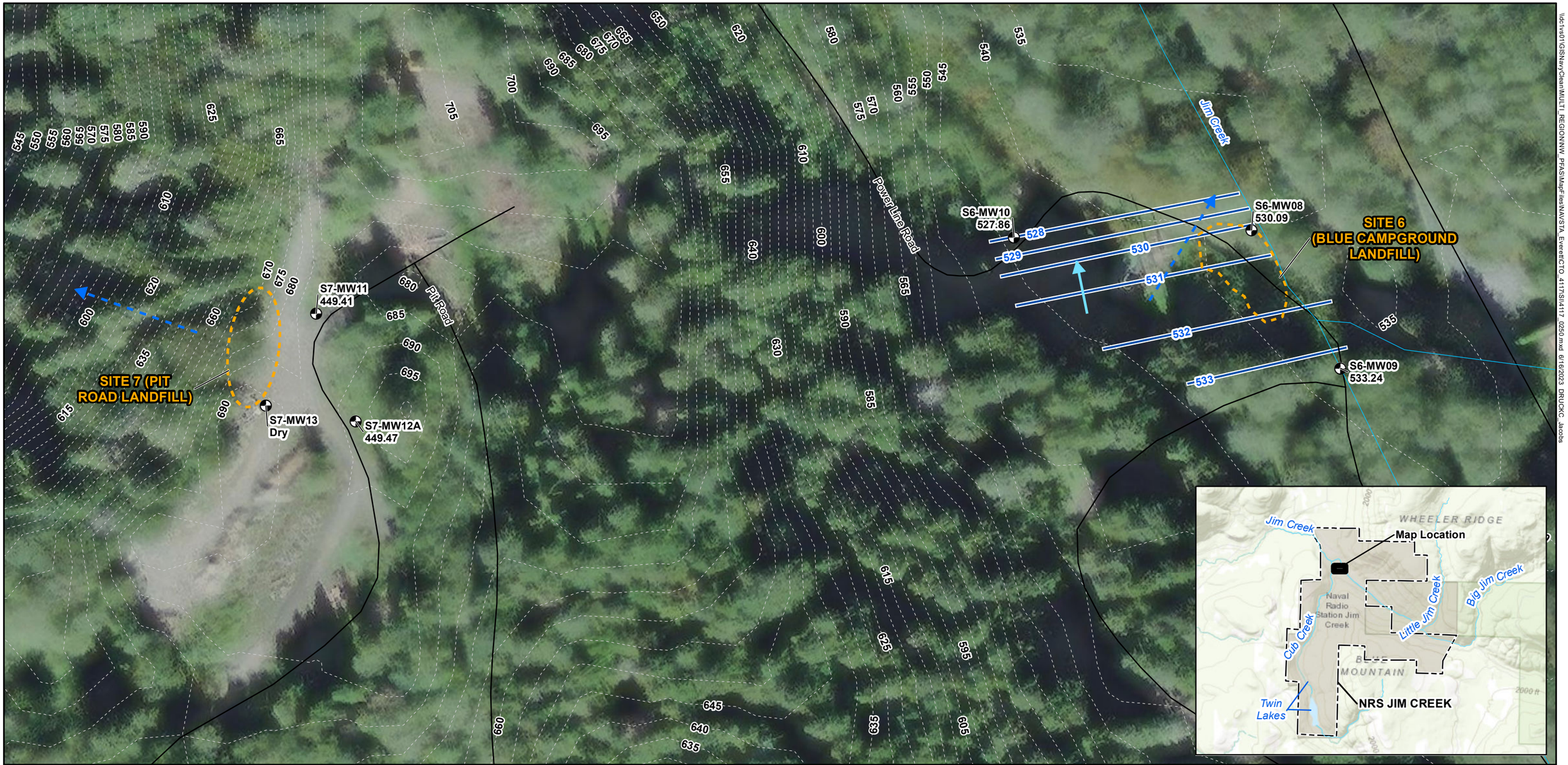

LEGEND

- Monitoring Well and Soil Sample Location
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Groundwater Elevation Contour
- Surface Waterbodies
- 5' Topographic Contours
- Road Centerline
- Potential PFAS Release Area (assumed boundary)
- Installation Boundary

NSE-B2114-MW03 = well ID
8.97 = groundwater elevation - ft amsl

NOTES:
ft amsl = feet above mean sea level
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances
Groundwater elevation contours could not be generated for Site 7 due to lack of water level data.

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2021
Contours derived from USGS National Elevation Dataset

Figure 3-4
Potentiometric Surface Map: NRS Jim Creek Sites 6 and 7
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 37.5 75
1 inch = 75 feet
N

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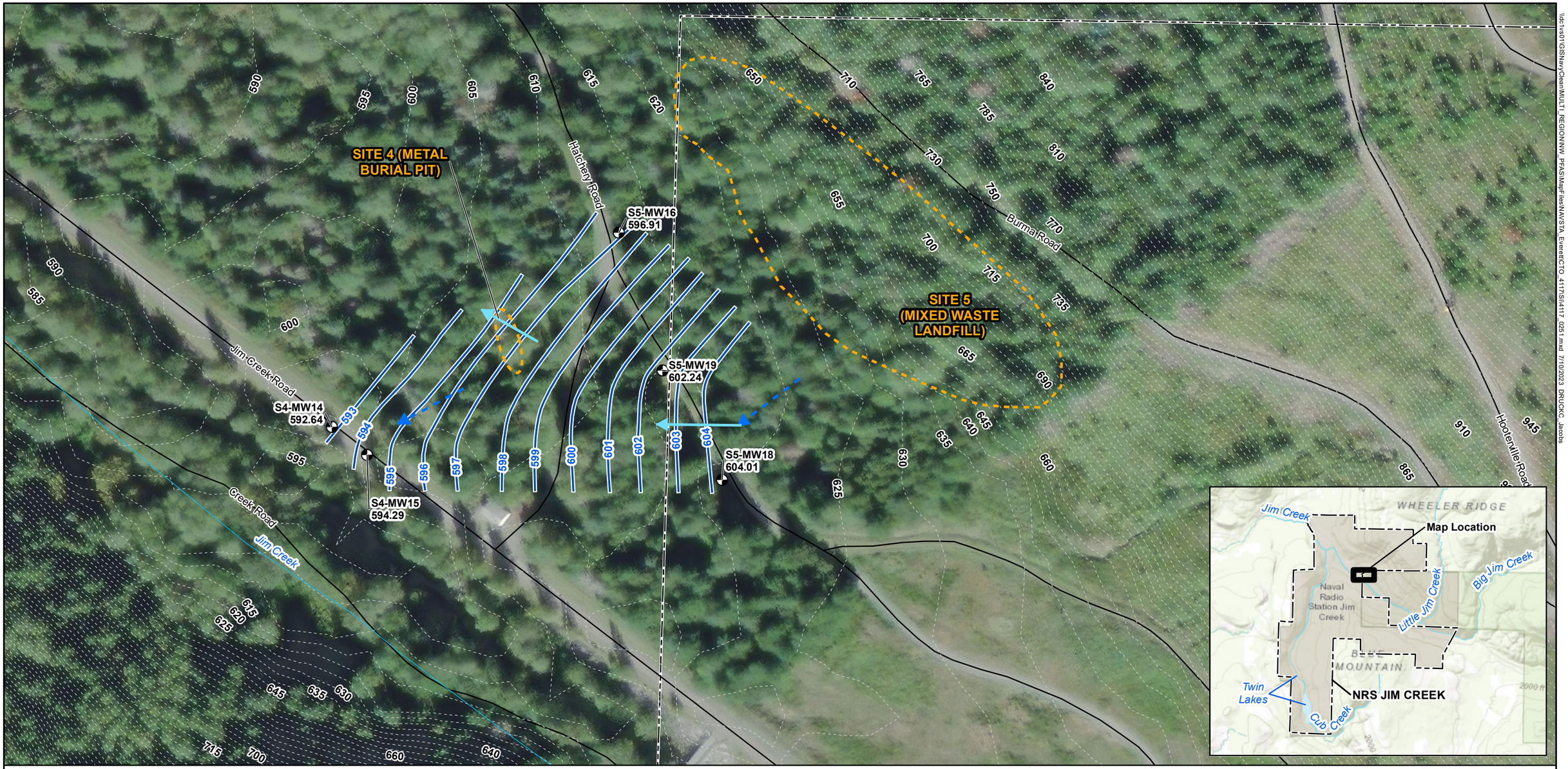

LEGEND

- Monitoring Well and Soil Sampling Location
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Groundwater Elevation Contour
- Surface Waterbodies
- 5' Topographic Contours
- Road Centerline
- Potential PFAS Release Area (assumed boundary)
- Installation Boundary

NSE-B2114-MW03 = well ID
8.97 = groundwater elevation - ft amsl

NOTES:
ft amsl = feet above mean sea level
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2021
Contours derived from USGS National Elevation Dataset

Figure 3-5
Potentiometric Surface Map: NRS Jim Creek Sites 4 and 5
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 62.5 125
1 inch = 125 feet
N

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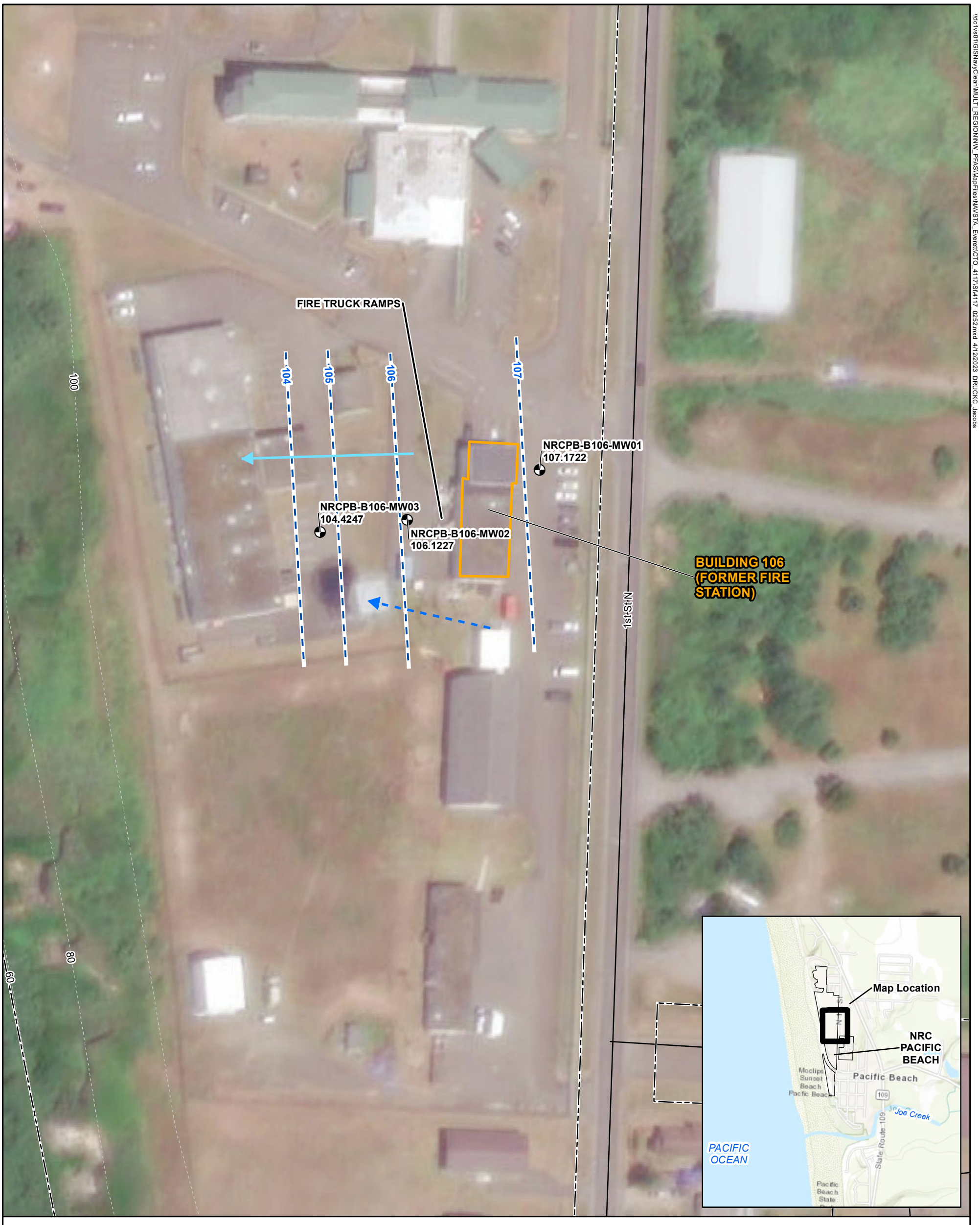

LEGEND

- Monitoring Well and Soil Sample Location
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Inferred Groundwater Elevation Contour
- Surface Waterbodies
- 20' Topographic Contours
- Road Centerline
- Potential PFAS Release Area
- Installation Boundary

NSE-B2114-MW03 = well ID
8.97 = groundwater elevation - ft amsl

NOTES:
ft amsl = feet above mean sea level
NRC = Naval Recreation Complex
NAVSTA = Naval Station
NRS = Naval Radio Station
PFAS = Per- and polyfluoroalkyl substances

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, 2021
Contours derived from USGS National Elevation Dataset

0 37.5 75
1 inch = 75 feet
N

Figure 3-6
Potentiometric Surface Map: NRC Pacific Beach Building 106
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

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SECTION 4

Field Investigation Results

The details of the data evaluation, Human Health Risk Screening (HHRS) process, basis for recommendations, and installation boundary proximity and drinking water exposure assessment presented in the conceptual site models (CSMs) are described in this section. The CSMs and results are presented in **Tables 4-1** through **4-8.** The CSMs were updated with information obtained during this SI and include description and operational history, the SI approach, site-specific lithology, upper aquifer groundwater flow directions, data evaluation, off-Base drinking water exposure assessment, the HHRS findings, conclusions, and recommendations.

Data Evaluation and Human Health Risk Screening

The soil and groundwater analytical results were compared to the residential scenario soil and tap water SLs for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA, presented in the November 2022 Regional Screening Level (RSL) Table, consistent with DoD technical guidance (DoD, 2022). RSLs for perfluorobutanoic acid (PFBA) and PFHxA were added in the May 2023 RSL update and will be considered in the Remedial Investigation (RI) planning. While PFBA was not analyzed under the SI, it is unlikely to impact site management decisions based on results and concentrations at similar Navy sites. PFHxA was analyzed in the samples and is discussed in the HHRS (Appendix J) for each potential PFAS release area and the results are also shown in Tables 4-9 and 4-10 .

Thus, the SLs are as follows:

- PFOA Soil SL: 19 micrograms per kilogram (µg/kg), Groundwater SL: 6.0 ng/L
- PFOS Soil SL: 13 µg/kg, Groundwater SL: 4.0 ng/L
- PFBS Soil SL: 1,900 µg/kg, Groundwater SL: 600 ng/L
- PFHxS Soil SL: 130 µg/kg, Groundwater SL: 39 ng/L
- PFNA Soil SL: 19 µg/kg, Groundwater SL: 5.9 ng/L
- HFPO-DA Soil SL: 23 µg/kg, Groundwater SL: 6.0 ng/L

The results for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA are presented for each of the investigation areas in **Figures 4-1** through **4-7** and summarized in **Tables 4-9** through **4-10**. Full analytical data tables are in **Appendix G**, and data validation reports are in **Appendix H**.

An HHRS based on future residential exposure and potable use of groundwater was conducted for the investigation areas [3] and is presented in detail in **Appendix J**. The HHRS evaluation is a preliminary risk screening tool used as a line of evidence to support site management decisions, path forward, and prioritization of future phases.

[3] Although the SAP indicated a HHRS would only be prepared if concentrations exceeded SLs, HHRS were conducted for all investigations areas to formalize the documentation that unacceptable risks were not identified and to confirm that the reporting limits were satisfactory to meet the objectives.

4.1 Naval Station Everett Building 2114 (Fire Station)

Table 4-1. Building 2114 (Fire Station) Conceptual Site Model

<table>
<tr><td>Potential for PFAS Release. See Section 2.1.1 for Description and Operational History.</td><td colspan="5">The PFAS PA (CH2M, 2021) identified Building 2114 as a potential PFAS release area. There were no reported spills or releases of AFFF associated with Building 2114; however, large quantities of AFFF were stored throughout its operating history as a fire station and satellite storage area. At similar facilities, firefighters historically filled the fire trucks by directly transferring AFFF from 5-gallon containers into fire trucks. Based on similar practices of AFFF transfer at other Navy installations during the same time period and the lack of available information for the handling and training practices, there is the potential for spills or leaks to have occurred during the transfer of AFFF into fire trucks.</td></tr>
<tr><td>SI Approach</td><td colspan="5">• Soil and groundwater samples were collected from newly installed monitoring well locations at Building 2114. New monitoring well locations were selected near and downgradient of likely PFAS release areas (based on operational history). Two wells are on either side of the truck ramp where runoff potentially containing PFAS could have accumulated, and one well is downgradient (southwest) of the truck ramp.
• Three surface soil samples were collected from three new monitoring well locations from 0 to 1 foot bgs (Table 4-9, Figure 4-1).
• Three subsurface soil samples were collected from three locations within the capillary fringe ranging in depth from 9 to 10 feet bgs to 19 to 20 feet bgs (Table 4-9, Figure 4-1).
• Three groundwater samples were collected from three newly installed monitoring wells with screen intervals ranging in depth from 9 to 19 feet btoc to 19 to 29 feet btoc (Table 4-10; Figure 4-1).</td></tr>
<tr><td rowspan="6">Sample Stations</td><td rowspan="2">Monitoring Wells</td><td>Well ID</td><td>NSE-B2114-MW01</td><td>NSE-B2114-MW02</td><td>NSE-B2114-MW03</td></tr>
<tr><td>Screen Interval (feet btoc)</td><td>9 to 19</td><td>19 to 29</td><td>15 to 25</td></tr>
<tr><td rowspan="2">Surface Soil Samples</td><td>Station ID</td><td>NSE-B2114-SS01</td><td>NSE-B2114-SS02</td><td>NSE-B2114-SS03</td></tr>
<tr><td>Sample Depth (feet bgs)</td><td colspan="3">0 to 1</td></tr>
<tr><td rowspan="2">Subsurface Soil Samples</td><td>Station ID</td><td>NSE-B2114-SB01</td><td>NSE-B2114-SB02</td><td>NSE-B2114-SB03</td></tr>
<tr><td>Sample Depth (feet bgs)</td><td>9 to 10</td><td>19 to 20</td><td>19 to 20</td></tr>
<tr><td>Site Lithology</td><td colspan="5">Based on observations from the soil borings at Building 2117, subsurface lithology consists primarily of poorly graded sand with minor amounts of silt. Soil becomes wet at 5 to 10 feet bgs. Soil boring logs are provided in Appendix B.</td></tr>
<tr><td>Site Hydrology</td><td colspan="5">There are no streams or surface drainage features near Building 2114. The Snohomish River channel is approximately 1,000 feet to the west, and East Waterway is approximately 500 feet to the south (Figure 2-2). Storm water is captured in a stormwater catch basin near the northern corner of the building (Figure 2-3).</td></tr>
<tr><td>Groundwater</td><td colspan="5">Groundwater at Building 2114 is present in an unconfined aquifer comprised of sand and thin interbedded silt layers. Depth to groundwater is between approximately 5.5 and 8 feet bgs. Based on water levels measured during groundwater sampling on August 11, 2022, groundwater flow near Building 2114 is west toward the Snohomish River channel (Figure 3-1).</td></tr>
</table>

Table 4-1. Building 2114 (Fire Station) Conceptual Site Model

	Analyte	SS			SB			GW		
		Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (ng/L)
SI Results Compared to SLs	PFOA	1/3	0/3	0.35 J	0/3	0/3	ND	3/3	2/3	12.9
	PFOS	3/3	2/3	34.5	2/3	0/3	0.636 J	3/3	2/3	516
	PFBS	0/3	0/3	ND	0/3	0/3	ND	3/3	0/3	14.3
	PFHxS	2/3	0/3	2.77	0/3	0/3	ND	3/3	2/3	224
	PFNA	1/3	0/3	0.24 J	0/3	0/3	ND	2/3	0/3	2.19 J
	HFPO-DA	0/3	0/3	ND	0/3	0/3	ND	0/3	0/3	ND
Proximity to Base Boundary and Drinking Water Exposure Assessment	Building 2114 (Fire Station) is approximately 700 feet north of the southern installation boundary of NAVSTA Everett (**Figure 2-2**). Several private drinking water wells may exist within 1 mile to the northwest and south of NAVSTA Everett. Based on the upper aquifer groundwater flows to the west, the southern installation boundary is cross-gradient from Building 2114. Off-Base drinking water sampling is not warranted at this time.									
Results Summary, HHRS Findings, Conclusions, and Recommendations	PFOS was detected in surface soil at two locations above the SLs. PFOA, PFHxS, and PFNA were detected in surface soil samples below the SLs. PFBS and HFPO-DA were not detected. PFOS was detected in subsurface soil at two locations below the SLs. PFOA, PFBS, PFHxS, PFNA, and HFPO-DA were not detected. PFOA, PFOS, and PFHxS were detected in groundwater at two wells above the SLs. PFBS and PFNA were detected in groundwater below the SLs. HFPO-DA was not detected. Based on the HHRS **(Appendix J**), PFOS and PFHxS were identified as COPCs for groundwater, indicating potential unacceptable human health risks. There were no COPCs in soil based on available results. The location of the PFOS soil exceedances and PFOA, PFOS, and PFHxS groundwater exceedances are at the monitoring wells immediately to the northeast and southwest of the fire truck ramp (NSE-B2114-MW-01 and NSE-B2114-MW-02), part of Building 2114 (Fire Station). PFAS did not exceed SLs in the soil or groundwater at the well cross-gradient of Building 2114 (NSE-B2114-MW-03). The building has been used historically to store AFFF concentrate and fire trucks with foam tanks (CH2M, 2021). While a confirmed release of AFFF was not documented; the PFOA, PFOS, and PFHxS exceedances of the SLs in groundwater and PFOS exceedance of the SLs in soil indicate a release occurred at Building 2114. In addition, PFOS and PFHxS were identified as COPCs for groundwater; therefore, an RI is recommended. Future RI activities will include an evaluation of PFBA and PFHxA using the updated RSLs from May 2023.									

btoc = below top of casing

COPC = chemical of potential concern

GW = groundwater samples

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

ND = not detected

RI = Remedial Investigation

SB = subsurface soil samples

SS = surface soil samples

4.2 Naval Radio Station Jim Creek Building 6 (Former Fire Station)

Table 4-2. Building 6 (Former Fire Station) Conceptual Site Model

Potential for PFAS Release. See **Section 2.1.2** for Description and Operational History.	The PFAS PA (CH2M, 2021) identified Building 6 as a potential PFAS release area. Based on historical knowledge, AFFF containers that leaked were stored at Building 6 and were rinsed off outside of Building 6.					
SI Approach	• Soil and groundwater samples were collected from four newly installed monitoring well locations at Building 6. New monitoring well locations were selected near and downgradient of likely PFAS release areas (based on operational history). Two wells are on the east and west side of the building, two potential locations where leaky containers of AFFF were reportedly placed and sprayed off; one well is near the stormwater catch basin southwest of the building where surface run off potentially containing PFAS could have accumulated and infiltrated to soil and/or groundwater and from which debris may have been removed and deposited at the Bio Pit Disposal Area; and one well is downgradient (west) of Building 6. • Three surface soil samples were collected from three locations from 0 to 0.5 foot bgs (**Table 4-9**; **Figure 4-2**). A surface soil sample was not collected at NRSJC-B6-MW01 due to asphalt at the surface; instead, a subsurface soil sample was collected from 1 to 2 feet bgs. • Six subsurface soil samples were collected from four locations ranging in depth from 1 to 2 feet bgs to 36 to 37 feet bgs (**Table 4-9**; **Figure 4-2**). • Four groundwater samples were collected from four newly installed monitoring wells with screen intervals ranging in depth from 25 to 35 feet btoc to 30 to 40 feet btoc (**Table 4-10**; **Figure 4-2**).					
Sample Stations	**Monitoring Wells**	**Well ID**	NRSJC-B6-MW01	NRSJC-B6-MW02	NRSJC-B6-MW03	NRSJC-B6-MW04
		Screen Interval (feet btoc)	30 to 40	25 to 35	28.5 to 38.5	30 to 40
	Surface Soil Samples	**Station ID**	Not sampled	NRSJC-B6-SS-02	NRSJC-B6-SS-03	NRSJC-B6-SS-04
		Sample Depth (feet bgs)	Asphalt		0 to 0.5	
	Subsurface Soil Samples	**Station ID**	NRSJC-B6-SB-01	NRSJC-B6-SB-02	NRSJC-B6-SB-03	NRSJC-B6-SB-04
		Sample Depth (feet bgs)	1 to 2 29 to 30	36 to 37	29 to 30	27 to 28 29 to 30
Site Lithology	Based on observations from the soil borings at Building 6, subsurface lithology consists of 15 to 25 feet of silty and clayey gravel underlain by 15 to 25 feet of sand and silty sand underlain by sandy clay. Soil becomes wet at 30 to 35 feet bgs. Soil boring logs are provided in **Appendix B**.					
Site Hydrology	Jim Creek is approximately 450 feet to the west (**Figure 2-5**) and flows northwest past Building 6. An unpaved ditch runs from the southern end of the building toward the south along a paved service road. A stormwater catch basin is near the southwest corner of the building.					
Groundwater	Groundwater at Building 6 is present in an unconfined aquifer comprised of sand and clayey sand. Depth to groundwater is between approximately 25 and 38 feet bgs. Based on synoptic water levels measured on March 1, 2023, groundwater flow near Building 6 is to the west toward Jim Creek (**Figure 3-2**).					

Table 4-2. Building 6 (Former Fire Station) Conceptual Site Model

	Analyte	SS			SB [a]			GW		
		Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (ng/L)
SI Results Compared to SLs	PFOA	0/3	0/3	ND	0/6	0/6	ND	4/4	0/4	2.97 J
	PFOS	2/3	0/3	0.356 J	0/6	0/6	ND	4/4	4/4	60.6
	PFBS	1/3	0/3	0.356 J	0/6	0/6	ND	4/4	0/4	17.4
	PFHxS	1/3	0/3	2.59	1/6	0/6	0.751 J	4/4	1/4	153
	PFNA	0/3	0/3	ND	0/6	0/6	ND	0/4	0/4	ND
	HFPO-DA	0/3	0/3	ND	0/6	0/6	ND	0/4	0/4	ND
Proximity to Base Boundary and Drinking Water Exposure Assessment	Building 6 (Former Fire Station) is approximately 1,400 feet south of the northern installation boundary of NRS Jim Creek (**Figure 2-4**). Several private drinking water wells may exist within 1 mile to the north of NRS Jim Creek. Upper aquifer groundwater flows to the west toward Jim Creek. Because Jim Creek flows west from the northwest corner of NRS Jim Creek, off-installation properties north of NRS Jim Creek are not impacted by groundwater from Building 6. The USEPA lifetime drinking water health advisory of 70 ppt for PFOA and PFOS, individually or combined, was not exceeded in groundwater at Building 6. Off-Base drinking water sampling is not warranted at this time.									
Results Summary, HHRS Findings, Conclusions, and Recommendations	PFOS, PFBS, and PFHxS were detected in surface soil samples below the SLs. PFOA, PFNA, and HFPO-DA were not detected. PFHxS was detected in one subsurface soil sample below the SL. PFOA, PFOS, PFBS, PFNA, and HFPO-DA were not detected. No exceedances of surface soil above the SLs were detected in the boring at B6-MW02 adjacent to the stormwater catch basin where vegetation and debris may have accumulated and could have been disposed of at the Bio Pit Disposal Area. This suggests no unacceptable risks associated with exposure to PFAS that may have accumulated in the stormwater catchment basin, and therefore material that was removed and disposed of at the Bio Pit area would not pose a risk for leaching into surface or subsurface soil or groundwater at that site. PFOS was detected in groundwater at four wells above the SL. PFHxS was detected at one well above the SL. PFOA and PFBS were detected in groundwater at four wells below the SLs. PFNA and HFPO-DA were not detected. Based on the HHRS **(Appendix J**), PFOS was identified as a COPC for groundwater, indicating potential unacceptable human health risks. There were no COPCs in soil based on available results. All wells exceeded the PFOS groundwater SL, including NRSJC-B6-MW01 at the fire truck ramps on the east side of Building 6 (Former Fire Station). As NRSJC-B6-MW01 is cross-gradient of the remaining wells, it is possible that AFFF was released at both fire truck ramps east of the building and west of the building where leaky AFFF containers may have been rinsed off. The PFOS and PFHxS exceedances of the SLs in groundwater indicate a release occurred at Building 6. In addition, PFOS was identified as COPC for groundwater; therefore, an RI is recommended. Future RI activities will include an evaluation of PFBA and PFHxA using the updated RSLs from May 2023.									

[a] Subsurface soil samples are from multiple depths at some locations.

ppt = part(s) per trillion

4.3 Naval Radio Station Jim Creek Site 1 (Building 11 Landfill)

Table 4-3. Site 1 (Building 11 Landfill) Conceptual Site Model

<table>
<tr><td>Potential for PFAS Release. See Section 2.1.2 for Description and Operational History.</td><td colspan="6">The PFAS PA (CH2M, 2021) identified Site 1 as a potential PFAS release area. Records were not available for review that would confirm disposal of AFFF or other PFAS-containing chemicals at the landfill; however, according to a former fire chief, AFFF was being stored at Building 6 at least as early as 1976 (CH2M, 2021), while the Site 1 landfill was in use, and the final disposition of these AFFF containers is unknown. Because waste was not removed from the installation prior to 1991, it is possible that these containers were disposed of at Site 1.</td></tr>
<tr><td>SI Approach</td><td colspan="6">• Soil and groundwater samples were collected from newly installed monitoring well locations at Site 1. New monitoring well locations were selected near and downgradient of likely PFAS release areas (based on operational history) in areas accessible to drilling equipment. Due to the uncertainty of the landfill extent, a groundwater sample was also collected from a new monitoring well installed on the topographically higher northeast side of the landfill to assess groundwater that may have been impacted by debris deposited outside the mapped landfill boundary as well as to provide an additional data point to confirm groundwater flow direction.
• Four surface soil samples were collected from four locations from 0 to 0.5 foot bgs (Table 4-9; Figure 4-3).
• Five subsurface soil samples were collected from four locations ranging in depth from 2 to 3 feet bgs to 25 to 26 feet bgs (Table 4-9; Figure 4-3). Samples were collected from the three new monitoring wells and one soil location near the downgradient landfill boundary accessible to hand-augering.
• Three groundwater samples were collected from three newly installed monitoring wells with screen intervals ranging in depth from 4 to 14 feet btoc to 28.5 to 38.5 feet btoc (Table 4-10; Figure 4-3).</td></tr>
<tr><td rowspan="5">Sample Stations</td><td rowspan="2">Monitoring Wells</td><td>Well ID</td><td>NRSJC-S1-MW05</td><td>NRSJC-S1-MW06</td><td>NRSJC-S1-MW07</td><td rowspan="2">Soil only</td></tr>
<tr><td>Screen Interval (feet btoc)</td><td>4 to 14</td><td>28.5 to 38.5</td><td>4 to 14</td></tr>
<tr><td rowspan="2">Surface Soil Samples</td><td>Station ID</td><td>NRSJC-S1-SS05</td><td>NRSJC-S1-SS06</td><td>NRSJC-S1-SS07</td><td>NRSJC-S1-SS20</td></tr>
<tr><td>Sample Depth (feet bgs)</td><td colspan="4">0 to 0.5</td></tr>
<tr><td rowspan="2">Subsurface Soil Samples</td><td>Station ID</td><td>NRSJC-S1-SB05</td><td>NRSJC-S1-SB06</td><td>NRSJC-S1-SB07</td><td>NRSJC-S1-SB20</td></tr>
<tr><td>Sample Depth (feet bgs)</td><td>3.5 to 4.5</td><td>7 to 8
25 to 26</td><td>3 to 4</td><td>2 to 3</td></tr>
<tr><td>Site Lithology</td><td colspan="6">Based on observations from the soil borings at Site 1, the subsurface lithology consists of 20 to 50 feet of a heterogeneous mixture of silt, sand, and gravel underlain by clay. Soils become wet at 30 feet on top of the hill near Building 11 and at approximately 4 feet at the foot of the hill. Soil boring logs are provided in Appendix B.</td></tr>
<tr><td>Site Hydrology</td><td colspan="6">Jim Creek is approximately 300 feet southwest of Site 1 (Figure 2-6) and flows northwest past Site 1 (Figure 2-6). Jim Creek is believed to be in direct hydraulic communication with groundwater at Site 1. An unpaved drainage ditch is approximately 400 feet east of Site 1.</td></tr>
</table>

Table 4-3. Site 1 (Building 11 Landfill) Conceptual Site Model

Groundwater	Groundwater at Site 1 is present in an unconfined aquifer comprised of silty sand and silty gravel. Depth to groundwater is approximately 30 feet at the top of the hill near Building 11 and approximately 4 to 5 feet at the bottom of the hill. Based on the synoptic water levels measured on December 15, 2022, groundwater flow at Site 1 is to the west-southwest (**Figure 3-3**).									
SI Results Compared to SLs		**SS**			**SB** [a]			**GW**		
	Analyte	**Frequency of Detection**	**Frequency of Exceedance**	**Maximum Concentration (µg/kg)**	**Frequency of Detection**	**Frequency of Exceedance**	**Maximum Concentration (µg/kg)**	**Frequency of Detection**	**Frequency of Exceedance**	**Maximum Concentration (ng/L)**
	PFOA	0/4	0/4	ND	0/5	0/5	ND	2/3	0/3	2.22 J
	PFOS	1/4	0/4	0.218 J	0/5	0/5	ND	0/3	0/3	ND
	PFBS	0/4	0/4	ND	0/5	0/5	ND	1/3	0/3	1.29 J
	PFHxS	0/4	0/4	ND	0/5	0/5	ND	0/3	0/3	ND
	PFNA	0/4	0/4	ND	0/5	0/5	ND	0/3	0/3	ND
	HFPO-DA	0/4	0/4	ND	0/5	0/5	ND	0/3	0/3	ND
Proximity to Base Boundary and Drinking Water Exposure Assessment	Site 1 (Building 11 Landfill) is approximately 2,200 feet south of the northern installation boundary of NRS Jim Creek (**Figure 2-4**). Several private drinking water wells may exist within 1 mile to the north of NRS Jim Creek. Upper aquifer groundwater flows to the west-southwest toward Jim Creek. Because Jim Creek flows west from the northwest corner of NRS Jim Creek, off-installation properties north of NRS Jim Creek are not impacted by groundwater from Site 1. The USEPA lifetime drinking water health advisory of 70 ppt for PFOA and PFOS, individually or combined, was not exceeded in groundwater at Site 1. Off-Base drinking water sampling is not warranted at this time.									
Results Summary, HHRS Findings, Conclusions, and Recommendations	PFOS was detected in one surface soil sample below the SL. PFOA, PFBS, PFHxS, PFNA, and HFPO-DA were not detected. PFAS were not detected in subsurface soil samples. PFOA was detected in groundwater at two wells below the SL, and PFBS was detected at one well below the SL. PFOS, PFHxS, PFNA, and HFPO-DA were not detected. Based on the HHRS, COPCs were not identified, indicating there are no unacceptable human health risks associated with exposure to PFAS in soil and groundwater (**Appendix J**). In addition, PFHxA was not detected in site media. While PFBA was not analyzed under the SI, it is unlikely to impact site management decisions based on results and concentrations at similar Navy sites. Based on the following lines of evidence, additional investigation is not recommended at this time: • Concentrations of PFOA, PFOS, and PFBS did not exceed SLs, and the HHRS did not identify COPCs • There is no documentation of a release from the PA									

[a] Subsurface soil samples are from multiple depths at some locations.

4.4 Naval Radio Station Jim Creek Site 6 (Blue Campground Landfill)

Table 4-4. Site 6 (Blue Campground Landfill) Conceptual Site Model

Potential for PFAS Release. See **Section 2.1.2** for Description and Operational History.	The PFAS PA (CH2M, 2021) identified Site 6 as a potential PFAS release area. Records were not available for review that would confirm disposal of AFFF or other PFAS-containing chemicals at the landfill; however, according to a former fire chief, AFFF was being stored at Building 6 at least as early as 1976 (CH2M, 2021), while the Site 6 landfill was in use, and the final disposition of these AFFF containers is unknown. Because waste was not removed from the installation prior to 1991, it is possible that these containers were disposed of at Site 6.				
SI Approach[ed]	• Soil and groundwater samples were collected from newly installed monitoring well locations at Site 6. New monitoring well locations were selected near and downgradient of likely PFAS release areas (based on operational history). Due to the uncertainty of the landfill extent, to the west and south, a groundwater sample was also collected from new monitoring wells installed on the west and south sides of the landfill to assess groundwater that may have been impacted by debris deposited outside the mapped landfill boundary as well as to provide an additional data point to confirm groundwater flow direction. • Three surface soil samples were collected from three locations from 0 to 0.5 foot bgs (**Table 4-9**; **Figure 4-4**). • Three subsurface soil samples were collected from three locations ranging in depth from 3.5 to 4 feet bgs to 14 to 15 feet bgs (**Table 4-9**; **Figure 4-4**). • Three groundwater samples were collected from three newly installed monitoring wells with screen intervals ranging in depth from 4 to 14 feet btoc to 14 to 24 feet btoc (**Table 4-10**; **Figure 4-4**).				
Sample Stations	**Monitoring Wells**	**Well ID**	NRSJC-S6-MW08	NRSJC-S6-MW09	NRSJC-S6-MW10
		Screen Interval (feet btoc)	4 to 14	4 to 14	14 to 24
	Surface Soil Samples	**Station ID**	NRSJC-S6-SS08	NRSJC-S6-SS09	NRSJC-S6-SS10
		Sample Depth (feet bgs)	0 to 0.5		
	Subsurface Soil Samples	**Station ID**	NRSJC-S6-SB08	NRSJC-S6-SB09	NRSJC-S6-SB10
		Sample Depth (feet bgs)	3.5 to 4	3.5 to 5	14 to 15
Site Lithology	Based on observations from the soil borings at Site 6, the subsurface lithology consists of approximately 25 feet of silty and clayey sand and gravel underlain by clay. Soils are wet at anywhere between 8 and 20 feet bgs. Soil boring logs are provided in **Appendix B**.				
Site Hydrology	Jim Creek is approximately 60 feet to the northeast (**Figure 2-7**) and flows northwest past Site 6 (**Figure 2-7**). Jim Creek is believed to be in direct hydraulic communication with groundwater at Site 6.				
Groundwater	Groundwater at Site 6 is present in an unconfined aquifer comprised of silty sand and gravel. Depth to groundwater is 20 feet bgs near Jim Creek and up to 30 feet bgs further from the creek. Based on synoptic water levels measured on December 15, 2022, groundwater flow at Site 6 is to the north-northwest approximately parallel to the flow of Jim Creek (**Figure 3-4**).				

Table 4-4. Site 6 (Blue Campground Landfill) Conceptual Site Model

	Analyte	SS			SB			GW		
		Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (ng/L)
SI Results Compared to SLs	PFOA	0/3	0/3	ND	0/3	0/3	ND	1/3	0/3	1.24 J
	PFOS	1/3	0/3	0.284 J	0/3	0/3	ND	0/3	0/3	ND
	PFBS	0/3	0/3	ND	0/3	0/3	ND	0/3	0/3	ND
	PFHxS	0/3	0/3	ND	0/3	0/3	ND	0/3	0/3	ND
	PFNA	0/3	0/3	ND	0/3	0/3	ND	0/3	0/3	ND
	HFPO-DA	0/3	0/3	ND	0/3	0/3	ND	0/3	0/3	ND
Proximity to Base Boundary and Drinking Water Exposure Assessment	Site 6 (Blue Campground Landfill) is approximately 3,900 feet south of the northern installation boundary of NRS Jim Creek (**Figure 2-4**). Several private drinking water wells may exist within 1 mile to the north of NRS Jim Creek. Upper aquifer groundwater flows to the north-northwest parallel to Jim Creek and is believed to be in direct hydraulic communication with Jim Creek. Because Jim Creek flows west from the northwest corner of NRS Jim Creek, off-installation properties north of NRS Jim Creek are not impacted by groundwater from Site 6. USEPA lifetime drinking water health advisory of 70 ppt for PFOA and PFOS, individually or combined, was not exceeded in groundwater at Site 6. Off-Base drinking water sampling is not warranted at this time.									
Results Summary, HHRS Findings, Conclusions, and Recommendations	PFOS was detected in one surface soil sample below the SL. PFOA, PFBS, PFHxS, PFNA, and HFPO-DA were not detected. No PFAS were detected in subsurface soil samples. PFOA was detected in groundwater at one well below the SL. PFOS, PFBS, PFHxS, PFNA, and HFPO-DA were not detected. Based on the HHRS, COPCs were not identified, indicating there are no unacceptable human health risks associated with exposure to PFAS in soil and groundwater (**Appendix J**). In addition, PFHxA was not detected in site media. While PFBA was not analyzed under the SI, it is unlikely to impact site management decisions based on results and concentrations at similar Navy sites. Based on the following lines of evidence, additional investigation is not recommended at this time: • Concentrations of PFOA and PFOS did not exceed SLs, and the HHRS did not identify COPCs • There is no documentation of a release from the PA									

4.5 Naval Radio Station Jim Creek Site 7 (Pit Road Landfill)

Table 4-5. Site 7 (Pit Road Landfill) Conceptual Site Model

Potential for PFAS Release. See **Section 2.1.2** for Description and Operational History.	The PFAS PA (CH2M, 2021) identified Site 7 as a potential PFAS release area. Records were not available for review that would confirm disposal of AFFF or other PFAS-containing chemicals at the landfill; however, according to a former fire chief, AFFF was being stored at Building 6 at least as early as 1976 (CH2M, 2021), while the Site 7 landfill was in use, and the final disposition of these AFFF containers is unknown. Because waste was not removed from the installation prior to 1991, it is possible that these containers were disposed of at Site 7.				
SI Approach [a]	• Soil and groundwater samples were collected from newly installed monitoring well locations at Site 7. New monitoring well locations were selected near and downgradient of likely PFAS release areas (based on operational history) in areas accessible to drilling equipment. Accessible drilling locations are limited by topography; therefore, one monitoring well was installed just outside the northeast landfill boundary, one monitoring well was installed just outside the southeast landfill boundary, and one additional monitoring wells was installed further southeast of the landfill to provide additional data points for confirming groundwater flow direction. • Three surface soil samples were collected from three locations from 0 to 0.5 foot bgs (**Table 4-9**; **Figure 4-5**). • Fifteen subsurface soil samples were collected from three locations ranging in depth from 38 to 39 feet bgs to 231 to 232 feet bgs (**Table 4-9**; **Figure 4-5**). • Two groundwater samples were collected from three newly installed monitoring wells with screen intervals ranging in depth from 233 to 243 feet btoc to 234 to 254 feet btoc (**Table 4-10**; **Figure 4-5**). NRSJC-S7-MW13, screened from 217 to 237 feet btoc, was not sampled because the well was dry.				
Sample Stations	**Monitoring Wells**	**Well ID**	NRSJC-S7-MW11	NRSJC-S7-MW12	NRSJC-S7-MW13
		Screen Interval (feet btoc)	234 to 254	233 to 243	217 to 237 well dry
	Surface Soil Samples	**Station ID**	NRSJC-S7-SS11	NRSJC-S7-SS12	NRSJC-S7-SS13
		Sample Depth (feet bgs)	0 to 0.5		
	Subsurface Soil Samples	**Station ID**	NRSJC-S7-SB11	NRSJC-S7-SB12	NRSJC-S7-SB13
		Sample Depth (feet bgs)	42.5 to 43.5 93 to 94 146 to 147 191 to 192 231 to 232	96 to 97 145 to 147 174 to 175 210 to 211 229 to 230	38 to 39 84 to 85 128 to 129 177 to 178 215 to 216
Site Lithology	Based on observations from the soil borings at Site 7, the subsurface lithology consists of approximately 240 feet of dense sand and gravel and trace lenses of silt and clay. Lithology transitions to silt/clay dominant at between 235 and 240 feet bgs. Soils become wet at approximately 235 feet bgs. Soil boring logs are provided in **Appendix B**.				
Site Hydrology	Cub Creek is approximately 500 feet to the west and flows north past Site 7 (**Figure 2-7**).				
Groundwater	Groundwater at Site 7 is present in an unconfined aquifer comprised of silty sand and interbedded silt layers. Depth to groundwater is approximately 240 feet bgs. One of the wells installed at Site 7 was dry during the synoptic water level survey on December 15, 2022; therefore, a groundwater flow direction could not be determined.				

Table 4-5. Site 7 (Pit Road Landfill) Conceptual Site Model

	Analyte	SS			SB [a]			GW		
		Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (ng/L)
SI Results Compared to SLs	PFOA	0/3	0/3	ND	0/15	0/15	ND	0/2	0/2	ND
	PFOS	0/3	0/3	ND	0/15	0/15	ND	0/2	0/2	ND
	PFBS	0/3	0/3	ND	0/15	0/15	ND	0/2	0/2	ND
	PFHxS	0/3	0/3	ND	0/15	0/15	ND	0/2	0/2	ND
	PFNA	0/3	0/3	ND	0/15	0/15	ND	0/2	0/2	ND
	HFPO-DA	0/3	0/3	ND	0/15	0/15	ND	0/2	0/2	ND
Proximity to Base Boundary and Drinking Water Exposure Assessment	Site 7 (Pit Road Landfill) is approximately 4,000 feet south of the northern installation boundary of NRS Jim Creek (**Figure 2-4**). Several private drinking water wells may exist within 1 mile to the north of NRS Jim Creek. Groundwater flow in the upper aquifer could not be determined at Site 7 because one of the three wells was dry. No PFAS were detected in groundwater at Site 7. Off-Base drinking water sampling is not warranted at this time.									
Results Summary, HHRS Findings, Conclusions, and Recommendations	No PFAS were detected in surface soil, subsurface soil or groundwater. Based on the HHRS, COPCs were not identified, indicating there are no unacceptable human health risks associated with exposure to PFAS in soil [b] and groundwater (**Appendix J**). In addition, PFHxA was not detected in site media. While PFBA was not analyzed under the SI, it is unlikely to impact site management decisions based on results and concentrations at similar Navy sites. Based on the following lines of evidence, additional investigation is not recommended at this time: • PFOS, PFOA, PFBS, PFHxS, PFNA, and HFPO-DA were not detected, and the HHRS did not identify COPCs • There is no documentation of a release from the PA • Site 7 is located approximately 250 feet west of the Bio Pit Disposal Area. Vegetation and potential surface soil debris was placed on an space at a higher elevation than Site 7 such that surface water runoff may have transported surface soil and debris towards Site 7. No PFAS detections in surface soil and groundwater at Site 7 are an additional line of evidence that no PFAS release occurred at the Bio Pit Disposal Area.									

[a] Subsurface soil samples are from multiple depths at some locations.

[b] Subsurface soil samples at Site 7 were collected at depths ranging from 38 to 39 feet bgs to 231 to 232 feet bgs, which is deeper than a human receptor would be expected to contact; therefore, subsurface soil was not included in the HHRS for Site 7.

4.6 Naval Radio Station Jim Creek Site 4 (Metal Burial Pit)

Table 4-6. Site 4 (Metal Burial Pit) Conceptual Site Model

<table>
<tr><td>Potential for PFAS Release. See Section 2.1.2 for Description and Operational History.</td><td colspan="4">The PFAS PA (CH2M, 2021) identified Site 4 as a potential PFAS release area. Records were not available for review that would confirm disposal of AFFF or other PFAS-containing chemicals at the landfill; however, according to a former fire chief, AFFF was being stored at Building 6 at least as early as 1976 (CH2M, 2021), while the Site 4 landfill was in use, and the final disposition of these AFFF containers is unknown. Because waste was not removed from the installation prior to 1991, it is possible that these containers were disposed of at Site 4.</td></tr>
<tr><td>SI Approach</td><td colspan="4">• Soil and groundwater samples were collected from newly installed monitoring well locations at Site 4. New monitoring well locations were selected near and downgradient of likely PFAS release areas (based on operational history).
• Surface soil samples were not collected due to asphalt surface.
• Three subsurface soil samples were collected from two locations ranging in depth from 2 to 3 feet bgs to 17 to 18 feet bgs (Table 4-9; Figure 4-6).
• Two groundwater samples were collected from two newly installed monitoring wells with screen intervals both ranging in depth from 17 to 27 feet btoc (Table 4-10; Figure 4-6).</td></tr>
<tr><td rowspan="6">Sample Stations</td><td rowspan="2">Monitoring Wells</td><td>Well ID</td><td>NRSJC-S4-MW14</td><td>NRSJC-S4-MW15</td></tr>
<tr><td>Screen Interval (feet btoc)</td><td>17 to 27</td><td>17 to 27</td></tr>
<tr><td rowspan="2">Surface Soil Samples</td><td>Station ID</td><td colspan="2" rowspan="2">Not sampled – asphalt</td></tr>
<tr><td>Sample Depth (feet bgs)</td></tr>
<tr><td rowspan="2">Subsurface Soil Samples</td><td>Station ID</td><td>NRSJC-S4-SB14</td><td>NRSJC-S4-SB15</td></tr>
<tr><td>Sample Depth (feet bgs)</td><td>2 to 3; 16 to 17</td><td>16 to 17</td></tr>
<tr><td>Site Lithology</td><td colspan="4">Based on observations from the soil borings at Site 4, the subsurface lithology consists of silty gravel and sand. Soils become wet at approximately 18 feet bgs. Soil boring logs are provided in Appendix B.</td></tr>
<tr><td>Site Hydrology</td><td colspan="4">Jim Creek is approximately 300 feet to the southwest and flows northwest past Site 4 (Figure 2-8). Jim Creek is believed to be in direct hydraulic communication with groundwater at Site 4.</td></tr>
<tr><td>Groundwater</td><td colspan="4">Groundwater at Site 4 is present in an unconfined aquifer comprised of silty and clayey gravel. Depth to groundwater is approximately 17 feet bgs. Based on the synoptic water levels measured at Site 4 and nearby Site 5 on December 15, 2022, groundwater flow at these two sites is to the northwest, approximately parallel to the flow of Jim Creek toward the mouth of the valley (Figure 3-5).</td></tr>
</table>

Table 4-6. Site 4 (Metal Burial Pit) Conceptual Site Model

	Analyte	SS			SB			GW		
		Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (ng/L)
SI Results Compared to SLs	PFOA	NS	NS	NS	0/3	0/3	ND	0/2	0/2	ND
	PFOS	NS	NS	NS	0/3	0/3	ND	0/2	0/2	ND
	PFBS	NS	NS	NS	0/3	0/3	ND	0/2	0/2	ND
	PFHxS	NS	NS	NS	0/3	0/3	ND	0/2	0/2	ND
	PFNA	NS	NS	NS	0/3	0/3	ND	0/2	0/2	ND
	HFPO-DA	NS	NS	NS	0/3	0/3	ND	0/2	0/2	ND
Proximity to Base Boundary and Drinking Water Exposure Assessment	Site 4 (Metal Burial Pit) is approximately 5,600 feet south of the northern installation boundary of NRS Jim Creek (**Figure 2-4**). Several private drinking water wells may exist within 1 mile to the north of NRS Jim Creek. Upper aquifer groundwater flows to the northwest parallel to Jim Creek and is believed to be in direct hydraulic communication with Jim Creek. Because Jim Creek flows west from the northwest corner of NRS Jim Creek, off-installation properties north of NRS Jim Creek are not impacted by groundwater from Site 4. PFAS were not detected in the groundwater at Site 4. Off-Base drinking water sampling is not warranted at this time.									
Results Summary, HHRS Findings, Conclusions, and Recommendations	PFAS were not detected in subsurface soil or groundwater. Surface soil samples were not collected due to asphalt surface. Based on the HHRS, COPCs were not identified, indicating there are no unacceptable human health risks associated with exposure to PFAS in soil and groundwater (**Appendix J**). In addition, PFHxA was not detected in site media. While PFBA was not analyzed under the SI, it is unlikely to impact site management decisions based on results and concentrations at similar Navy sites. Based on the following lines of evidence, additional investigation is not recommended at this time: • PFOS, PFOA, PFBS, PFHxS, PFNA, and HFPO-DA were not detected, and the HHRS did not identify COPCs • There is no documentation of a release from the PA									

NS = Not sampled

4.7 Naval Radio Station Jim Creek Site 5 (Mixed Waste Landfill)

Table 4-7. Site 5 (Mixed Waste Landfill) Conceptual Site Model

<table>
<tr><td>Potential for PFAS Release. See Section 2.1.2 for Description and Operational History.</td><td colspan="6">The PFAS PA (CH2M, 2021) identified Site 5 as a potential PFAS release area. Records were not available for review that would confirm disposal of AFFF or other PFAS-containing chemicals at the landfill; however, according to a former fire chief, AFFF was being stored at Building 6 at least as early as 1976 (CH2M, 2021), while the Site 5 landfill was in use, and the final disposition of these AFFF containers is unknown. Because waste was not removed from the installation prior to 1991, it is possible that these containers were disposed of at Site 5.</td></tr>
<tr><td>SI Approach</td><td colspan="6">• Soil and groundwater samples were collected from newly installed monitoring well locations at Site 5. New monitoring well locations were selected near and downgradient of likely PFAS release areas (based on operational history). Due to the uncertainty of the landfill extent, a groundwater sample was planned to be collected from a new monitoring well to be installed up to 100 feet bgs on the upgradient (north) side of the landfill to assess groundwater that may have been impacted by debris deposited outside the mapped landfill boundary. However, this well was not installed due to drilling accessibility issues.
• Three surface soil samples were collected from three locations from 0 to 0.5 foot bgs (Table 4-9; Figure 4-6).
• Five subsurface soil samples were collected from four locations ranging in depth from 2 to 3 feet bgs to 14 to 15 feet bgs (Table 4-9; Figure 4-6). Samples were collected from the three new monitoring wells and one soil location near the downgradient landfill boundary accessible to hand-augering.
• Three groundwater samples were collected from three newly installed monitoring wells with screen intervals ranging in depth from 11 to 21 feet btoc to 16.5 to 26.5 feet btoc (Table 4-10; Figure 4-6).</td></tr>
<tr><td rowspan="6">Sample Stations</td><td rowspan="2">Monitoring Wells</td><td>Well ID</td><td>NRSJC-S5-MW16</td><td>NRSJC-S5-MW18</td><td>NRSJC-S5-MW19</td><td rowspan="3">NS</td></tr>
<tr><td>Screen Interval (feet btoc)</td><td>16.5 to 26.5</td><td>14 to 24</td><td>11 to 21</td></tr>
<tr><td rowspan="2">Surface Soil Samples</td><td>Station ID</td><td>NRSJC-S5-SS16</td><td>NRSJC-S5-SS18</td><td>NRSJC-S5-SS19</td></tr>
<tr><td>Sample Depth (feet bgs)</td><td colspan="3">0-0.5</td></tr>
<tr><td rowspan="2">Subsurface Soil Samples</td><td>Station ID</td><td>NRSJC-S5-SB16</td><td>NRSJC-S5-SB18</td><td>NRSJC-S5-SB19</td><td>NRSJC-S5-SB21</td></tr>
<tr><td>Sample Depth (feet bgs)</td><td>13 to 14</td><td>7 to 8
14 to 15</td><td>10 to 11</td><td>2 to 3</td></tr>
<tr><td colspan="6">NRSJC-S5-MW17 was not installed due to accessibility issues</td></tr>
<tr><td>Site Lithology</td><td colspan="6">Based on observations from the soil borings at Site 5, the subsurface lithology consists of silty and clayey gravel with interbedded silty sand. Soils become wet at 11 to 18 feet bgs. Soil boring logs are provided in Appendix B.</td></tr>
<tr><td>Site Hydrology</td><td colspan="6">Jim Creek is approximately 550 feet to the southwest and flows northwest past Site 5 (Figure 2-8). Jim Creek is believed to be in direct hydraulic communication with groundwater at Site 5.</td></tr>
<tr><td>Groundwater</td><td colspan="6">Groundwater at Site 5 is present in an unconfined aquifer comprised of silty sand and silty gravel. Depth to groundwater is between approximately 13 and 19 feet bgs. Based on synoptic water levels measured at Site 5 and nearby Site 4 on December 15, 2022, groundwater flow is to the west-northwest, approximately parallel to the flow of Jim Creek toward the mouth of the valley (Figure 3-5).</td></tr>
</table>

Table 4-7. Site 5 (Mixed Waste Landfill) Conceptual Site Model

	Analyte	SS			SB			GW		
		Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (ng/L)
SI Results Compared to SLs	PFOA	0/3	0/3	ND	0/4	0/4	ND	0/3	0/3	ND
	PFOS	0/3	0/3	ND	0/4	0/4	ND	0/3	0/3	ND
	PFBS	0/3	0/3	ND	0/4	0/4	ND	0/3	0/3	ND
	PFHxS	0/3	0/3	ND	0/4	0/4	ND	0/3	0/3	ND
	PFNA	0/3	0/3	ND	0/4	0/4	ND	0/3	0/3	ND
	HFPO-DA	0/3	0/3	ND	0/4	0/4	ND	0/3	0/3	ND
Proximity to Base Boundary and Drinking Water Exposure Assessment	Site 5 (Mixed Waste Landfill) is approximately 5,400 feet south of the northern installation boundary of NRS Jim Creek (**Figure 2-4**). Several private drinking water wells may exist within 1 mile to the north of NRS Jim Creek. Upper aquifer groundwater flows to the west-northwest parallel to Jim Creek and is believed to be in direct hydraulic communication with Jim Creek. Because Jim Creek flows west from the northwest corner of NRS Jim Creek, off-installation properties north of NRS Jim Creek are not impacted by groundwater from Site 5. PFAS were not detected in the groundwater at Site 5. Off-Base drinking water sampling is not warranted at this time..									
Results Summary, HHRS Findings, Conclusions, and Recommendations	PFAS were not detected in surface soil, subsurface soil, or groundwater. Based on the HHRS, COPCs were not identified, indicating there are no unacceptable human health risks associated with exposure to PFAS in soil and groundwater (**Appendix J**). In addition, PFHxA was not detected in site media. While PFBA was not analyzed under the SI, it is unlikely to impact site management decisions based on results and concentrations at similar Navy sites. Based on the following lines of evidence, additional investigation is not recommended at this time: • Concentrations of PFOS did not exceed SLs, and the HHRS did not identify COPCs • There is no documentation of a release from the PA									

4.8 Naval Recreation Complex Pacific Beach Building 106 (Former Fire Station)

Table 4-8. Building 106 (Former Fire Station) Conceptual Site Model

Potential for PFAS Release. See **Section 2.1.2** for Description and Operational History.	The PFAS PA (CH2M, 2021) identified Building 106 as a potential PFAS release area. According to interviews with former Navy employees at NRC Pacific Beach, there was no known storage, use, or release of AFFF at this site. However, the operational timeframe of Building 106 as a fire station, from the late 1950s through the 1980s, overlaps with the timeframe in which AFFF has been in use by the Navy. If AFFF transfer or washing of fire trucks occurred on fire truck ramps east and west of Building 106, AFFF or AFFF residual could have been splashed or washed onto the pavement and migrated to nearby unpaved areas with overland drainage.				
SI Approach	• Soil and groundwater samples were collected from newly installed monitoring well locations at Building 106. New monitoring well locations were selected near and downgradient of likely PFAS release areas (based on operational history). Two wells are located near the bay doors on both sides (east and west) of the building in areas where AFFF transfer or washing of fire trucks potentially containing AFFF occurred, and one well is downgradient (east) of Building 106. • Three surface soil samples were collected from the three new monitoring well locations from 0 to 1.0 foot bgs (**Table 4-9**; **Figure 4-7**). • Three subsurface soil samples were collected from three locations ranging in depth from 5 to 6 feet bgs to 13 to 14 feet bgs (**Table 4-9**; **Figure 4-7**). • Three groundwater samples were collected from three newly installed monitoring wells with screen intervals ranging in depth from 6 to 16 feet btoc to 11 to 21 feet btoc (**Table 4-10**; **Figure 4-7**).				
Sample Stations	**Monitoring Wells**	**Well ID**	NRCPB-B106-MW01	NRCPB-B106-MW02	NRCPB-B106-MW03
		Screen Interval (feet btoc)	11 to 21	10 to 20	6 to 16
	Surface Soil Samples	**Station ID**	NRCPB-B106-SS01	NRCPB-B106-SS02	NRCPB-B106-SS03
		Sample Depth (feet bgs)	0 to 1		
	Subsurface Soil Samples	**Station ID**	NRCPB-B106-SB01	NRCPB-B106-SB02	NRCPB-B106-SB03
		Sample Depth (feet bgs)	13 to 14	9 to 10	5 to 6
Site Lithology	Based on observations from the soil borings at Building 106, the subsurface lithology consists of 5 to 10 feet of silty sand and gravel underlain by approximately 10 feet of sand and interbedded gravel. Lithology transitions to silt and clay dominant soil at approximately 20 feet bgs. Soils become wet between 4 and 6 feet bgs. Soil boring logs are provided in **Appendix B**.				
Site Hydrology	The nearest hydraulic feature is South Ravine (**Figure 2-10**), an ephemeral drainage feature approximately 350 feet to the west that runs south-southwest toward the Pacific Ocean. The Pacific Ocean is approximately 1,500 feet to the west.				
Groundwater	Groundwater at Building 106 is present in an unconfined aquifer comprised of sand and gravel. Depth to groundwater is approximately 12 feet bgs. Based on water levels measured on August 9, 2022, groundwater flow in the vicinity of Building 106 is to the west toward the Pacific Ocean (**Figure 3-6**).				

Table 4-8. Building 106 (Former Fire Station) Conceptual Site Model

	Analyte	SS			SB			GW		
		Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (µg/kg)	Frequency of Detection	Frequency of Exceedance	Maximum Concentration (ng/L)
SI Results Compared to SLs	PFOA	0/3	0/3	ND	0/3	0/3	ND	2/3	0/3	3.61 J
	PFOS	2/3	0/3	0.621 J	0/3	0/3	ND	3/3	2/3	14.1
	PFBS	0/3	0/3	ND	0/3	0/3	ND	0/3	0/3	ND
	PFHxS	0/3	0/3	ND	0/3	0/3	ND	2/3	0/3	3.7 J
	PFNA	0/3	0/3	ND	0/3	0/3	ND	0/3	0/3	ND
	HFPO-DA	0/3	0/3	ND	0/3	0/3	ND	0/3	0/3	ND
Proximity to Base Boundary and Drinking Water Exposure Assessment	Building 106 (Former Fire Station) is approximately 100 feet west of the eastern installation boundary of NRC Pacific Beach (**Figure 2-10**). Public drinking water wells are within 1 mile east of NRC Pacific Beach. Based on the upper aquifer groundwater flow to the west, off-installation properties are upgradient from Building 106. USEPA lifetime drinking water health advisory of 70 ppt for PFOA and PFOS, individually or combined, was not exceeded in groundwater at Building 106. Off-Base drinking water sampling is not warranted at this time.									
Results Summary, HHRS Findings, Conclusions, and Recommendations	PFOS was detected in surface soil at two locations below the SLs. PFOA, PFBS, PFHxS, PFNA, and HFPO-DA were not detected. PFAS were not detected in subsurface soil. PFOS was detected in groundwater at two wells above the SLs. PFOA and PFHx were detected in groundwater below the SLs. PFBS, PFNA, and HFPO-DA was not detected. Based on the HHRS, COPCs were not identified, indicating there are no unacceptable human health risks associated with exposure to PFAS in soil and groundwater (**Appendix J**). In addition, PFHxA was not detected in site media. While PFBA was not analyzed under the SI, it is unlikely to impact site management decisions based on results and concentrations at similar Navy sites. Based on the following lines of evidence, additional investigation is not recommended at this time: • Concentrations of PFOS in soil and PFOA and PFHxS in groundwater did not exceed SLs. PFOS in groundwater was detected above the SLs; however, the HHRS did not identify COPCs • There is no documentation of a release from the PA									

Table 4-9. Soil Analytical Results for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington,
Naval Radio Station Jim Creek, Arlington, Washington, and
Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

				PFAS Analyte (µg/kg)						
Sample Station	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date and Time**	**PFOA**	**PFOS**	**PFBS**	**PFHxS**	**PFNA**	**HFPO-DA**	**PFHxA**
			Residential Soil Screening Level	19	13	1,900	130	19	23	3200*
Naval Station Everett										
Building 2114 (Fire Station)										
NSE-B2114-MW-01	NSE-B2114-SS01-0001	0.0-1.0	7/26/2022 11:10	0.501 U	**34.5**	0.501 U	**2.77**	0.501 U	0.501 U	0.501 U
	NSE-B2114-SS01P-0001	0.0-1.0	7/26/2022 11:12	0.501 U	**30.9**	0.501 U	**2.15**	0.501 U	0.501 U	**0.207 J**
	NSE-B2114-SB01-0910	9.0-10	7/27/2022 11:30	0.5 U	**0.636 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
NSE-B2114-MW-02	NSE-B2114-SS02-0001	0.0-1.0	7/26/2022 14:58	**0.35 J**	**14.8 J**	0.501 U	**0.982 J**	**0.24 J**	0.501 U	**0.436 J**
	NSE-B2114-SB02-1920	19-20	7/27/2022 15:45	0.498 U	**0.208 J**	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U
NSE-B2114-MW-03	NSE-B2114-SS03-0001	0.0-1.0	7/27/2022 8:35	0.5 U	**0.399 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NSE-B2114-SB03-1920	19-20	7/28/2022 14:40	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
Naval Radio Station Jim Creek										
Building 6 (Former Fire Station)										
NRSJC-B6-MW-01	NRSJC-B6-SB01-0102	1.0-2.0	6/1/2022 15:20	0.501 U	0.501 U	0.501 U	**0.751 J**	0.501 U	0.501 U	**0.318 J**
	NRSJC-B6-SB01-2930	29-30	6/2/2022 11:55	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
NRSJC-B6-MW-02	NRSJC-B6-SS02-000H	0.0-0.5	5/24/2022 8:45	0.502 U	**0.313 J**	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U
	NRSJC-B6-SB02-3637	36-37	6/3/2022 13:00	0.494 U	0.494 U	0.494 U	0.494 U	0.494 U	0.494 U	0.494 U
NRSJC-B6-MW-03	NRSJC-B6-SS03-000H	0.0-0.5	6/6/2022 15:20	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U
	NRSJC-B6-SS03P-000H	0.0-0.5	6/6/2022 15:25	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRSJC-B6-SB03-2930	29-30	6/7/2022 16:45	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U
NRSJC-B6-MW-04	NRSJC-B6-SS04-000H	0.0-0.5	6/8/2022 14:45	0.533 U	**0.356 J**	**0.356 J**	**2.59**	0.533 U	0.533 U	0.533 U
	NRSJC-B6-SB04-2728	27-28	6/9/2022 11:10	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-B6-SB04-2930	29-30	6/9/2022 11:15	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U
Site 1 (Building 11 Landfill)										
NRSJC-S1-MW-05	NRSJC-S1-SS05-000H	0.0-0.5	5/24/2022 11:23	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-S1-SB05-3H4H	3.5-4.5	6/16/2022 15:00	0.513 U	0.513 U	0.513 U	0.513 U	0.513 U	0.513 U	0.513 U
NRSJC-S1-MW-06	NRSJC-S1-SS06-000H	0.0-0.5	5/24/2022 11:04	0.5 U	**0.218 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NRSJC-S1-SB06-0708	7.0-8.0	6/20/2022 16:50	0.506 U	0.506 U	0.506 U	0.506 U	0.506 U	0.506 U	0.506 U
	NRSJC-S1-SB06-2526	25-26	6/21/2022 14:35	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U

Table 4-9. Soil Analytical Results for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington,
Naval Radio Station Jim Creek, Arlington, Washington, and
Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

				PFAS Analyte (µg/kg)						
Sample Station	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date and Time**	**PFOA**	**PFOS**	**PFBS**	**PFHxS**	**PFNA**	**HFPO-DA**	**PFHxA**
			Residential Soil Screening Level	19	13	1,900	130	19	23	3200*
NRSJC-S1-MW-07	NRSJC-S1-SS07-000H	0.0-0.5	5/24/2022 11:31	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRSJC-S1-SB07-0304	3.0-4.0	6/17/2022 12:30	0.513 U	0.513 U	0.513 U	0.513 U	0.513 U	0.513 U	0.513 U
NRSJC-S1-SB-20	NRSJC-S1-SS20-000H	0.0-0.5	5/24/2022 12:06	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-S1-SB20-0203	2.0-3.0	5/24/2022 13:51	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U
	NRSJC-S1-SB20P-0203	2.0-3.0	5/24/2022 13:52	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Site 6 (Blue Campground Landfill)										
NRSJC-S6-MW-08	NRSJC-S6-SS08-000H	0.0-0.5	5/24/2022 15:39	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-S6-SB08-3H04	3.5-4.0	6/15/2022 10:00	0.503 U	0.503 U	0.503 U	0.503 U	0.503 U	0.503 U	0.503 U
NRSJC-S6-MW-09	NRSJC-S6-SS09-000H	0.0-0.5	5/24/2022 14:48	0.497 U	**0.284 J**	0.497 U	0.497 U	0.497 U	0.497 U	0.497 U
	NRSJC-S6-SB09-3H05	3.5-5.0	6/15/2022 14:15	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
NRSJC-S6-MW-10	NRSJC-S6-SS10-000H	0.0-0.5	5/24/2022 15:28	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-S6-SB10-1415	14-15	6/10/2022 13:50	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-S6-SB10P-1415	14-15	6/10/2022 13:55	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Site 7 (Pit Road Landfill)										
NRSJC-S7-MW-11	NRSJC-S1-SS11-000H	0.0-0.5	11/1/2022 11:30	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-S1-SS11P-000H	0.0-0.5	11/1/2022 9:00	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRSJC-S1-SB11-42H43H	42.5-43.5	11/1/2022 9:05	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NRSJC-S1-SB11-9394	93-94	11/1/2022 15:15	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NRSJC-S1-SB11-146147	146-147	11/2/2022 11:00	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NRSJC-S1-SB11-191192	191-192	11/2/2022 14:40	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRSJC-S1-SB11-231232	231-232	11/3/2022 11:00	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
NRSJC-S7-MW-12	NRSJC-S7-SS12-000H	0.0-0.5	10/7/2022 9:45	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NRSJC-S7-SB12-9697	96-97	10/5/2022 11:10	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NRSJC-S7-SB12-145146	145-146	10/5/2022 16:00	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NRSJC-S7-SB12-174175	174-175	10/6/2022 14:00	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-S7-SB12-210211	210-211	10/6/2022 15:20	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NRSJC-S7-SB12-229230	229-230	10/10/2022 12:55	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U

Table 4-9. Soil Analytical Results for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington,
Naval Radio Station Jim Creek, Arlington, Washington, and
Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

				PFAS Analyte (µg/kg)						
Sample Station	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date and Time**	**PFOA**	**PFOS**	**PFBS**	**PFHxS**	**PFNA**	**HFPO-DA**	**PFHxA**
			Residential Soil Screening Level	19	13	1,900	130	19	23	3200*
NRSJC-S7-MW-13	NRSJC-S1-SS07-000H	0.0-0.5	5/24/2022 16:04	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U
	NRSJC-S7-SB13-3839	38-39	10/13/2022 17:00	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRSJC-S7-SB13-8485	84-85	10/14/2022 10:35	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRSJC-S7-SB13-128129	128-129	10/25/2022 16:15	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	NRSJC-S7-SB13-177178	177-178	10/25/2022 12:25	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRSJC-S7-SB13-215216	215-216	10/27/2022 8:30	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRSJC-S7-SB13P-215216	215-216	10/27/2022 8:30	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Site 4 (Metal Burial Pit)										
NRSJC-S4-MW-14	NRSJC-S4-SB14-0203	2.0-3.0	6/29/2022 11:15	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U
	NRSJC-S4-SB14-1718	17-18	6/29/2022 15:20	0.487 U	0.487 U	0.487 U	0.487 U	0.487 U	0.487 U	0.487 U
NRSJC-S4-MW-15	NRSJC-S4-SB15-1617	3.5-5.0	6/30/2022 14:25	0.494 U	0.494 U	0.494 U	0.494 U	0.494 U	0.494 U	0.494 U
Site 5 (Mixed Waste Landfill)										
NRSJC-S5-MW-16	NRSJC-S5-SS16-000H	0.0-0.5	5/25/2022 10:07	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-S5-SB16-1314	13-14	6/27/2022 12:15	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U
NRSJC-S5-MW-18	NRSJC-S5-SS18-000H	0.0-0.5	5/25/2022 11:43	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRSJC-S5-SB18-0708	7.0-8.0	6/22/2022 14:45	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U
	NRSJC-S5-SB18-1415	14-15	6/22/2022 14:50	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U
	NRSJC-S5-SB18P-1415	14-15	6/22/2022 14:55	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
NRSJC-S5-MW-19	NRSJC-S5-SS19-000H	0.0-0.5	5/25/2022 11:15	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U	0.501 U
	NRSJC-S5-SB19-1011	10-11	6/23/2022 15:40	0.491 U	0.491 U	0.491 U	0.491 U	0.491 U	0.491 U	0.491 U
NRSJC-S5-SB-21	NRSJC-S5-SB21-0203	2.0-3.0	5/25/2022 10:48	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U
Naval Recreation Complex Pacific Beach										
Building 106 (Former Fire Station)										
NRCPB-B106-MW-01	NRCPB-B106-SS01-0001	0.0-1.0	8/3/2022 10:30	0.502 U	**0.26 J**	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U
	NRCPB-B106-SS01P-0001	0.0-1.0	8/3/2022 10:35	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U
	NRCPB-B106-SB01-1314	13-14	8/3/2022 16:50	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U

Table 4-9. Soil Analytical Results for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington,
Naval Radio Station Jim Creek, Arlington, Washington, and
Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

				PFAS Analyte (µg/kg)						
Sample Station	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date and Time**	**PFOA**	**PFOS**	**PFBS**	**PFHxS**	**PFNA**	**HFPO-DA**	**PFHxA**
			Residential Soil Screening Level	19	13	1,900	130	19	23	3200*
NRCPB-B106-MW-02	NRCPB-B106-SS02-0001	0.0-1.0	8/3/2022 11:00	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U	0.502 U
	NRCPB-B106-SB02-0910	9.0-10	8/4/2022 9:40	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U
NRCPB-B106-MW-03	NRCPB-B106-SS03-0001	0.0-1.0	8/8/2022 12:00	0.499 U	**0.621 J**	0.499 U	0.499 U	0.499 U	0.499 U	0.499 U
	NRCPB-B106-SB03-0506	5.0-6.0	8/8/2022 13:40	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U	0.498 U

Bolded text indicates detection.

Shaded text indicates exceedance of Residential Soil Screening Level (SL).

*= May 2023 SL for PFHxA

µg/kg = micrograms per kilogram

ft bgs = feet below ground surface

HFPO-DA = hexafluoropropylene oxide dimer acid

ID = identification

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

PFAS = per- and polyfluoroalkyl substances

PFBS = perfluorobutanesulfonic acid

PFHxS = perfluorohexanesulfonic acid

PFNA = perfluorononanoic acid

PFOA = perfluorooctanoic acid

PFOS = perfluorooctane Sulfonate

U = The material was analyzed for, but not detected.

Table 4-10. Groundwater Analytical Results for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington,
Naval Radio Station Jim Creek, Arlington, Washington, and
Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

				PFAS Analyte (ng/L)						
Sample Station	**Sample ID**	**Sample Date and Time**	**Screen Depth (ft btoc)**	**PFOA**	**PFOS**	**PFBS**	**PFHxS**	**PFNA**	**HFPO-DA**	**PFHxA**
		USEPA Lifetime Health Advisory		70	70	--	--	--	--	--
		Tapwater Screening Level		6.0	4.0	600	39	5.9	6.0	990*
Naval Station Everett										
Building 2114 (Fire Station)										
NSE-B2114-MW01	NSE-B2114-GW01-0822	8/11/2022 17:40	9-19	**8.9**	**514**	**10.1**	**223**	**1.93 J**	2.64 U	**13.9**
NSE-B2114-MW01	NSE-B2114-GW01P-0822	8/11/2022 17:45	9-19	**9.47**	**516**	**10.6**	**224**	**2.19 J**	2.51 U	**15.4**
NSE-B2114-MW02	NSE-B2114-GW02-0822	8/11/2022 19:30	19-29	**12.9**	**6.79 J**	**14.3**	**59.6**	**0.869 J**	2.56 U	**13.3**
NSE-B2114-MW03	NSE-B2114-GW03-0822	8/11/2022 18:45	15-25	**5.19**	**3.3 J**	**7.97**	**4.29 J**	2.41 U	2.41 U	**8.63**
Naval Radio Station Jim Creek										
Building 6 (Former Fire Station)										
NRSJC-B6-MW01	NRSJC-B6-GW01-0622	6/30/2022 10:20	30-40	**1.33 J**	**4.22 J**	**1.04 J**	**1.49 J**	2.33 U	2.33 U	2.33 U
NRSJC-B6-MW02	NRSJC-B6-GW02-0622	6/30/2022 12:55	25-35	**2.2 J**	**18.3 J**	**2.64 J**	**7.34**	2.4 U	2.4 U	**2.63 J**
NRSJC-B6-MW03	NRSJC-B6-GW03-0622	6/30/2022 14:55	28.5-38.5	**2.97 J**	**16.5**	**17.4**	**153**	2.4 U	2.4 U	**11.7**
NRSJC-B6-MW04	NRSJC-B6-GW04-0722	7/1/2022 9:45	30-40	**2.36 J**	**60.6**	**5.46**	**32.1**	2.21 U	2.21 U	**3.95 J**
Site 1 (Building 11 Landfill)										
NRSJC-S1-MW05	NRSJC-S1-GW05-0722	7/11/2022 17:00	4.0-14	**2.22 J**	2.31 U	**1.29 J**	2.31 U	2.31 U	2.31 U	2.31 U
NRSJC-S1-MW06	NRSJC-S1-GW06-0722	7/11/2022 14:45	28.5-38.5	2.28 U	2.28 U	2.28 U	2.28 U	2.28 U	2.28 U	2.28 U
NRSJC-S1-MW07	NRSJC-S1-GW07-0722	7/12/2022 11:35	4.0-14	2.27 U	2.27 U	2.27 U	2.27 U	2.27 U	2.27 U	2.27 U
NRSJC-S1-MW07	NRSJC-S1-GW07P-0722	7/12/2022 11:37	4.0-14	**1.09 J**	2.31 U	2.31 U	2.31 U	2.31 U	2.31 U	2.31 U

Table 4-10. Groundwater Analytical Results for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington,
Naval Radio Station Jim Creek, Arlington, Washington, and
Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

				PFAS Analyte (ng/L)						
Sample Station	**Sample ID**	**Sample Date and Time**	**Screen Depth (ft btoc)**	**PFOA**	**PFOS**	**PFBS**	**PFHxS**	**PFNA**	**HFPO-DA**	**PFHxA**
USEPA Lifetime Health Advisory				70	70	--	--	--	--	--
Tapwater Screening Level				6.0	4.0	600	39	5.9	6.0	990*
Site 6 (Blue Campground Landfill)										
NRSJC-S6-MW08	NRSJC-S6-GW08-0722	7/13/2022 13:05	4.0-14	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
NRSJC-S6-MW09	NRSJC-S6-GW09-0722	7/12/2022 12:50	4.0-14	2.19 U	2.19 U	2.19 U	2.19 U	2.19 U	2.19 U	2.19 U
NRSJC-S6-MW09	NRSJC-S6-GW09P-0722	7/12/2022 12:52	4.0-14	**1.24 J**	2.16 U	2.16 U	2.16 U	2.16 U	2.16 U	2.16 U
NRSJC-S6-MW10	NRSJC-S6-GW10-0722	7/13/2022 12:00	14-24	2.43 U	2.43 U	2.43 U	2.43 U	2.43 U	2.43 U	2.43 U
Site 7 (Pit Road Landfill)										
NRSJC-S7-MW11	NRSJC-S7-GW11-1122	11/9/2022 15:15	234-244	2.31 U	2.31 U	2.31 U	2.31 U	2.31 U	2.31 U	2.31 U
NRSJC-S7-MW11	NRSJC-S7-GW11P-1122	11/9/2022 15:20	234-244	2.69 U	2.69 U	2.69 U	2.69 U	2.69 U	2.69 U	2.69 U
NRSJC-S7-MW12	NRSJC-S7-GW12A-1122	11/10/2022 13:35	233-243	2.68 U	2.68 U	2.68 U	2.68 U	2.68 U	2.68 U	2.68 U
NRSJC-S7-MW13	Not sampled, well dry	NA	217-237	NA	NA	NA	NA	NA	NA	NA
Site 4 (Metal Burial Pit)										
NRSJC-S4-MW14	NRSJC-S4-GW14-0722	7/13/2022 14:20	17-27	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U
NRSJC-S4-MW14	NRSJC-S4-GW14P-0722	7/13/2022 14:22	7.0-17	2.34 U	2.34 U	2.34 U	2.34 U	2.34 U	2.34 U	2.34 U
NRSJC-S4-MW15	NRSJC-S4-GW15-0722	7/13/2022 15:15	17-27	2.25 U	2.25 U	2.25 U	2.25 U	2.25 U	2.25 U	2.25 U
Site 5 (Mixed Waste Landfill)										
NRSJC-S5-MW16	NRSJC-S5-GW16-0722	7/12/2022 15:30	16.5-26.5	2.44 U	2.44 U	2.44 U	2.44 U	2.44 U	2.44 U	2.44 U
NRSJC-S5-MW16	NRSJC-S5-GW16P-0722	7/12/2022 15:32	16.5-26.5	2.36 U	2.36 U	2.36 U	2.36 U	2.36 U	2.36 U	2.36 U
NRSJC-S5-MW18	NRSJC-S5-GW18-0722	7/13/2022 9:40	14-24	2.38 U	2.38 U	2.38 U	2.38 U	2.38 U	2.38 U	2.38 U
NRSJC-S5-MW-19	NRSJC-S5-GW19-0722	7/12/2022 10:40	11-21	2.34 U	2.34 U	2.34 U	2.34 U	2.34 U	2.34 U	2.34 U

Table 4-10. Groundwater Analytical Results for PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA

Site Inspection Report for Per- and Polyfluoroalkyl Substances at Naval Station Everett, Everett, Washington,
Naval Radio Station Jim Creek, Arlington, Washington, and
Naval Recreation Complex Pacific Beach, Pacific Beach, Washington

				PFAS Analyte (ng/L)						
Sample Station	**Sample ID**	**Sample Date and Time**	**Screen Depth (ft btoc)**	**PFOA**	**PFOS**	**PFBS**	**PFHxS**	**PFNA**	**HFPO-DA**	**PFHxA**
USEPA Lifetime Health Advisory				70	70	--	--	--	--	--
Tapwater Screening Level				6.0	4.0	600	39	5.9	6.0	990*
Naval Recreation Complex Pacific Beach										
Building 106 (Former Fire Station)										
NRCPB-B106-MW-01	NRCPB-B106-GW01-0822	8/9/2022 11:40	11-21	**3.61 J**	**2.9 J**	2.71 U	**3.7 J**	2.71 U	2.71 U	2.71 U
NRCPB-B106-MW-01	NRCPB-B106-GW01P-0822	8/9/2022 11:45	11-21	**3.42 J**	**2.55 J**	2.55 U	**3.21 J**	2.55 U	2.55 U	2.55 U
NRCPB-B106-MW-02	NRCPB-B106-GW02-0822	8/9/2022 12:40	10-20	**2.08 J**	**5.53 J**	2.46 U	2.46 U	2.46 U	2.46 U	**2.05 J**
NRCPB-B106-MW-03	NRCPB-B106-GW03-0822	8/10/2022 10:35	6.0-16	2.5 U	**14.1**	2.5 U	**2.4 J**	2.5 U	2.5 U	2.5 U

Bolded text indicates detection.

Shaded text indicates exceedance of Tapwater Screening Level (SL).

*= May 2023 SL for PFHxA

ft btoc = feet below top of casing

HFPO-DA = hexafluoropropylene oxide dimer acid

ID = identification

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

ng/L = nanograms per liter

PFAS = per- and polyfluoroalkyl substances

PFBS = perfluorobutanesulfonic acid

PFHxS = perfluorohexanesulfonic acid

PFNA = perfluorononanoic acid

PFOA = perfluorooctanoic acid

PFOS = perfluorooctane Sulfonate

U = The material was analyzed for, but not detected.

USEPA = United States Environmental Protection Agency

Location		NSE-B2114-MW-01				
Sample		NSE-B2114-GW01-0822	NSE-B2114-GW01P-0822	NSE-B2114-SS01-0001	NSE-B2114-SS01P-0001	NSE-B2114-SB01-0910
Sample Date/Time		*8/11/2022 17:40*	*8/11/2022 17:45*	*7/26/2022 11:10*	*7/26/2022 11:12*	*7/27/2022 11:30*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*9.0-19**	*9.0-19**	*0.0-1.0***	*0.0-1.0***	*9.0-10***
Media/Units		*Groundwater (ng/L)*	*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])					
PFOA	6.0/19	**8.9**	**9.47**	0.501 U	0.501 U	0.5 U
PFOS	4.0/13	**514**	**516**	**34.5**	**30.9**	**0.636 J**
PFBS	600/1,900	**10.1**	**10.6**	0.501 U	0.501 U	0.5 U
PFHxS	39/130	**223**	**224**	**2.77**	**2.15**	0.5 U
PFNA	5.9/19	**1.93 J**	**2.19 J**	0.501 U	0.501 U	0.5 U
HFPO-DA	6.0/23	2.64 U	2.51 U	0.501 U	0.501 U	0.5 U

Location		NSE-B2114-MW-02		
Sample		NSE-B2114-GW02-0822	NSE-B2114-SS02-0001	NSE-B2114-SB02-1920
Sample Date/Time		*8/11/2022 19:30*	*7/26/2022 14:58*	*7/27/2022 15:45*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*19-29**	*0.0-1.0***	*19-20***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])			
PFOA	6.0/19	**12.9**	**0.35 J**	0.498 U
PFOS	4.0/13	**6.79 J**	**14.8 J**	**0.208 J**
PFBS	600/1,900	**14.3**	0.501 U	0.498 U
PFHxS	39/130	**59.6**	**0.982 J**	0.498 U
PFNA	5.9/19	**0.869 J**	**0.24 J**	0.498 U
HFPO-DA	6.0/23	2.56 U	0.501 U	0.498 U

Location		NSE-B2114-MW-03		
Sample		NSE-B2114-GW03-0822	NSE-B2114-SS03-0001	NSE-B2114-SB03-1920
Sample Date/Time		*8/11/2022 18:45*	*7/27/2022 8:35*	*7/28/2022 14:40*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*15-25**	*0.0-1.0***	*19-20***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])			
PFOA	6.0/19	**5.19**	0.5 U	0.499 U
PFOS	4.0/13	**3.3 J**	**0.399 J**	0.499 U
PFBS	600/1,900	**7.97**	0.5 U	0.499 U
PFHxS	39/130	**4.29 J**	0.5 U	0.499 U
PFNA	5.9/19	2.41 U	0.5 U	0.499 U
HFPO-DA	6.0/23	2.41 U	0.5 U	0.499 U

Fire Truck Ramp

BUILDING 2114 (FIRE STATION)

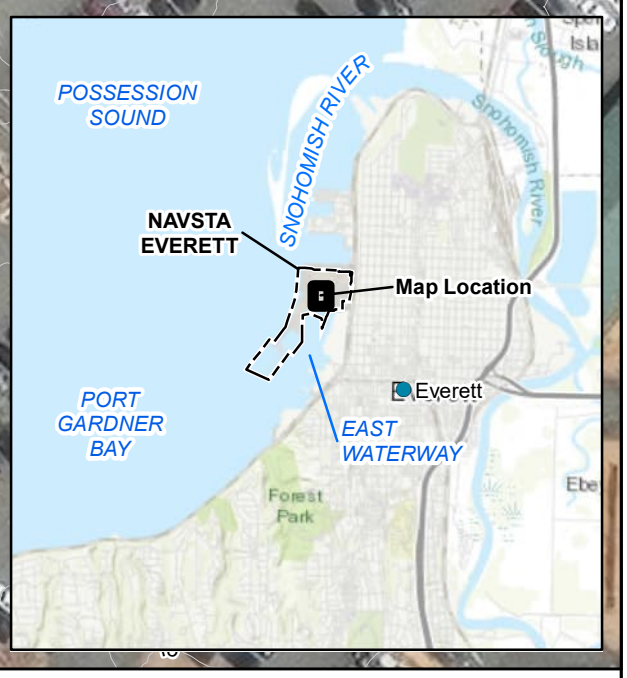
Spruance Boulevard

Fletcher Way

Mahan Avenue

NOTES:
Bolded text indicates detection
Shaded indicates exceedance of screening level
EPA = United States Environmental Protection Agency
ft bgs = feet below ground surface
ft btoc = feet below top of casing
HFPO-DA = hexafluoropropylene oxide dimer acid
J = Analyte present, value may or may not be accurate or precise
NAVSTA = Naval Station
ng/L = nanograms per liter
NRC = Naval Recreation Complex
NRS = Naval Radio Station
PFAS = per- and polyfluoroalkyl Substances
PFBS = perfluorobutanesulfonic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
RSL = regional screening level
U = The material was analyzed for, but not detected
µg/kg = micrograms per kilogram

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, Maxar, 2022
Contours derived from USGS National Elevation Dataset



LEGEND
- Monitoring Well and Soil Sample Location
- Stormwater Catch Basin
- 5' Topographic Contours
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Road Centerline
- Potential PFAS Release Area
- Installation Boundary

Figure 4-1
PFAS Soil and Groundwater Results: NAVSTA Everett, Building 2114
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 37.5 75
1 inch = 75 feet
N

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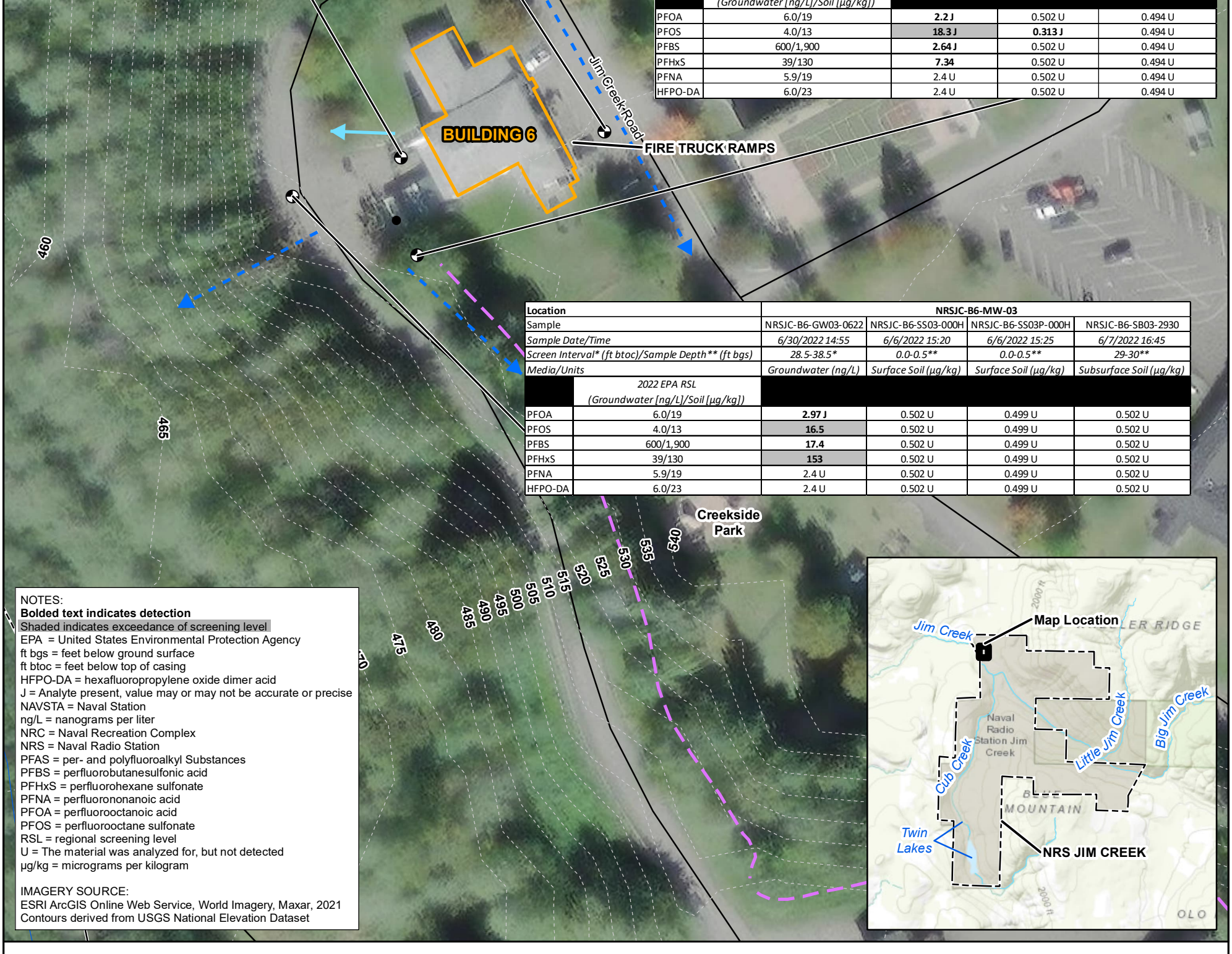
Location		NRSJC-B6-MW-04			
Sample		NRSJC-B6-GW04-0722	NRSJC-B6-SS04-000H	NRSJC-B6-SB04-2728	NRSJC-B6-SB04-2930
Sample Date/Time		*7/1/2022 9:45*	*6/8/2022 14:45*	*6/9/2022 11:10*	*6/9/2022 11:15*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*30-40**	*0.0-0.5***	*27-28***	*29-30***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])				
PFOA	6.0/19	**2.36 J**	0.533 U	0.501 U	0.502 U
PFOS	4.0/13	**60.6**	**0.356 J**	0.501 U	0.502 U
PFBS	600/1,900	**5.46**	**0.356 J**	0.501 U	0.502 U
PFHxS	39/130	**32.1**	**2.59**	0.501 U	0.502 U
PFNA	5.9/19	2.21 U	0.533 U	0.501 U	0.502 U
HFPO-DA	6.0/23	2.21 U	0.533 U	0.501 U	0.502 U

Location		NRSJC-B6-MW-01		
Sample		NRSJC-B6-GW01-0622	NRSJC-B6-SB01-0102	NRSJC-B6-SB01-2930
Sample Date/Time		*6/30/2022 10:20*	*6/1/2022 15:20*	*6/2/2022 11:55*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*30-40**	*1.0-2.0***	*29-30***
Media/Units		*Groundwater (ng/L)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])			
PFOA	6.0/19	**1.33 J**	0.501 U	0.5 U
PFOS	4.0/13	**4.22 J**	0.501 U	0.5 U
PFBS	600/1,900	**1.04 J**	0.501 U	0.5 U
PFHxS	39/130	**1.49 J**	**0.751 J**	0.5 U
PFNA	5.9/19	2.33 U	0.501 U	0.5 U
HFPO-DA	6.0/23	2.33 U	0.501 U	0.5 U

Location		NRSJC-B6-MW-02		
Sample		NRSJC-B6-GW02-0622	NRSJC-B6-SS02-000H	NRSJC-B6-SB02-3637
Sample Date/Time		*6/30/2022 12:55*	*5/24/2022 8:45*	*6/3/2022 13:00*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*25-35**	*0.0-0.5***	*36-37***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])			
PFOA	6.0/19	**2.2 J**	0.502 U	0.494 U
PFOS	4.0/13	**18.3 J**	**0.313 J**	0.494 U
PFBS	600/1,900	**2.64 J**	0.502 U	0.494 U
PFHxS	39/130	**7.34**	0.502 U	0.494 U
PFNA	5.9/19	2.4 U	0.502 U	0.494 U
HFPO-DA	6.0/23	2.4 U	0.502 U	0.494 U

Location		NRSJC-B6-MW-03			
Sample		NRSJC-B6-GW03-0622	NRSJC-B6-SS03-000H	NRSJC-B6-SS03P-000H	NRSJC-B6-SB03-2930
Sample Date/Time		*6/30/2022 14:55*	*6/6/2022 15:20*	*6/6/2022 15:25*	*6/7/2022 16:45*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*28.5-38.5**	*0.0-0.5***	*0.0-0.5***	*29-30***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])				
PFOA	6.0/19	**2.97 J**	0.502 U	0.499 U	0.502 U
PFOS	4.0/13	**16.5**	0.502 U	0.499 U	0.502 U
PFBS	600/1,900	**17.4**	0.502 U	0.499 U	0.502 U
PFHxS	39/130	**153**	0.502 U	0.499 U	0.502 U
PFNA	5.9/19	2.4 U	0.502 U	0.499 U	0.502 U
HFPO-DA	6.0/23	2.4 U	0.502 U	0.499 U	0.502 U



LEGEND

- Monitoring Well and Soil Sample Location
- Stormwater Catch Basin
- Unpaved Ditch
- Surface Waterbodies
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- 5' Topographic Contours
- Road Centerline
- Potential PFAS Release Area
- Installation Boundary

Figure 4-2
PFAS Soil and Groundwater Results: NRS Jim Creek, Building 6
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 37.5 75
1 inch = 75 feet
N

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Location		NRSJC-S1-MW-05		
Sample		NRSJC-S1-GW05-0722	NRSJC-S1-SS05-000H	NRSJC-S1-SB05-3H4H
Sample Date/Time		*7/11/2022 17:00*	*5/24/2022 11:23*	*6/16/2022 15:00*
Screen Interval (ft btoc)/ Sample Depth** (ft bgs)*		*4.0-14**	*0.0-0.5***	*3.5-4.5***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/ Soil [µg/kg])			
PFOA	6.0/19	**2.22 J**	0.501 U	0.513 U
PFOS	4.0/13	2.31 U	0.501 U	0.513 U
PFBS	600/1,900	**1.29 J**	0.501 U	0.513 U
PFHxS	39/130	2.31 U	0.501 U	0.513 U
PFNA	5.9/19	2.31 U	0.501 U	0.513 U
HFPO-DA	6.0/23	2.31 U	0.501 U	0.513 U

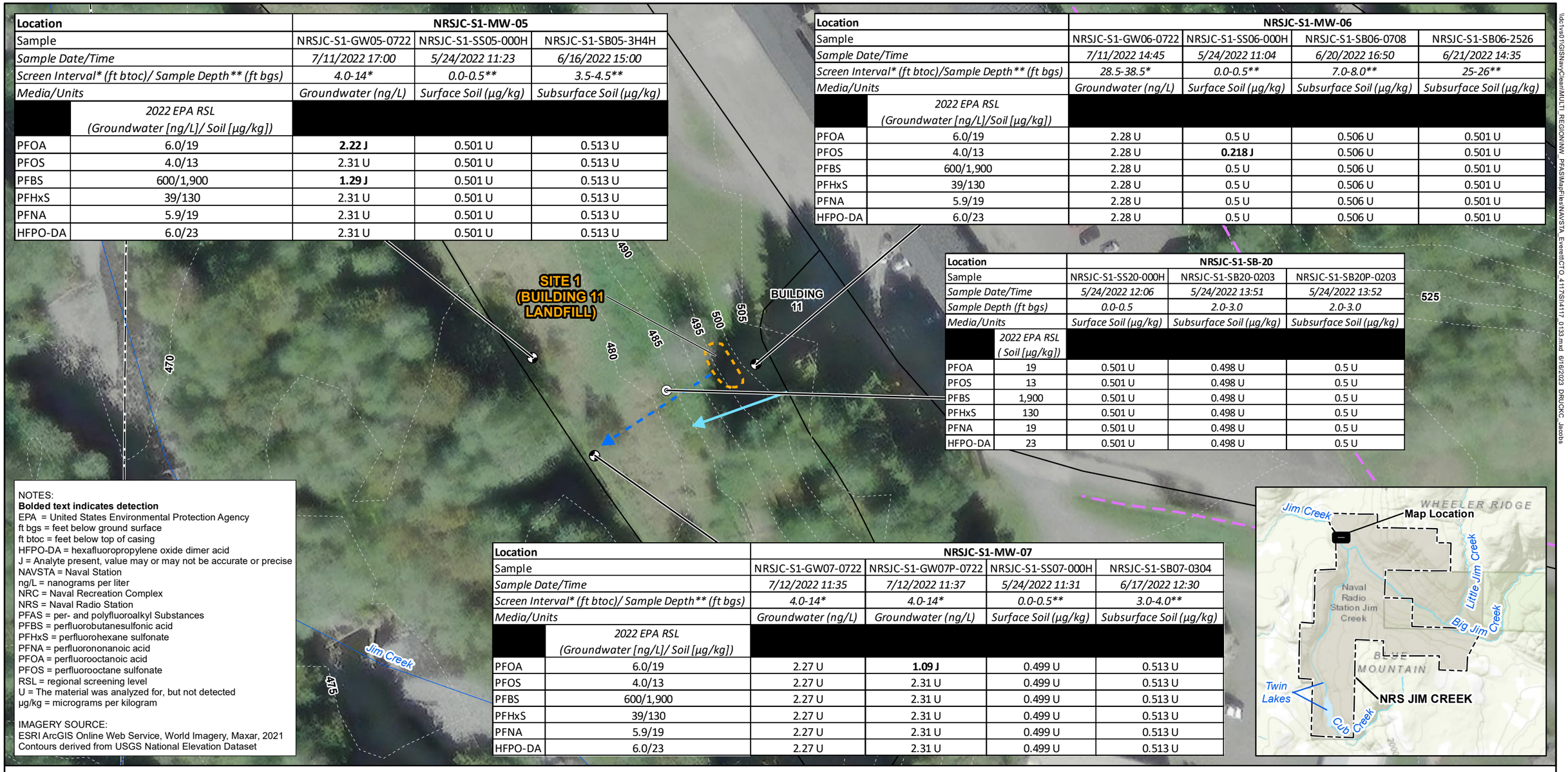
Location		NRSJC-S1-MW-06			
Sample		NRSJC-S1-GW06-0722	NRSJC-S1-SS06-000H	NRSJC-S1-SB06-0708	NRSJC-S1-SB06-2526
Sample Date/Time		*7/11/2022 14:45*	*5/24/2022 11:04*	*6/20/2022 16:50*	*6/21/2022 14:35*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*28.5-38.5**	*0.0-0.5***	*7.0-8.0***	*25-26***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])				
PFOA	6.0/19	2.28 U	0.5 U	0.506 U	0.501 U
PFOS	4.0/13	2.28 U	**0.218 J**	0.506 U	0.501 U
PFBS	600/1,900	2.28 U	0.5 U	0.506 U	0.501 U
PFHxS	39/130	2.28 U	0.5 U	0.506 U	0.501 U
PFNA	5.9/19	2.28 U	0.5 U	0.506 U	0.501 U
HFPO-DA	6.0/23	2.28 U	0.5 U	0.506 U	0.501 U

Location		NRSJC-S1-SB-20		
Sample		NRSJC-S1-SS20-000H	NRSJC-S1-SB20-0203	NRSJC-S1-SB20P-0203
Sample Date/Time		*5/24/2022 12:06*	*5/24/2022 13:51*	*5/24/2022 13:52*
Sample Depth (ft bgs)		*0.0-0.5*	*2.0-3.0*	*2.0-3.0*
Media/Units		*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Soil [µg/kg])			
PFOA	19	0.501 U	0.498 U	0.5 U
PFOS	13	0.501 U	0.498 U	0.5 U
PFBS	1,900	0.501 U	0.498 U	0.5 U
PFHxS	130	0.501 U	0.498 U	0.5 U
PFNA	19	0.501 U	0.498 U	0.5 U
HFPO-DA	23	0.501 U	0.498 U	0.5 U

Location		NRSJC-S1-MW-07			
Sample		NRSJC-S1-GW07-0722	NRSJC-S1-GW07P-0722	NRSJC-S1-SS07-000H	NRSJC-S1-SB07-0304
Sample Date/Time		*7/12/2022 11:35*	*7/12/2022 11:37*	*5/24/2022 11:31*	*6/17/2022 12:30*
Screen Interval (ft btoc)/ Sample Depth** (ft bgs)*		*4.0-14**	*4.0-14**	*0.0-0.5***	*3.0-4.0***
Media/Units		*Groundwater (ng/L)*	*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/ Soil [µg/kg])				
PFOA	6.0/19	2.27 U	**1.09 J**	0.499 U	0.513 U
PFOS	4.0/13	2.27 U	2.31 U	0.499 U	0.513 U
PFBS	600/1,900	2.27 U	2.31 U	0.499 U	0.513 U
PFHxS	39/130	2.27 U	2.31 U	0.499 U	0.513 U
PFNA	5.9/19	2.27 U	2.31 U	0.499 U	0.513 U
HFPO-DA	6.0/23	2.27 U	2.31 U	0.499 U	0.513 U

NOTES:
Bolded text indicates detection
EPA = United States Environmental Protection Agency
ft bgs = feet below ground surface
ft btoc = feet below top of casing
HFPO-DA = hexafluoropropylene oxide dimer acid
J = Analyte present, value may or may not be accurate or precise
NAVSTA = Naval Station
ng/L = nanograms per liter
NRC = Naval Recreation Complex
NRS = Naval Radio Station
PFAS = per- and polyfluoroalkyl Substances
PFBS = perfluorobutanesulfonic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
RSL = regional screening level
U = The material was analyzed for, but not detected
µg/kg = micrograms per kilogram

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, Maxar, 2021
Contours derived from USGS National Elevation Dataset



LEGEND

- Monitoring Well and Soil Sampling Location
- Shallow Subsurface Soil Sample
- Unpaved Ditch
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- 5' Topographic Contours
- Surface Waterbodies
- Road Centerline
- Potential PFAS Release Area (assumed boundary)
- Installation Boundary

Figure 4-3
PFAS Soil and Groundwater Results: NRS Jim Creek, Site 1
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 37.5 75
1 inch = 75 feet
N

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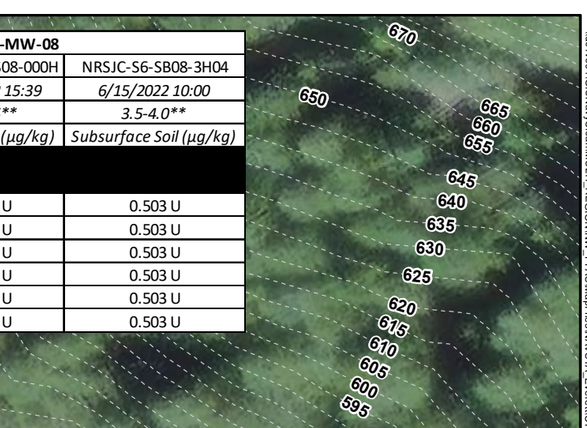
Location		NRSJC-S6-MW-10			
Sample		NRSJC-S6-GW10-0722	NRSJC-S6-SS10-000H	NRSJC-S6-SB10-1415	NRSJC-S6-SB10P-1415
Sample Date/Time		*7/13/2022 12:00*	*5/24/2022 15:28*	*6/10/2022 13:50*	*6/10/2022 13:55*
Screen Interval (ft btoc)/ Sample Depth** (ft bgs)*		*14-24**	*0.0-0.5***	*14-15***	*14-15***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/ Soil [µg/kg])				
PFOA	6.0/19	2.43 U	0.501 U	0.501 U	0.5 U
PFOS	4.0/13	2.43 U	0.501 U	0.501 U	0.5 U
PFBS	600/1,900	2.43 U	0.501 U	0.501 U	0.5 U
PFHxS	39/130	2.43 U	0.501 U	0.501 U	0.5 U
PFNA	5.9/19	2.43 U	0.501 U	0.501 U	0.5 U
HFPO-DA	6.0/23	2.43 U	0.501 U	0.501 U	0.5 U

Location		NRSJC-S6-MW-08		
Sample		NRSJC-S6-GW08-0722	NRSJC-S6-SS08-000H	NRSJC-S6-SB08-3H04
Sample Date/Time		*7/13/2022 13:05*	*5/24/2022 15:39*	*6/15/2022 10:00*
Screen Interval (ft btoc)/ Sample Depth** (ft bgs)*		*4.0-14**	*0.0-0.5***	*3.5-4.0***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/ Soil [µg/kg])			
PFOA	6.0/19	2.3 U	0.501 U	0.503 U
PFOS	4.0/13	2.3 U	0.501 U	0.503 U
PFBS	600/1,900	2.3 U	0.501 U	0.503 U
PFHxS	39/130	2.3 U	0.501 U	0.503 U
PFNA	5.9/19	2.3 U	0.501 U	0.503 U
HFPO-DA	6.0/23	2.3 U	0.501 U	0.503 U

Location		NRSJC-S6-MW-09			
Sample		NRSJC-S6-GW09-0722	NRSJC-S6-GW09P-0722	NRSJC-S6-SS09-000H	NRSJC-S6-SB09-3H05
Sample Date/Time		*7/12/2022 12:50*	*7/12/2022 12:52*	*5/24/2022 14:48*	*6/15/2022 14:15*
Screen Interval (ft btoc)/ Sample Depth** (ft bgs)*		*4.0-14**	*4.0-14**	*0.0-0.5***	*3.5-5.0***
Media/Units		*Groundwater (ng/L)*	*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/ Soil [µg/kg])				
PFOA	6.0/19	2.19 U	**1.24 J**	0.497 U	0.5 U
PFOS	4.0/13	2.19 U	2.16 U	**0.284 J**	0.5 U
PFBS	600/1,900	2.19 U	2.16 U	0.497 U	0.5 U
PFHxS	39/130	2.19 U	2.16 U	0.497 U	0.5 U
PFNA	5.9/19	2.19 U	2.16 U	0.497 U	0.5 U
HFPO-DA	6.0/23	2.19 U	2.16 U	0.497 U	0.5 U

NOTES:
Bolded text indicates detection
EPA = United States Environmental Protection Agency
ft amsl = feet above mean sea level
ft bgs = feet below ground surface
ft btoc = feet below top of casing
HFPO-DA = hexafluoropropylene oxide dimer acid
J = Analyte present, value may or may not be accurate or precise
NAVSTA = Naval Station
ng/L = nanograms per liter
NRC = Naval Recreation Complex
NRS = Naval Radio Station
PFAS = per- and polyfluoroalkyl Substances
PFBS = perfluorobutanesulfonic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
RSL = regional screening level
U = The material was analyzed for, but not detected
µg/kg = micrograms per kilogram

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, Maxar, 2021
Contours derived from USGS National Elevation Dataset



LEGEND

- Monitoring Well and Soil Sample Location
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Surface Waterbodies
- 5' Topographic Contours
- Road Centerline
- Potential PFAS Release Area (assumed boundary)
- Installation Boundary

Figure 4-4
PFAS Soil and Groundwater Results: NRS Jim Creek, Site 6
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 37.5 75
1 inch = 75 feet
N

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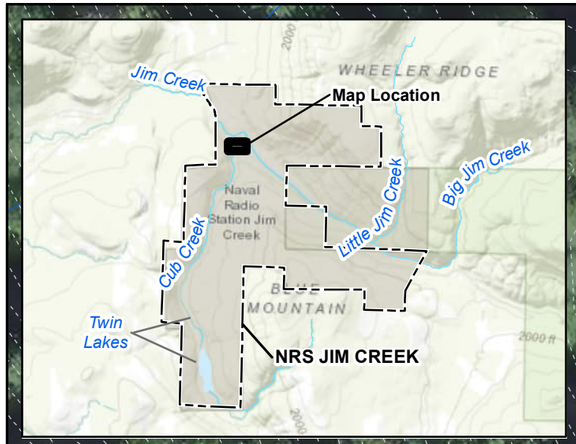

Location		NRSJC-S7-MW-11								
Sample		NRSJC-S7-GW11-1122	NRSJC-S7-GW11P-1122	NRSJC-S1-SS11-000H	NRSJC-S1-SS11P-000H	NRSJC-S1-42H43H	NRSJC-S1-SB11-9394	NRSJC-S1-SB11-146147	NRSJC-S1-SB11-191192	NRSJC-S1-SB11-231232
Sample Date/Time		*11/9/2022 15:15*	*11/9/2022 15:20*	*11/1/2022 11:30*	*11/1/2022 9:00*	*11/1/2022 9:05*	*11/1/2022 15:15*	*11/2/2022 11:00*	*11/2/2022 14:40*	*11/3/2022 11:00*
Screen Interval (ft btoc)/ Sample Depth** (ft bgs)*		*234-254**	*234-244**	*0.0-0.5***	*0.0-0.5***	*42.5-43.5***	*93-94***	*146-147***	*191-192***	*231-232***
Media/Units		*Groundwater (ng/L)*	*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/ Soil [µg/kg])									
PFOA	6.0/19	2.31 U	2.69 U	0.501 U	0.499 U	0.5 U	0.5 U	0.5 U	0.499 U	0.5 U
PFOS	4.0/13	2.31 U	2.69 U	0.501 U	0.499 U	0.5 U	0.5 U	0.5 U	0.499 U	0.5 U
PFBS	600/1,900	2.31 U	2.69 U	0.501 U	0.499 U	0.5 U	0.5 U	0.5 U	0.499 U	0.5 U
PFHxS	39/130	2.31 U	2.69 U	0.501 U	0.499 U	0.5 U	0.5 U	0.5 U	0.499 U	0.5 U
PFNA	5.9/19	2.31 U	2.69 U	0.501 U	0.499 U	0.5 U	0.5 U	0.5 U	0.499 U	0.5 U
HFPO-DA	6.0/23	2.31 U	2.69 U	0.501 U	0.499 U	0.5 U	0.5 U	0.5 U	0.499 U	0.5 U

Location		NRSJC-S7-MW-13[b]						
Sample		NRSJC-S1-SS07-000H	NRSJC-S7-SB13-3839	NRSJC-S7-SB13-8485	NRSJC-S7-SB13-128129	NRSJC-S7-SB13-177178	NRSJC-S7-SB13-215216	NRSJC-S7-SB13P-215216
Sample Date/Time		*5/24/2022 16:04*	*10/13/2022 17:00*	*10/14/2022 10:35*	*10/25/2022 16:15*	*10/25/2022 12:25*	*10/27/2022 8:30*	*10/27/2022 8:30*
Sample Depth (ft bgs)		*0.0-0.5*	*38-39*	*84-85*	*128-129*	*177-178*	*215-216*	*215-216*
Media/Units		*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Soil [µg/kg])							
PFOA	19	0.502 U	0.499 U	0.499 U	0.5 U	0.499 U	0.499 U	0.5 U
PFOS	13	0.502 U	0.499 U	0.499 U	0.5 U	0.499 U	0.499 U	0.5 U
PFBS	1,900	0.502 U	0.499 U	0.499 U	0.5 U	0.499 U	0.499 U	0.5 U
PFHxS	130	0.502 U	0.499 U	0.499 U	0.5 U	0.499 U	0.499 U	0.5 U
PFNA	19	0.502 U	0.499 U	0.499 U	0.5 U	0.499 U	0.499 U	0.5 U
HFPO-DA	23	0.502 U	0.499 U	0.499 U	0.5 U	0.499 U	0.499 U	0.5 U

Location		NRSJC-S7-MW-12[a]						
Sample		NRSJC-S7-GW12A-1122	NRSJC-S7-SS12-000H	NRSJC-S7-SB12-9697	NRSJC-S7-SB12-145146	NRSJC-S7-SB12-174175	NRSJC-S7-SB12-210211	NRSJC-S7-SB12-229230
Sample Date/Time		*11/10/2022 13:35*	*10/7/2022 9:45*	*10/5/2022 11:10*	*10/5/2022 16:00*	*10/6/2022 14:00*	*10/6/2022 15:20*	*10/10/2022 12:55*
Screen Interval (ft btoc)/ Sample Depth** (ft bgs)*		*233-243**	*0.0-0.5***	*96-97***	*145-146***	*174-175***	*210-211***	*229-230***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/ Soil [µg/kg])							
PFOA	6.0/19	2.68 U	0.5 U	0.5 U	0.5 U	0.501 U	0.5 U	0.501 U
PFOS	4.0/13	2.68 U	0.5 U	0.5 U	0.5 U	0.501 U	0.5 U	0.501 U
PFBS	600/1,900	2.68 U	0.5 U	0.5 U	0.5 U	0.501 U	0.5 U	0.501 U
PFHxS	39/130	2.68 U	0.5 U	0.5 U	0.5 U	0.501 U	0.5 U	0.501 U
PFNA	5.9/19	2.68 U	0.5 U	0.5 U	0.5 U	0.501 U	0.5 U	0.501 U
HFPO-DA	6.0/23	2.68 U	0.5 U	0.5 U	0.5 U	0.501 U	0.5 U	0.501 U

NOTES:
[a]Well was redrilled. All data is from redrilled well.
[b]Well was dry. No groundwater sample collected.
EPA = United States Environmental Protection Agency
ft bgs = feet below ground surface
HFPO-DA = hexafluoropropylene oxide dimer acid
NAVSTA = Naval Station
ng/L = nanograms per liter
NRC = Naval Recreation Complex
NRS = Naval Radio Station
PFAS = per- and polyfluoroalkyl Substances
PFBS = perfluorobutanesulfonic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
RSL = regional screening level
U = The material was analyzed for, but not detected
µg/kg = micrograms per kilogram

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, Maxar, 2021
Contours derived from USGS National Elevation Dataset

LEGEND

- Monitoring Well and Soil Sample Location
- Anticipated Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Surface Waterbodies
- 5' Topographic Contours
- Road Centerline
- Potential PFAS Release Area (assumed boundary)
- Potential PFAS Release Area (No Investigation Required based on Building 6 Data)
- Installation Boundary

Figure 4-5
PFAS Soil and Groundwater Results: NRS Jim Creek, Site 7
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 37.5 75
1 inch = 75 feet
N

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Location		NRSJC-S4-MW-14			
Sample		NRSJC-S4-GW14-0722	NRSJC-S4-GW14P-0722	NRSJC-S4-SB14-0203	NRSJC-S4-SB14-1718
Sample Date/Time		*7/13/2022 14:20*	*7/13/2022 14:22*	*6/29/2022 11:15*	*6/29/2022 15:20*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*17-27**	*7.0-17**	*2.0-3.0***	*17-18***
Media/Units		*Groundwater (ng/L)*	*Groundwater (ng/L)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])				
PFOA	6.0/19	2.4 U	2.34 U	0.498 U	0.487 U
PFOS	4.0/13	2.4 U	2.34 U	0.498 U	0.487 U
PFBS	600/1,900	2.4 U	2.34 U	0.498 U	0.487 U
PFHxS	39/130	2.4 U	2.34 U	0.498 U	0.487 U
PFNA	5.9/19	2.4 U	2.34 U	0.498 U	0.487 U
HFPO-DA	6.0/23	2.4 U	2.34 U	0.498 U	0.487 U

Location		NRSJC-S4-MW-15	
Sample		NRSJC-S4-GW15-0722	NRSJC-S4-SB15-1617
Sample Date/Time		*7/13/2022 15:15*	*6/30/2022 14:25*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*17-27**	*16-17***
Media/Units		*Groundwater (ng/L)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])		
PFOA	6.0/19	2.25 U	0.494 U
PFOS	4.0/13	2.25 U	0.494 U
PFBS	600/1,900	2.25 U	0.494 U
PFHxS	39/130	2.25 U	0.494 U
PFNA	5.9/19	2.25 U	0.494 U
HFPO-DA	6.0/23	2.25 U	0.494 U

Location		NRSJC-S5-MW-16			
Sample		NRSJC-S5-GW16-0722	NRSJC-S5-GW16P-0722	NRSJC-S5-SS16-000H	NRSJC-S5-SB16-1314
Sample Date/Time		*7/12/2022 15:30*	*7/12/2022 15:32*	*5/25/2022 10:07*	*6/27/2022 12:15*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*16.5-26.5**	*16.5-26.5**	*0.0-0.5***	*13-14***
Media/Units		*Groundwater (ng/L)*	*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])				
PFOA	6.0/19	2.44 U	2.36 U	0.501 U	0.502 U
PFOS	4.0/13	2.44 U	2.36 U	0.501 U	0.502 U
PFBS	600/1,900	2.44 U	2.36 U	0.501 U	0.502 U
PFHxS	39/130	2.44 U	2.36 U	0.501 U	0.502 U
PFNA	5.9/19	2.44 U	2.36 U	0.501 U	0.502 U
HFPO-DA	6.0/23	2.44 U	2.36 U	0.501 U	0.502 U

Location	NRSJC-S5-SB-21
Sample	NRSJC-S5-SB21-0203
Sample Date/Time	*5/25/2022 10:48*
Sample Depth (ft bgs)	*2.0-3.0*
Media/Units	*Subsurface Soil (µg/kg)*
2022 EPA RSL (Soil [µg/kg])	
PFOA 19	0.502 U
PFOS 13	0.502 U
PFBS 1,900	0.502 U
PFHxS 130	0.502 U
PFNA 19	0.502 U
HFPO-DA 23	0.502 U

Location		NRSJC-S5-MW-19		
Sample		NRSJC-S5-GW19-0722	NRSJC-S5-SS19-000H	NRSJC-S5-SB19-1011
Sample Date/Time		*7/12/2022 10:40*	*5/25/2022 11:15*	*6/23/2022 15:40*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*11-21**	*0.0-0.5***	*10-11***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])			
PFOA	6.0/19	2.34 U	0.501 U	0.491 U
PFOS	4.0/13	2.34 U	0.501 U	0.491 U
PFBS	600/1,900	2.34 U	0.501 U	0.491 U
PFHxS	39/130	2.34 U	0.501 U	0.491 U
PFNA	5.9/19	2.34 U	0.501 U	0.491 U
HFPO-DA	6.0/23	2.34 U	0.501 U	0.491 U

Location		NRSJC-S5-MW-18				
Sample		NRSJC-S5-GW18-0722	NRSJC-S5-SS18-000H	NRSJC-S5-SB18-0708	NRSJC-S5-SB18-1415	NRSJC-S5-SB18P-1415
Sample Date/Time		*7/13/2022 9:40*	*5/25/2022 11:43*	*6/22/2022 14:45*	*6/22/2022 14:50*	*6/22/2022 14:55*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*14-24**	*0.0-0.5***	*7.0-8.0***	*14-15***	*14-15***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])					
PFOA	6.0/19	2.38 U	0.499 U	0.511 U	0.498 U	0.499 U
PFOS	4.0/13	2.38 U	0.499 U	0.511 U	0.498 U	0.499 U
PFBS	600/1,900	2.38 U	0.499 U	0.511 U	0.498 U	0.499 U
PFHxS	39/130	2.38 U	0.499 U	0.511 U	0.498 U	0.499 U
PFNA	5.9/19	2.38 U	0.499 U	0.511 U	0.498 U	0.499 U
HFPO-DA	6.0/23	2.38 U	0.499 U	0.511 U	0.498 U	0.499 U

NOTES:
EPA = United States Environmental Protection Agency
ft bgs = feet below ground surface
ft btoc = feet below top of casing
HFPO-DA = hexafluoropropylene oxide dimer acid
NAVSTA = Naval Station
ng/L = nanograms per liter
NRC = Naval Recreation Complex
NRS = Naval Radio Station
PFAS = per- and polyfluoroalkyl Substances
PFBS = perfluorobutanesulfonic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
RSL = regional screening level
U = The material was analyzed for, but not detected
µg/kg = micrograms per kilogram

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, Maxar, 2021
Contours derived from USGS National Elevation Dataset

SITE 5 (MIXED WASTE LANDFILL)

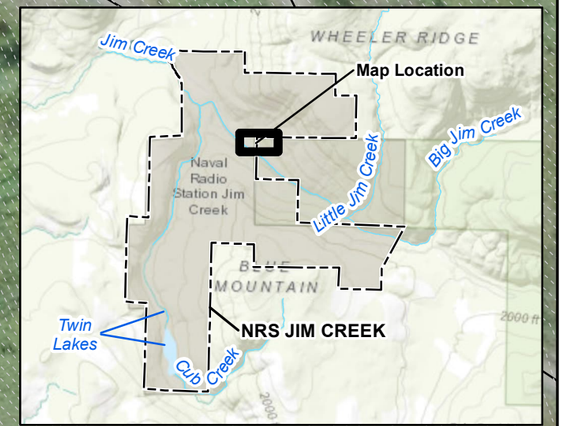
SITE 4 (METAL BURIAL PIT)

Hatchery Road

Jim Creek Road

Flats Road

Jim Creek



LEGEND

- Monitoring Well and Soil Sampling Location
- Shallow Subsurface Soil Sample Location
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Surface Waterbodies
- 5' Topographic Contours
- Road Centerline
- Potential PFAS Release Area (assumed boundary)
- Installation Boundary

Figure 4-6
PFAS Soil and Groundwater Results: NRS Jim Creek, Sites 4 and 5
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

0 75 150
1 inch = 150 feet
N

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Location		NRCPB-B106-MW-01				
Sample		NRCPB-B106-GW01-0822	NRCPB-B106-GW01P-0822	NRCPB-B106-SS01-0001	NRCPB-B106-SS01P-0001	NRCPB-B106-SB01-1314
Sample Date/Time		*8/9/2022 11:40*	*8/9/2022 11:45*	*8/3/2022 10:30*	*8/3/2022 10:35*	*8/3/2022 16:50*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*11-21**	*11-21**	*0.0-1.0***	*0.0-1.0***	*13-14***
Media/Units		*Groundwater (ng/L)*	*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])					
PFOA	6.0/19	**3.61 J**	**3.42 J**	0.502 U	0.498 U	0.502 U
PFOS	4.0/13	**2.9 J**	**2.55 J**	**0.26 J**	0.498 U	0.502 U
PFBS	600/1,900	2.71 U	2.55 U	0.502 U	0.498 U	0.502 U
PFHxS	39/130	**3.7 J**	**3.21 J**	0.502 U	0.498 U	0.502 U
PFNA	5.9/19	2.71 U	2.55 U	0.502 U	0.498 U	0.502 U
HFPO-DA	6.0/23	2.71 U	2.55 U	0.502 U	0.498 U	0.502 U

Location		NRCPB-B106-MW-03		
Sample		NRCPB-B106-GW03-0822	NRCPB-B106-SS03-0001	NRCPB-B106-SB03-0506
Sample Date/Time		*8/10/2022 10:35*	*8/8/2022 12:00*	*8/8/2022 13:40*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*6.0-16**	*0.0-1.0***	*5.0-6.0***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])			
PFOA	6.0/19	2.5 U	0.499 U	0.498 U
PFOS	4.0/13	**14.1**	**0.621 J**	0.498 U
PFBS	600/1,900	2.5 U	0.499 U	0.498 U
PFHxS	39/130	**2.4 J**	0.499 U	0.498 U
PFNA	5.9/19	2.5 U	0.499 U	0.498 U
HFPO-DA	6.0/23	2.5 U	0.499 U	0.498 U

Location		NRCPB-B106-MW-02		
Sample		NRCPB-B106-GW02-0822	NRCPB-B106-SS02-0001	NRCPB-B106-SB02-0910
Sample Date/Time		*8/9/2022 12:40*	*8/3/2022 11:00*	*8/4/2022 9:40*
Screen Interval (ft btoc)/Sample Depth** (ft bgs)*		*10-20**	*0.0-1.0***	*9.0-10***
Media/Units		*Groundwater (ng/L)*	*Surface Soil (µg/kg)*	*Subsurface Soil (µg/kg)*
	2022 EPA RSL (Groundwater [ng/L]/Soil [µg/kg])			
PFOA	6.0/19	**2.08 J**	0.502 U	0.498 U
PFOS	4.0/13	**5.53 J**	0.502 U	0.498 U
PFBS	600/1,900	2.46 U	0.502 U	0.498 U
PFHxS	39/130	2.46 U	0.502 U	0.498 U
PFNA	5.9/19	2.46 U	0.502 U	0.498 U
HFPO-DA	6.0/23	2.46	0.502 U	0.498 U

FIRE TRUCK RAMPS

BUILDING 106 (FORMER FIRE STATION)

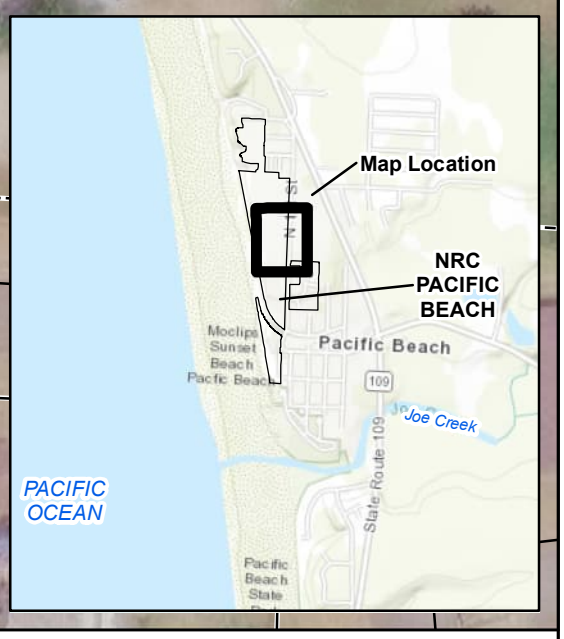
1st St N

80

100

NOTES:
Bolded text indicates detection
Shaded indicates exceedance of screening level
ft bgs = feet below ground surface
ft btoc = feet below top of casing
HFPO-DA = hexafluoropropylene oxide dimer acid
J = Analyte present, value may or may not be accurate or precise
NAVSTA = Naval Station
ng/L = nanograms per liter
NRC = Naval Recreation Complex
NRS = Naval Radio Station
PFAS = per- and polyfluoroalkyl Substances
PFBS = perfluorobutanesulfonic acid
PFHxS = perfluorohexane sulfonate
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
RSL = regional screening level
U = The material was analyzed for, but not detected
µg/kg = micrograms per kilogram

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Imagery, Maxar, 2019
Contours derived from USGS National Elevation Dataset



LEGEND
- Monitoring Well and Soil Sample Location
- Groundwater Flow Direction
- Anticipated Overland Water Flow Direction
- Surface Waterbodies
- Surface Waterbodies
- 20' Topographic Contours
- Road Centerline
- Potential PFAS Release Area
- Installation Boundary

0 37.5 75
1 inch = 75 feet
N

Figure 4-7
PFAS Soil and Groundwater Results: NRC Pacific Beach, Building 106
Site Inspection for PFAS
NAVSTA Everett, NRS Jim Creek,
NRC Pacific Beach, Washington

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SECTION 5

Conclusions and Recommendations

Of the eight potential PFAS release areas identified for SI activities in the PA, two are recommended for further investigation in the form of an RI, and six are recommended for no further investigation at this time. In addition, the Bio Pit Disposal Area is also recommended for no further investigation as indicated in **Table 5-1**. The conclusions and recommendations from the SI are summarized in **Table 5-1**.

Table 5-1. PFAS Site Inspection Summary and Recommendations

Potential PFAS Release Area	Rationale	Recommendation
NAVSTA Everett		
Building 2114 (Fire Station)	• PFAS are present in the soil and groundwater at Building 2114. PFOA, PFOS, and PFHxS are present in groundwater and PFOS is present in the surface soil in two monitoring wells at Building 2114 at concentrations above the SLs. HHRS identified PFOS and PFHxS as COPCs for groundwater, indicating potential unacceptable human health risks.	• Initiate RI. •
NRS Jim Creek		
Building 6 (Former Fire Station)	• PFAS are present in the soil and groundwater at Building 6. PFOS and/or PFHxS are present in groundwater in four monitoring wells at Building 6 at concentrations above the SLs. HHRS identified PFOS as a COPC for groundwater, indicating potential unacceptable human health risks.	• Initiate RI. •
Site 1 (Building 11 Landfill)	• Concentrations of PFOA, PFOS, and PFBS were detected in surface soil and/or groundwater but did not exceed SLs. PFAS were not detected in the subsurface soil samples. • The HHRS did not identify COPCs, indicating there are no unacceptable human health risks associated with exposure to PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA in soil or groundwater based on available results. • There is no documentation of a release from the PA.	• No further investigation at this time.
Site 6 (Blue Campground Landfill)	• Concentrations of PFOS in surface soil and PFOA in groundwater were detected but did not exceed SLs. PFAS were not detected in the subsurface soil samples. • The HHRS did not identify COPCs, indicating there are no unacceptable human health risks associated with exposure to PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA in soil or groundwater based on available results. • There is no documentation of a release from the PA.	• No further investigation at this time.
Site 7 (Pit Road Landfill)	• PFAS were not detected in the surface or subsurface soil and groundwater samples. • There is no documentation of a release from the PA.	• No further investigation at this time.
Site 4 (Metal Burial Pit)	• PFAS were not detected in the subsurface soil and groundwater samples. Surface soil samples were not collected due to asphalt at surface. • There is no documentation of a release from the PA.	• No further investigation at this time.
Site 5 (Mixed Waste Landfill)	• PFAS were not detected in the surface or subsurface soil and groundwater samples. • There is no documentation of a release from the PA.	• No further investigation at this time.

Table 5-1. PFAS Site Inspection Summary and Recommendations

Potential PFAS Release Area	Rationale	Recommendation
Bio Pit Disposal Area	• Concentrations of surface and subsurface soil for all PFAS parameters are either non-detect or below SLs from suspected soil source material near the stormwater catch basin at Building 6. • Nondetections of PFAS in soil and groundwater at Site 7 (Pit Road Landfill) indicates no transport of PFAS-containing surface water from the Bio Pit Disposal Area. • There is no evidence that PFAS-containing vegetative debris or sediment in the storm drain at Building 6 were transported to the Bio Pit Disposal Area. • There is no documentation of a release to this area from the PA.	• No further investigation at this time.
NRC Pacific Beach		
Building 106 (Former Fire Station)	• PFAS are present in surface soil and groundwater at Building 106. PFOS in groundwater was detected above the SLs in two wells. • The HHRS did not identify COPCs, indicating there are no unacceptable human health risks associated with exposure to PFOA, PFOS, PFBS, PFHxS, PFNA, and HFPO-DA in soil or groundwater based on available results. • There is no documentation of a release from the PA.	• No further investigation at this time.

SECTION 6

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