FINAL
Site Inspection Report
Kalaeloa Army Aviation Support Facility #1-JRF
O‘ahu, Hawai‘i

Site Inspections for Perfluorooctanoic Acid (PFOA), Perfluorooctanesulfonic Acid (PFOS), Perfluorohexanesulfonic Acid (PFHxS), Perfluorononanoic Acid (PFNA), Hexafluoropropylene oxide dimer Acid (HFPO-DA) and Perfluorobutanesulfonic Acid (PFBS)
ARNG Installations, Nationwide

December 2023

Prepared for:

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

UNCLASSIFIED

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
%	Percent
µg/kg	Microgram(s) per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous film-forming foam
amsl	Above mean sea level
AOI	Area of interest
ARFF	Airport Rescue and Fire Fighting
ARNG	Army National Guard
bgs	Below ground surface
btoc	Below top of casing
BRAC	Base Realignment and Closure Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-custody
CSM	Conceptual site model
CWRM	Commission on Water Resource Management
DA	Department of the Army
DoD	Department of Defense
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EB	Equipment Blank
FB	Field blank
FedEx	Federal Express
ft	Foot (feet)
HA	Health advisory
HDOH	Hawai‘i State Department of Health
HDOT	Hawai‘i Department of Transportation
HDOT-A	Hawai‘i Department of Transportation, Airports Division
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
HIARNG	Hawai‘i Army National Guard
IDW	Investigation-derived waste

ACRONYMS AND ABBREVIATIONS (*continued*)

In.	Inch(es)
ITRC	Interstate Technology Regulatory Council
JRF	John Rodgers Field
LC/MS/MS	Liquid chromatography tandem mass spectrometry
MIL-SPEC	Military Specification
mg/L	Milligram(s) per liter
MS	Matrix spike
MSD	Matrix spike duplicate
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Systems Command
NELAP	National Environmental Laboratory Accreditation Program
ng/L	Nanogram(s) per liter
No.	Number
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PFAS	Per- and polyfluoroalkyl substances
PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PID	Photoionization detector
PQAPP	Programmatic Uniform Federal Policy Quality Assurance Project Plan
PVC	Polyvinyl chloride
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
QSM	Quality Systems Manual
RI	Remedial investigation
SI	Site inspection
SL	Screening level
TOC	Total organic carbon
TPP	Technical Project Planning

ACRONYMS AND ABBREVIATIONS (*continued*)

UCMR3	Unregulated Contaminant Monitoring Rule 3
UFP	Uniform Federal Policy
UIC	Underground Injection Control
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

EXECUTIVE SUMMARY

The Army National Guard (ARNG) G-9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on the six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) (Assistant Secretary of Defense) dated 6 July 2022. The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) [1]. These compounds are collectively referred to as "relevant compounds" throughout the document and the applicable Screening Levels (SLs) are provided below in Table ES-1.

The PA identified two Areas of Interest (AOIs), where PFAS-containing materials may have been stored, disposed, or released historically (see Table ES-2 for AOI locations). The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, no further action is required because there is no release that is the responsibility of the ARNG, or based on a comparison of SI results to SLs for the relevant compounds. This SI was completed at the Kalaeloa Army Aviation Support Facility (AASF) #1-John Rodgers Field (JRF) in Kapolei, Hawaiʻi.

In 2001, Hawaiʻi Army National Guard (HIARNG) acquired multiple parcels of land totaling approximately 172.83 acres belonging to the former Naval installation. The area acquired include numerous existing Navy buildings which could be adapted for HIARNG use. In July 2016, HIARNG began leasing two additional parcels of land (totaling approximately 17.09 acres) from the Hawaiʻi Department of Transportation (HDOT) for a term of 30 years. The parcels are located along the north/northeastern boundary of the airport and includes a vacant overgrown area which was formerly part of a Navy Fuel Farm (approximately 7.31 acres) and an open area (approximately 9.78 acres) adjacent to a HDOT runway which is used as an access apron to support AASF operations. In 2017, HIARNG also acquired a 10.94-acre parcel from the Navy which abuts HIARNG lands in the southwest. Currently, the HIARNG operates on approximately 200.86 acres.

The PA identified two AOIs for investigation during the SI phase. SI sampling results from the AOIs were compared to OSD SLs. The Naval Facilities Engineering Systems Command (NAVFAC) Final PA dated June 2022, which was finalized after the ARNG SI fieldwork was completed, mentioned a former Navy plating shop located in the southwestern portion of Building 117 on HIARNG property. Wastewater from Building 117 discharged into an adjacent drywell to the north-northwest. NAVFAC's PA noted a potential for PFAS to be present onsite at

[1] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the Facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

this location (NAVFAC 2022). No previous PFAS investigations have been completed at Building 117 as the identification of Building 117 did not occur until after the SI fieldwork, it was not investigated as part of the SI. Building 117 is recommended for future investigation. Table ES-2 summarizes the SI results for the AOIs. Based on the results of this SI, and following the CERCLA process, a remedial investigation (RI) is warranted for AOI 2. For AOI 1, at no point during either the PA or the SI was there any evidence that any of the relevant compounds were the result of current or historical ARNG/Department of Defense (DoD) activities.

Table ES-1. Screening Levels (Soil and Groundwater)

Analyte[2]	Residential (Soil) (µg/kg) [1]	Industrial/Commercial Composite Worker (Soil) (µg/kg) [1]	Tap Water (Groundwater) (ng/L) [1]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	600
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:

1. Assistant Secretary of Defense. 2022. Risk Based Screening Levels Calculated for Groundwater and Soil using U.S. Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022
2. Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

ng/L = Nanogram(s) per liter
µg/kg = Microgram(s) per kilogram

Table ES-2. Summary of Site Inspection Findings and Recommendations

AOI	Potential Release Area	Soil Source Area	Groundwater Source Area	Groundwater Facility Boundary	Future Action
1	Former Fuel Farm Area	●	●	●	No further action under CERCLA
2	Hangar Suppression and Storage	◐	●	●	Proceed to RI

Legend:
● = Detected; exceedance of screening levels
◐ = Detected; no exceedance of screening levels
○ = Not detected

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense 2022). The six compounds listed in the OSD memorandum will be referred to as “relevant compounds” throughout this document and include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide-dimer acid (HFPO-DA)[3] at ARNG facilities nationwide.
The ARNG performed this SI at the Kalaeloa Army Aviation Support Facility (AASF) #1- John Rodgers Field (JRF) in Kapolei, Hawaiʻi. The Kalaeloa AASF #1-JRF will be referred to as the “Facility” throughout this report.

The SI project elements were performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (U.S. Environmental Protection Agency [USEPA] 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300; USEPA 1994), and in compliance with U.S. Department of the Army (DA) requirements and guidance for field investigations.

1.2 SITE INSPECTION PURPOSE

A PA was performed at the Kalaeloa AASF #1-JRF (AECOM Technical Services, Inc. [AECOM] 2020) that identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically. The objective of the SI is to identify whether there has been a release to the environment from the AOIs identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required because there is no release that is the responsibility of the ARNG or based on SLs for the relevant compounds.

[3] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the conceptual site model (CSM) developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the Facility because HFPO-DA is generally not a component of military specification (MIL-SPEC) aqueous film forming foam (AFFF) and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

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2. FACILITY BACKGROUND

2.1 FACILITY LOCATION AND DESCRIPTION

Kalaeloa AASF #1-JRF is located on a portion of Former Naval Air Station (NAS) Barbers Point. The Navy commissioned the NAS Barbers Point on April 15, 1942, and the 3,700-acre installation was manned by 12,000 Navy servicemen. NAS Barbers Point primary mission was to support the Naval operations in nearby Pearl Harbor, but its role quickly expanded to include aircraft repair and maintenance for carrier-based aircraft for the duration of the war.

After World War II ended, NAS Barbers Point became the primary Naval Air Station for Naval operations in the Pacific throughout the Cold War era until its close in 1989. NAS Barbers Point closed on 2 July 1999 in accordance with the Base Realignment and Closure Act (BRAC). Since 1999, the former installation has had ongoing redevelopment by Federal, state, and county agencies, as well as military and private organizations.

Much of the former NAS Barbers Point installation currently operates as Kalaeloa Airport (JFR) on 757 acres and is used as an alternate landing site for Honolulu International Airport and for general aviation purposes. The transfer of the airport property from the Department of the Navy to the Hawaiʻi Department of Transportation (HDOT) was finalized on July 1, 1999 (WOC, 2010). However, environmental oversight is maintained by the BRAC Cleanup Team. In addition to the airport, the community of Kalaeloa, which approximates the former NAS Barbers Point installation area, comprises park space, industrial, and low and medium density residential land uses. The BRAC portions of the former installation also support the Hawaiʻi ARNG (HIARNG), U.S. Coast Guard, industrial/commercial land uses, and park space.

In 2001, HIARNG acquired multiple parcels of land totaling approximately 172.83 acres belonging to the former Naval installation. The area acquired include numerous existing Navy buildings which could be adapted for HIARNG use. In July 2016, HIARNG began leasing two additional parcels of land (totaling approximately 17.09 acres) from the Hawaiʻi Department of Transportation (HDOT) for a term of 30 years. The parcels are located along the north/northeastern boundary of the airport and includes a vacant overgrown area which was formerly part of a Navy fuel farm (approximately 7.31 acres) and an open area (approximately 9.78 acres) adjacent to the HDOT runways which is used as an access apron to support AASF operations. In 2017, HIARNG also acquired a 10.94-acre parcel from the Navy which abuts HIARNG lands in the southwest. Currently the HIARNG operates on approximately 200.86 acres.

The Facility is located at Midway Street in Kapolei, Hawaiʻi on the island of Oʻahu (**Figure 2-1**). The property boundary as outlined in the figures includes a readiness center, joint forces headquarters and the AASF. The AASF provides training, maintenance, and flight operations for the various aviation units that support the HIARNG. AASF #1-JRF consists of office areas, hangars, aircraft parking area, maintenance bays, and storages bays. The Kalaeloa AASF #1-JRF formally opened in 2018 (AECOM 2020). The Facility is bordered by Kalaeloa mixed-use lots (commercial/industrial/ residential) to the west, the city of Kapolei to the north, Ewa Beach residential communities to the east, and the Kalaeloa Airport (operated by HDOT, Airports Division [HDOT-A]) to the south (AECOM 2020).

2.2 FACILITY ENVIRONMENTAL SETTING

The Facility is located on the southern shore of Oʻahu, approximately 5 miles west of the entrance to Pearl Harbor. The natural terrain in the area slopes gently southward, ranging from a maximum elevation of 0 to 65 feet (ft) above mean sea level (amsl) over a distance of about 2 miles (**Figure 2-2**) (AECOM 2020).

The following sections include information on geology, hydrogeology, hydrology, climate, and current and future land use. The topography at the Facility is shown on **Figure 2-2**. The regional geology and groundwater features are shown on **Figure 2-3**. The regional surface water features and drainage basins are shown on **Figure 2-4**. Groundwater elevations and contours are presented on **Figure 2-5**.

2.2.1 Geology

The island of Oʻahu is composed of two shield volcanoes, the Waiʻanae volcano and the Koʻolau volcano. The geomorphic sequence of volcanic eruptions, basaltic lava flow deposition, and coastal plain development was created by of the eruption of the Waiʻanae volcano, which formed the Waiʻanae range on the western side of Oʻahu, followed by the eruption and formation of the Koʻolau range to the east. Subsequent lava flows and ash deposits resulting from the eruptions that formed the Koʻolau range formed the Schofield plateau, bridging the Koʻolau range and the Waiʻanae range in the center of the island. Coastal plain environments on the coasts of Oʻahu are comprised of alternating shallow marine coral limestone units and non-marine, volcanically derived, detrital sediments (NEESA 1983).

The Facility is located in the southern coastal plain on the southwestern coast of Oʻahu where the primary lithology is coralline limestone caprock. Caprock at former NAS Barbers Point ranges in thickness from 50 to 400 feet at the northern boundary and 750 to 1,000 feet along the coastline. The near-surface geological units encountered at the Facility are predominantly marine with minor terrestrial and fill sediments. Major units include coralline limestone, carbonate clastics, and construction fill material. The coral limestone is of Pleistocene age and was deposited on a shoreline or in shallow-water, near shore environment. Within the carbonate clastics unit are minor layers of darker carbonate mud and reworked coralline rubble and sand (AECOM 2020). Multiple sinkholes are present within the Facility boundary.

According to the United States Department of Agriculture Natural Resource Conservation Service Web Soil Survey for the Island of Oʻahu, Hawaiʻi, almost three quarters of the of the Facility is comprised of coral outcrops. However, Mamala cobbly silty clay loam with zero to twelve percent slopes and mixed fill comprise the remaining soil at the Facility (USDA 2022).

The subsurface conditions at the site were explored through a total of 11 cores ranging in depth from 33’- 48’ below ground surface (bgs), which were collected using hollow-stem, continuous core augers. Subsurface descriptions are a general observation, provided to highlight the major soil strata encountered.

The topsoil fill material was found to be generally dry and loose primarily comprised of medium silty sands, silty gravel, and sandy gravel. The older alluvium depths generally consisted of silty sand, silty gravel, clayey sands, sandy silt gravels, clayey silts, gravelly cobbles, and minor fat clay deposits.

Sample locations AOI01-01 through AOI01-03 were primarily comprised of white coralline silty sand, with 20-30% fines and gravels with increasing size of course sand and gravels indicating fine coralline debris and sands, consistent with alluvial geology of the site. AOI01-04, AOI01-05, AOI02-01, AOI02-02, AOI02-04 had varying degrees of topsoil fill between 0’- 2’ bgs mainly comprised of dry organic soils with cobbles, and gravels which may be associated with past grading of the site. Surface soils were generally classified as dark grayish brown to grayish brown, dry, poorly graded gravels, and fines. AOI02-04 had concrete cobbles that was encountered to a depth of approximately 0’- 1’ bgs. Highly plastic fat clay was encountered 11’-48’ bgs. Soil boring logs are provided in **Appendix E**.

2.2.2 Hydrogeology

The shallow groundwater beneath Kalaeloa AASF #1-JRF is perched and occurs within the caprock. The caprock consists of alternating layers of permeable marine sedimentary rock and alluvial deposits that overlie the basal volcanic aquifer. Caprock pore water is largely separate from the deeper basal groundwater, occurring above and frequently within caprock sediments and extending from the ocean edge to approximately 1 mile inland. This type of groundwater is usually connected with the ocean and therefore has high concentrations of total dissolved solids and is considered non-potable (AECOM 2020).

The Aquifer Identification and Classification for O‘ahu: Groundwater Protection Strategy for Hawai‘i, published by the Water Resources Research Center at the University of Hawai‘i (Mink and Lau 1990) provides information on groundwater conditions below the Facility. According to the report, two aquifer systems, an upper and a lower, underlie the Facility in the Ewa aquifer system. The upper aquifer (Aquifer Code 3-02-04-116, Status Code 13321) is described as a basal, unconfined aquifer in sedimentary or non-volcanic lithology. The groundwater status for the upper aquifer is classified as: neither a drinking water source nor ecologically important; moderate salinity level of 1,000 to 5,000 milligrams per liter (mg/L) chloride; replaceable in uniqueness; and highly vulnerable to contamination. The lower aquifer (Aquifer Code 3-02-04-121, Status Code 13213) is described as a confined basal aquifer of the flank type. The groundwater status is classified as: neither a drinking water source nor ecologically important; low salinity level of 250 to 1,000 mg/L chloride; irreplaceable in uniqueness; and low vulnerability to contamination.

Additionally, the Facility is located below (downgradient) of the Underground Injection Control (UIC) line as shown on the UIC map of O‘ahu published by the Hawai‘i State Department of Health (HDOH). This typically indicates that the underlying aquifer is not considered a drinking water source.

An Environmental Database Report (EDR™) report conducted a well search for a 1-mile radius surrounding the Facility. Using additional online resources, such as state and local Geographic Information System databases, wells were researched to a 4-mile radius of the Facility (**Figure**

2-3). Several irrigation and industrial wells lie in the inferred upgradient and cross-gradient pathway to the Facility. A 2002 Annual Groundwater monitoring report for Former NAS Barber’s Point showed 21 groundwater monitoring wells within a mile radius of the Facility (DON 2002). It is uncertain if these wells are still in place or actively monitored, with the exception of MW-11 which was sampled as part of this investigation.

According to records from the State of Hawaiʻi Department of Land and Natural Resources, Commission on Water Resource Management (CWRM), groundwater within the former NAS Barbers Point boundary, including Kalaeloa AASF #1-JRF, is currently designated to be allocated for non-drinking uses only (CWRM 2019). Drinking water for the Facility is supplied by a “Maui type” well (mine-like shaft with infiltration tunnels) located approximately 2 miles north and is known as the “Barbers Point Shaft” (AECOM 2020).

2.2.3 Hydrology

No perennial streams or drainage ways exist on Kalaeloa AASF #1-JRF due to relatively low precipitation (20 inches per year) and highly permeable coralline limestone. Storm water runoff follows the topography (**Figure 2-4**), flowing south toward the Pacific Ocean (**Figure 2-5**). Local drainage diversions also convey runoff into a series of dry wells. There are an estimated 77 UIC wells located around the Facility, which are used for stormwater drainage. Details regarding the construction of the UIC wells were not available at the time of the PA (AECOM 2020). The dry wells are currently permitted through the State Department of Health, but as of 2006 they did not conform to city standards (Naval Facilities Engineering Systems Command [NAVFAC] 2022).

2.2.4 Climate

Oʻahu is located in the tropics, with a climate characterized by mild temperatures, northeasterly trade winds year-round, and moderate humidity. Hawaiʻi has two seasons: summer (between May and October) and winter (between October and April). The average coastal temperature is approximately 79 degrees Fahrenheit (°F), with temperatures decreasing at higher elevations. The coldest temperatures are in January (72°F) and the warmest temperatures are in August (89°F). Humidity on Oʻahu ranges from approximately 30 to 90 percent (%). Precipitation predominantly occurs when the island’s mountain masses capture and cool the rising, warm, moist ocean air, producing higher rainfall in the windward and mountain areas and lower rainfall in the leeward and coastal zones. Annual rainfall ranges from 20 inches in the leeward coastal areas (where Kalaeloa AASF #1-JRF is located) to 250 inches on the Ko’olau mountain peaks. Kalaeloa HIARNG has a mean annual rainfall of approximately 20 inches (AECOM 2020).

2.2.5 Current and Future Land Use

Current Kalaeloa AASF #1-JRF operations include training and maintenance for the various aviation units, which support the HIARNG. In addition to aircraft maintenance and aircraft support for HIARNG, periodic training exercises and course work for the National Guard/Army Reserve units are conducted at the Facility. AASF #1-JRF shares tarmac space with the neighboring Kalaeloa Airport to the south. Portions of the eastern and western borders of

Kalaeloa AASF #1-JRF are abutted primarily by commercial properties. Residential homes border the northeastern border of the Facility (AECOM 2020).

Reasonably anticipated future land use of the Facility includes continued use by HIARNG which is not expected to change from the current land use described above (AECOM 2020). The HIARNG is fenced with a guarded access point to the north, near sample location KAASF-01. Access to and from the airfield (also a fenced, secure Facility) is toward the southeast near AOI 2 and restricts access.

2.2.6 Sensitive Habitat and Threatened/Endangered Species

Historically surveys have been conducted by others on the former NAS Barbers Point. As noted in NAVFAC's Final PA, the vegetation found at the former Barbers Point installation includes kiawe and lowland scrub, coastal strand, coastal salt flat, sinkholes, mangrove swamp, and marine wetland. Federally listed endangered plant species previously observed on former NAS Barbers Point include ʻEwa Plains ʻakoko and ʻEwa Hinahina. Conservation and restoration actions and subsequent surveys have been conducted to determine the proliferation of those endangered species. Biological surveys were also performed by Botanical Consultants in 1984 identified 170 plant and 23 bird species at former NAS Barbers Point. Five of these bird species are considered indigenous and the remaining 17 are species that have been introduced to the ecosystem. The Hawaiian black-necked stilt, Hawaiian Coot, and Hawaiian Moorhen are federal- and state-listed endangered species that have been detected during the former NAS Barbers Point surveys, and individuals were historically observed in the coastal salt flats around Ordy Pond (NAVFAC 2022). Specific locations of the species/habitat identified was not listed in the PA.

A wildlife survey at the Kalaeloa AASF #1-JRF was not included as part of this investigation. Therefore, the U.S. Fish and Wildlife Services (USFWS) was consulted to identify species that may be present in the surrounding area and which are listed as federally endangered, threatened, proposed, and/or candidate species in Honolulu County, Hawaiʻi (USFWS 2022). The following species were identified (2022):

- Birds:
  - Band-rumped Storm-petrel, *Oceanodroma castro* (Endangered)
  - Hawaiʻi ʻĀkepa, *Loxops coccineus* (Endangered)
  - Hawaiʻian Duck, *Anas wyvilliana* (Endangered)
  - Hawaiʻian Common Gallinule, *Gallinula galeata sandvicensis* (Endangered)
  - Hawaiʻian Coot, *Fulica americana alai* (Endangered)
  - Hawaiʻian Petrel, *Pterodroma sandwichensis* (Endangered)
  - Hawaiʻian Stilt, *Himantopus mexicanus knudseni* (Endangered)
  - Newell's Townsend's Shearwater, *Puffinus auricularis newelli* (Endangered)

- Mammals:
  - Hawaiʻian Hoary Bat, *Lasiurus cinereus semotus* (Endangered)

- Ferns and Allies:
  - ʻIhiʻihi, Marsilea villosa (Endangered)

- Flowering Plants:
  - ʻakoko, *Euphorbia spp.* (Endangered)
  - ʻ enaʻena, *Pseudognaphalium sandwicensium var.molokaiense* (Endangered)
  - ʻoheʻohe, *Polyscias gymnocarpa* (Endangered)
  - Ewa Plains ʻakoko, *Euphorbia skottsbergii var. skottsbergii* (Endangered)
  - ʻIhi, *Portulaca villosa* (Endangered)
  - Puʻukaʻa, *Cyperus trachysanthos* (Endangered)
  - Round-leaved Chaff-flower, *Achyranthes splendens* (Endangered)
  - *Vigna o-wahuensis* (Endangered).

2.3 HISTORY OF PFAS USE

Two AOIs were identified in the PA where aqueous film-forming foam (AFFF) may have been used, stored, disposed, or released historically at the Kalaeloa AASF #1-JRF (AECOM 2020). The potential PFAS release areas were grouped into two AOIs based on preliminary data and presumed groundwater flow directions.

Chemguard C301MS AFFF was released by the HDOT-A Kalaeloa Airport Rescue and Fire Fighting (ARFF) Unit (hereafter referred to as HDOT-A Kalaeloa ARFF Unit) into AOI 1 in 2017 during pump testing and repair activities which occurred at the adjacent Kalaeloa Airport. The area where the release occurred was part of the Former Fuel Farm area and it is located on land currently owned by HDOT-A and leased by ARNG.

AOI 2 is the location of the hangar and the adjacent surrounding area at Kalaeloa AASF #1-JRF. Although there have been no known incidence of AFFF release at AOI 2, the hangar and the surrounding area are conservatively considered a potential PFAS release area based on the presence of the AFFF charged fire suppression system and the storage of eight 55-gallon drums of 3% AFFF concentrate (identified as Ansulite AFC-3MS) (AECOM 2020).

A description of each AOI is presented in **Section 3**.

Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

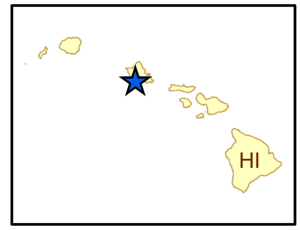
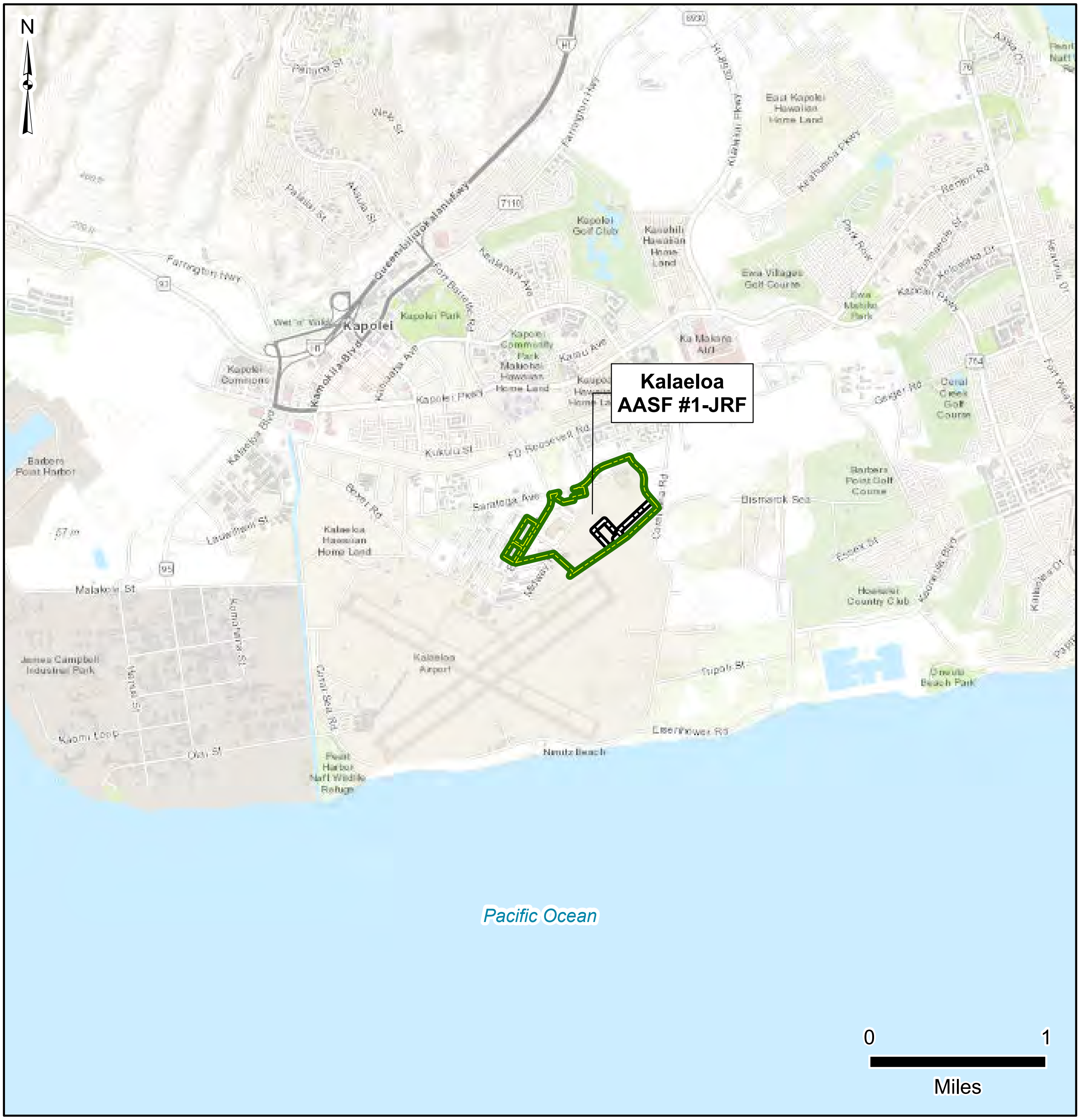


Figure 2-1
Facility Location



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Facility Data

- Facility Boundary
- Leased Parcels

Data Sources:
ESRI 2020
AECOM 2020

Date:....................November 2023
Prepared By:............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 4N

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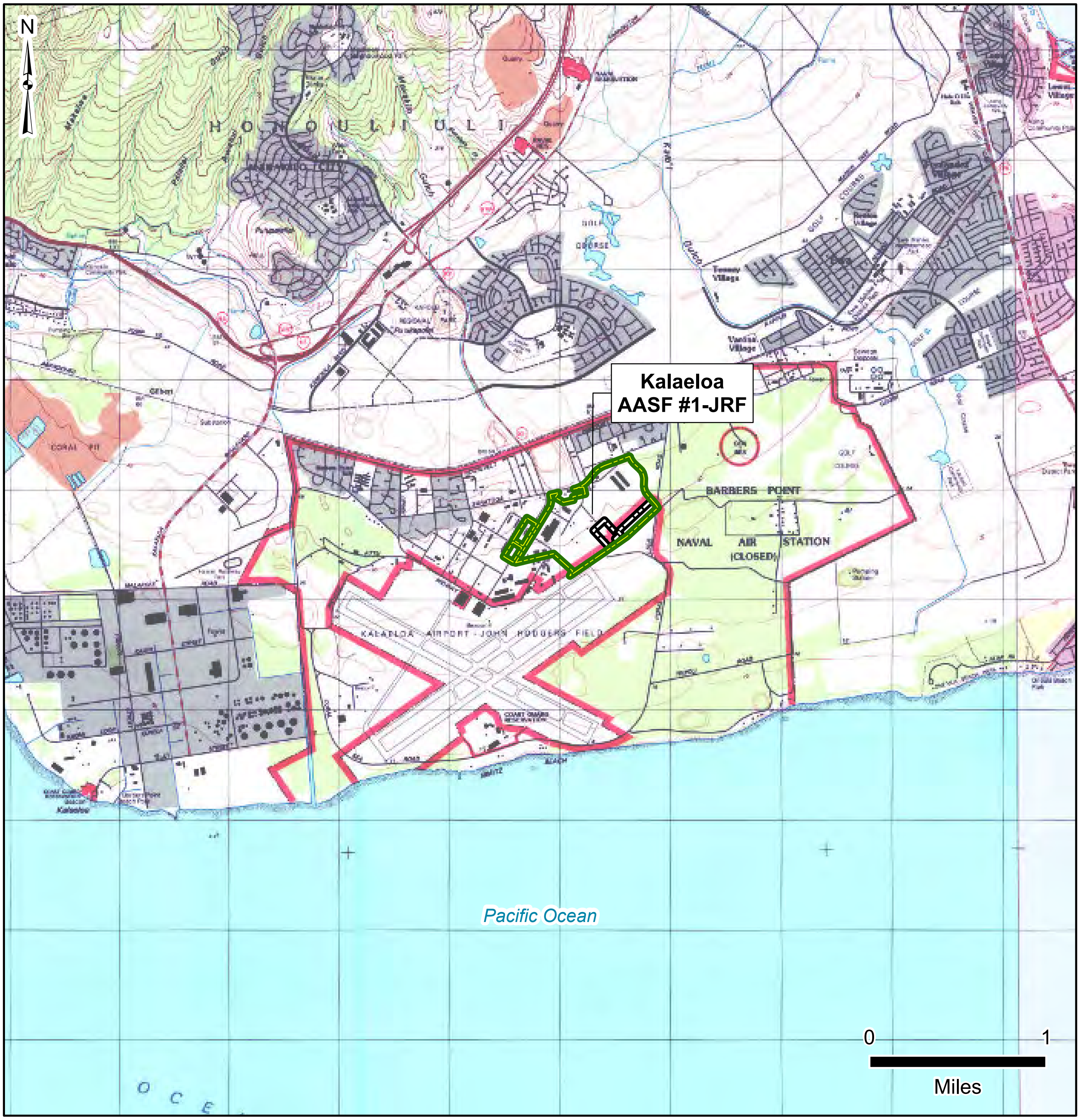
Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

Figure 2-2
Topography



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Facility Data

Facility Boundary

Leased Parcels

Data Sources:
ESRI 2020
AECOM 2020

Date:....................November 2023
Prepared By:............................EA
Prepared For:....................USACE
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Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

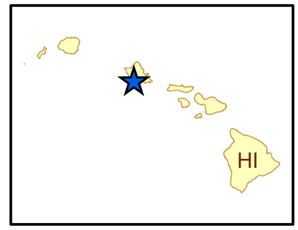
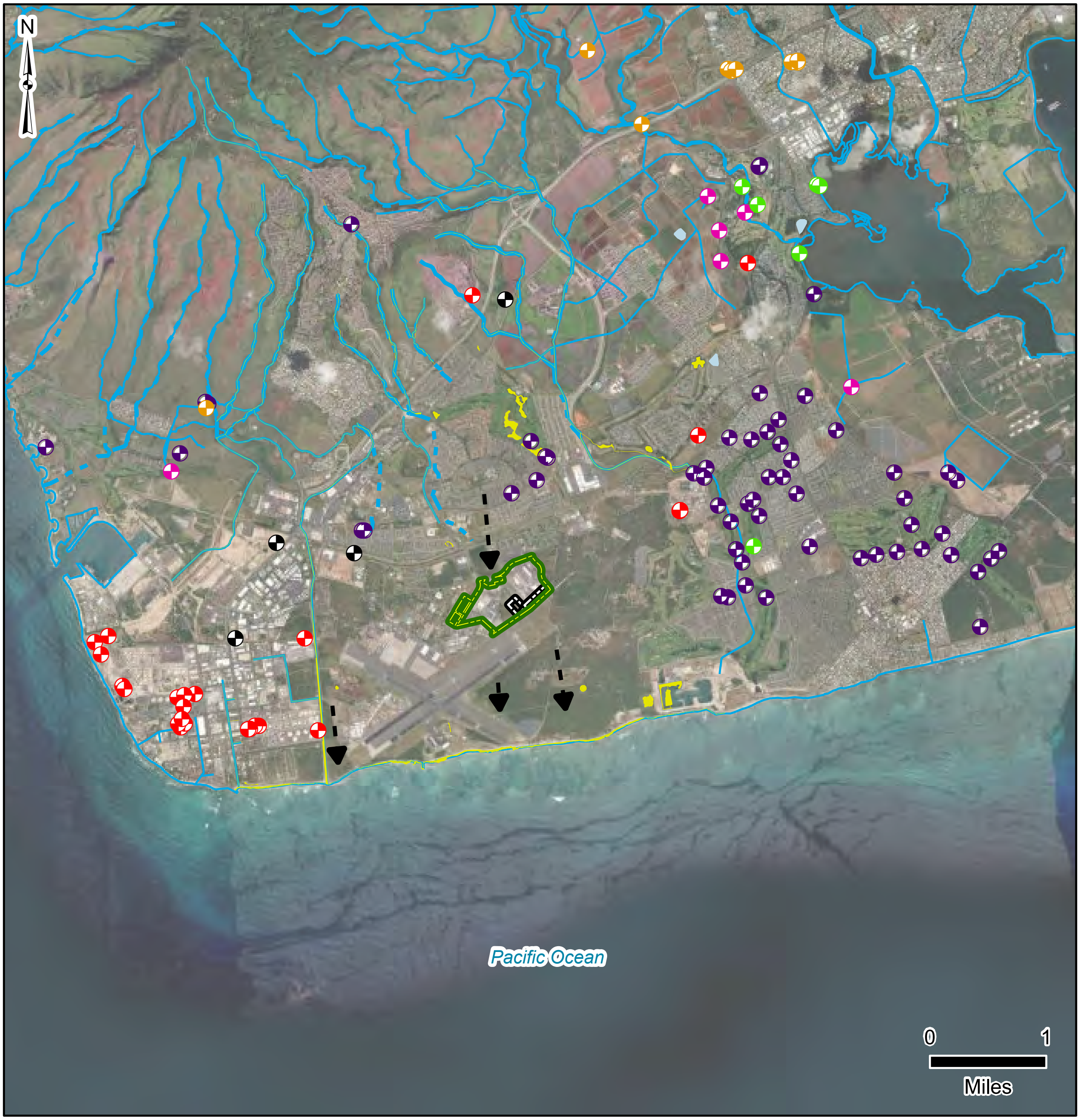


Figure 2-3
Groundwater Features



Facility Data
- Facility Boundary
- Leased Parcels

Well Type
- Agricultural Well
- Domestic Well
- Industrial Well
- Irrigation Well
- Municipal Water Supply Well
- Other Well

Hydrology/Hydrogeology
- Inferred Groundwater Flow Direction
- Perennial Stream/Creek
- Intermittent Stream/Creek
- Water Body
- Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:....................November 2023
Prepared By:.............................EA
Prepared For:....................USACE
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Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

Figure 2-4
Surface Water Features

Facility Data

Facility Boundary
Leased Parcels

Hydrology

Surface Water Flow Direction
Intermittent Stream/Creek
Water Body
Wetlands

Watershed Boundary

Data Sources:
ESRI 2020
AECOM 2020

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Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

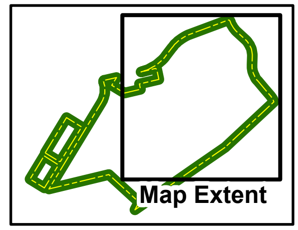
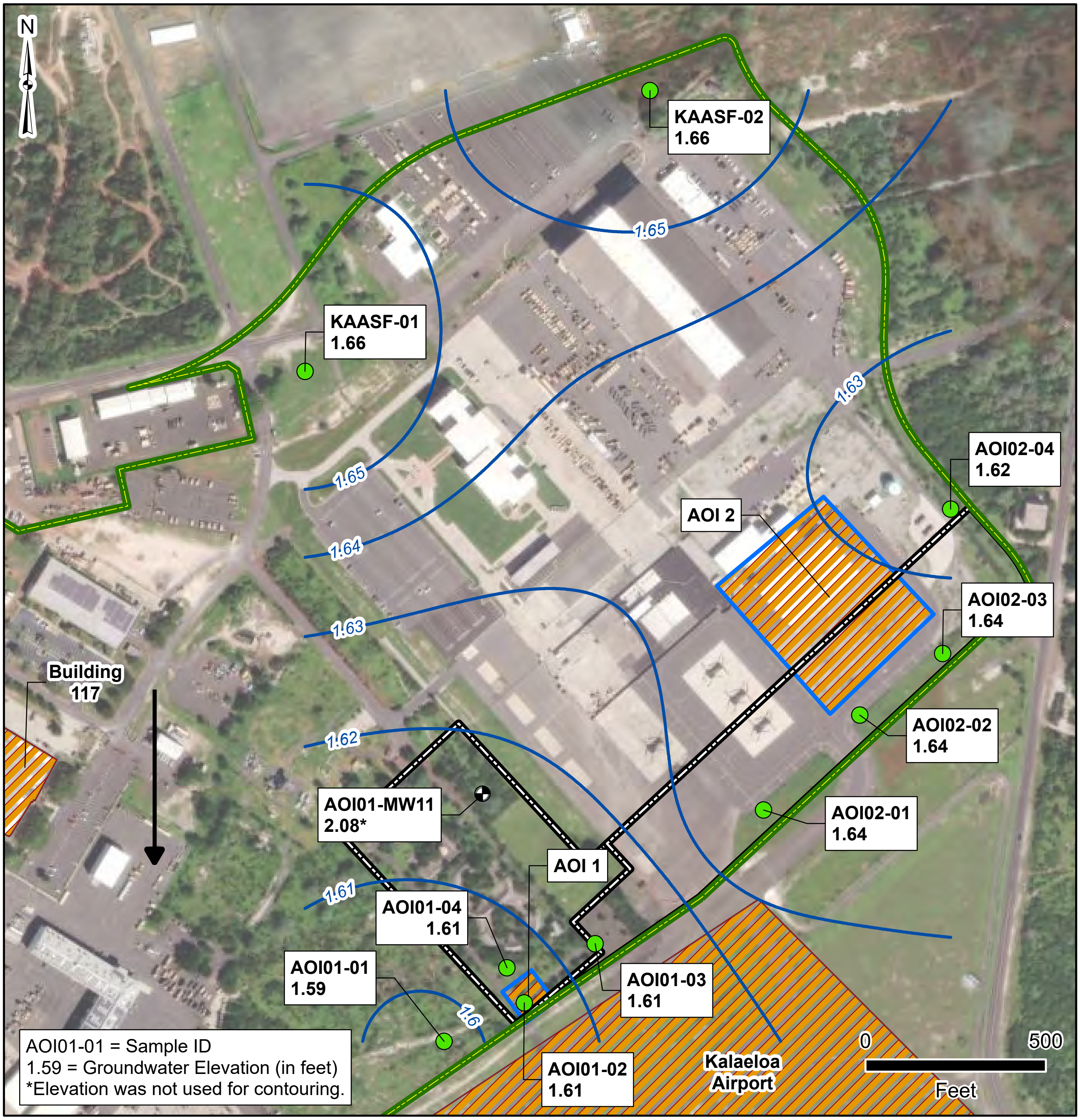


Figure 2-5
Groundwater Elevation (April 2022)



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Facility Data
- Facility Boundary
- Leased Parcels
- Area of Interest
- Potential Release Area

Sample Locations
- Sample Location
- Monitoring Well

Hydrogeology
- Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:....................November 2023
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3. SUMMARY OF AREAS OF INTEREST

The ARNG Final PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, two potential release areas were identified at Kalaeloa AASF #1-JRF and grouped into two AOIs identified as: AOI 1 Former Fuel Farm Area and AOI 2 Hangar Suppression System and Storage. Additionally, there is an off-Facility potential source area as detailed in **Section 3.3**. The potential AOIs are shown on **Figure 3-1**.

3.1 AOI 1 – FORMER FUEL FARM AREA

AOI 1 consists of a portion of HDOT-A property, leased by HIARNG since July 2016, that contains a former fuel farm area. The former fuel farm is located adjacent to the northern side of the airfield and was approximately 7 acres in size. The site previously contained 26 large fuel USTs which were removed. NAVFAC prepared a PA for the Former NAS Barber Point site which encompasses the approximately 7-acre former fuel farm area. The Final PA identified the former fuel farm as AOI 23. The PA noted that based on a review of historical information, operations at the site did not involve materials known to contain PFAS. The PA also concluded that no known DoD releases of products containing PFAS are suspected at the former tank farm. The PA determined no further DoD action was required for the area, based on the lack of AFFF storage and use by the DoD (NAVFAC 2022). The site is covered with low grass and shrubs and there have been no documented releases in this area by the HIARNG.

HDOT-A operates the adjacent Kalaeloa Airport and maintains an ARFF unit. On 12 October 2017, HIARNG personnel observed an unknown foam-like substance present on a walkway located within the former fuel farm area near UIC well #73. As documented in the subsequent spill report and confirmed by an interview with the unit fire chief, it was determined that the HDOT Kalaeloa ARFF Unit discharged the contents of a firetruck's water tank during pump testing/repair. The water tank reportedly contained 25-gallons of 1.6% Chemguard C301MS AFFF mixed with water. Tank contents flowed onto the former fuel farm area leased by HIARNG from the point of release along the fence line that separates HDOT-A controlled property from the former fuel farm which is controlled by HIARNG. HDOT-A Kalaeloa ARFF Unit personnel were unaware that the former fuel farm area was no longer under HDOT-A use. Unit personnel were reportedly following the historical practice of performing pump testing over the fence line that separates the former fuel farm from the active runway. HIARNG personnel did not participate in pump testing activities (AECOM 2020).

In addition to the foam observed on the walkway, HIARNG personnel observed flattened vegetation among the surrounding areas, indicating that the foam mixture likely affected a larger area. The spill report notes that based on the direction of flattened vegetation adjacent to UIC Well #73, it is suspected some of the AFFF mixture may have also entered the UIC well (AECOM 2020).

3.2 AOI 2 – HANGAR SUPPRESSION SYSTEM AND STORAGE

AOI 2 consists of the hangar at Kalaeloa AASF #1-JRF, which was constructed in 2017 and is equipped with an AFFF fire suppression system. The system consists of an 800-gallon tank that contains approximately 440-gallons of Ansulite AFC-3MS 3% AFFF (NSN 4210-01-144-0291) concentrate. The AFFF tank is located within the mechanical room of the hangar. Prior to 2022, an additional eight 55-gallon drums of the same Ansulite 3% AFFF were stored on secondary containment pallets within the Facility's hangar. The drums of AFFF were reportedly moved within the hangar as needed and had temporarily been stored outside the hangar on at least one occasion (AECOM 2020). In January 2022, the 800-gallon bladder tank was replaced. The foam in the tank was disposed of at PVT Landfill, consistent with current laws and regulations. The tank was refilled to full capacity (800 gallons) and the facility now stores twenty 55-gal drums of the Ansulite 3% AFFF at its vehicle wash rack equipment room, constructed in September 2022. During the bladder tank replacement, the fire suppression system was not tested and there was no release of AFFF.

The hangar suppression system is supplied with water by an external aboveground storage tank and associated Fire Pump Building located northeast of the hangar. The Fire Pump Building contains the diesel-powered water pump system that services the hangar building. AFFF is not currently or historically stored within the Fire Pump Building (AECOM 2020).

The hangar was not inspected during the PA's visual site inspection. Information provided by HIARNG indicates that the system has never been tested, and there have been no known instances of leaks or spills from either the system or the drums of AFFF. However, because AFFF was stored at the Facility, there is potential for it to have been incidentally released to the environment during handling or via leaks. If a spill or system release occurred within the hangar or mechanical room, it would likely flow into floor drains that connect to an oil/water separator and subsequently discharge to the sanitary sewer. Incidental spills that may have occurred or been tracked outside the hangar would travel via stormwater as sheet flow across impervious pavement to areas of crushed concrete that surround the hangar and subsequently to stormwater infiltration pits and/or UIC wells (AECOM 2020).

3.3 ADJACENT SOURCES

Following the investigation, one potential source on the HIARNG Facility and one potential off-Facility source of PFAS adjacent to the Facility and that is not under the control of the HIARNG was identified. The adjacent potential sources are shown on **Figure 3-1** and described in the following sections for informational purposes only and they were not investigated as part of this SI.

3.3.1 Building 117

A Final PA report prepared by NAVFAC in 2022 as part of the Base-wide Investigation for PFAS at the Former NAS Barbers Point noted that a former Plating Facility was located in the southwestern portion of Building 117 (See Figure 3-1). Wastewater from the Facility discharged into an adjacent drywell to the north-northwest. Specifics were not available as to the type of plating operation or the types and quantities of the wastes; however, NAVFAC's PA identified Building 117 as an AOI (AOI 1) and noted a potential for PFAS to be present onsite at this location (NAVFAC 2022). The property where the Plating Facility was located was transferred to the HIARNG on September 14, 2001, and is part of Kalaeloa AASF #1-JRF. No previous PFAS investigations have been completed at Building 117. Due to the release date of

NAVFAC's Final PA, this area was not included in ARNG's SI. Building 117 is recommend for further evaluation during future CERCLA phases.

3.3.2 Kalaeloa Airport

No visual site inspection was performed at the adjacent Kalaeloa Airport during the ARNG PA in 2020. However, the Kalaeloa Airport is considered an adjacent PFAS source, as runways are typically the location of crash sites requiring the usage of AFFF in emergency response, and aviation hangars may have fire suppression systems charged with AFFF. The Kalaeloa Airport was originally part of the NAS Barbers Point facility operated by the Navy. According to NAVFAC's 2022 PA, the general configuration of the runways are consistent with the runways originally constructed for former NAS Barbers Point. According to the Base Supervisory Engineer at the former NAS Barbers Point (leaving in 1993 because of the BRAC Act), the Federal Aviation Agency (FAA) had recommended foaming runways for emergency landings in 1966 before withdrawing the recommendation in 1987 and banning it 2002. At that time, the base engineer spoke with Airfield Operations personnel who described the practice of foaming runways. The base engineer also recalled that there was a time constraint on how fast the foaming needed to be done, however, he never witnessed the foaming. The runway property was transferred to HDOT on June 30, 1999. Based on the potential for foaming to have occurred from 1966 to 1987 (due to FAA Recommendations), the runways were identified as an AOI (AOI 5) in NAVFAC's PA. Additional fire training areas and a fire station which are also located on the Kalaeloa Airport were noted as potential AOIs where PFAS may have been released (NAVFAC 2022). No previous PFAS investigations have been completed for these areas, although it is noted that the areas identified in the PA are not immediately adjacent to the ARNG Facility and they are considered downgradient of the Facility.

An interview obtained during the 2020 ARNG PA indicated that the HDOT-A Kalaeloa Airport ARFF Unit conducts pump tests of their firetrucks on the vacant areas controlled by HDOT-A around the airstrip. According to the ARFF fire chief, at the time ARFF was performing monthly maintenance tests of the firetruck pumps. The fire chief noted this is typically just water; however, sometimes a little AFFF is in the tank. He noted that the discharges occur in open areas around the airstrip/DOT Property (AECOM 2020). One such pump testing location was a former fuel farm that was previously controlled by HDOT-A until July 2016 when HIARNG began leasing the property (identified as ARNG AOI-1). Previous pump testing may have also occurred at the former fuel farm area while it was under HDOT-A use. The exact locations of all pump testing areas at Kalaeloa Airport are unknown. As documented, although the pump testing was typically conducted with water, AFFF was sometimes mixed in the water tank; thus, residual PFAS may have been released from the previous testing of equipment with AFFF. Pump testing began at an unknown time and is conducted once a month. Review of the EDR™ reports did not reveal other likely PFAS sources near the Facility (AECOM 2020).

The Kalaeloa Airport is located downgradient of the AASF; however, as noted in previous discussions, HDOT-A Kalaeloa ARFF Unit conducts pump tests of their firetrucks at random locations surrounding the adjacent airport runway which could have included other fenceline or over the fenceline releases (similar to the tank farm area release identified as ARNG AOI 1). The potential exists that releases from HDOT-A ARFF pump tests along the boundary of the airport may enter the HIARNG Facility via runoff if the release was close enough to the boundary.

Army National Guard Site Inspections
Site-Specific Quality Assurance Project Plan
Kalaeloa AASF #1-JRF, Hawaii

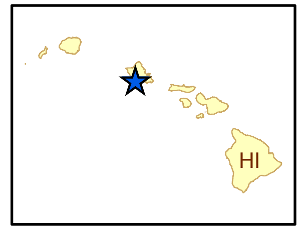
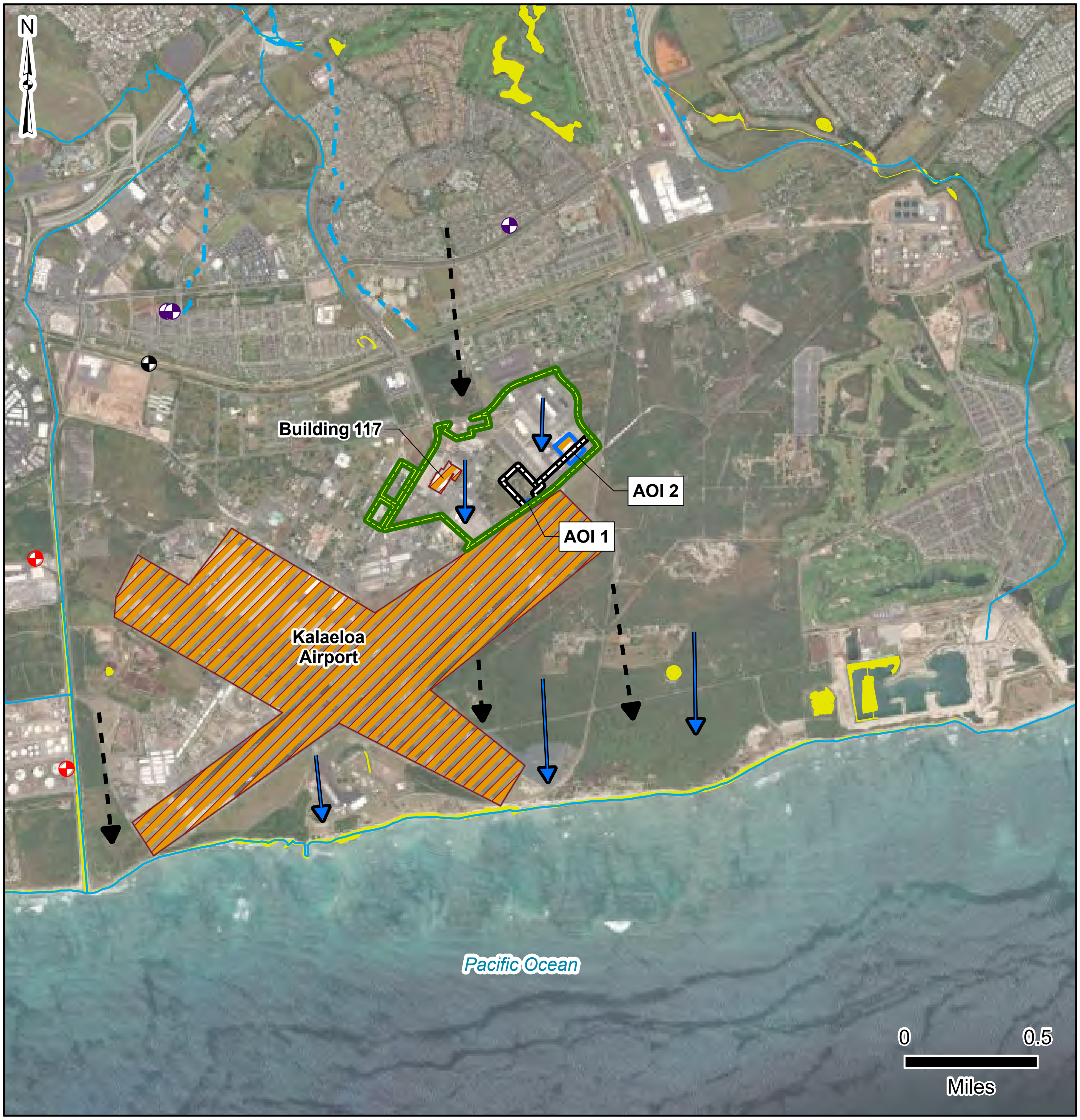


Figure 3-1
Area of Interest



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Facility Data
- Facility Boundary
- Leased Parcels
- Area of Interest
- Potential PFAS Release

Well Type
- Industrial Well
- Irrigation Well
- Other Well

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction
- Perennial Stream/Creek
- Intermittent Stream/Creek
- Water Body
- Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:....................November 2023
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4. PROJECT DATA QUALITY OBJECTIVES

As identified during the data quality objective (DQO) process and outlined in the SI Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP) Addendum (EA 2022), the objective of the SI is to identify whether there has been a release to the environment at the AOIs identified in the PA. For each AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for presence or absence of relevant compounds at each of the sampled AOIs.

4.1 PROBLEM STATEMENT

ARNG will recommend AOIs for remedial investigation (RI) if related soil and groundwater samples have concentrations of the relevant compounds above the OSD risk-based screening levels (SLs) that were the result of ARNG/Dod activities. The SLs are presented in **Section 6.1** of this report.

4.2 INFORMATION INPUTS

Primary information inputs for the SI include the following:

- The PA Report for Kalaeloa Army Aviation Support Facility #1-JRF (AECOM 2020)
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific UFP-QAPP Addendum (EA 2022)
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling

4.3 STUDY BOUNDARIES

The scope of the SI was bounded horizontally by the property limits of the Facility (**Figure 2-2**). Off-Facility sampling was not included in the scope of this SI. If future off-Facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). Temporal boundaries were limited to the earliest available time field resources were available to complete the study.

4.4 ANALYTICAL APPROACH

Samples were analyzed by Eurofins Sacramento and Eurofins Lancaster Laboratories Environment Testing, LLC, accredited under the DoD Environmental Laboratory Accreditation Program (ELAP); Accreditation Numbers (Nos.) L2468 and 0001.01, and the National Environmental Laboratory Accreditation Program (NELAP); Certificate Nos. 4040 and 022-001, respectively. PFAS data underwent 100 percent (%) Stage 2B validation in accordance with the DoD General Data Validation Guidelines (2019b) and DoD Data Validation Guidelines Module 3: Data Validation Procedure of Per- and Polyfluoroalkyl Substances Analysis by Quality

Systems Manual (QSM) Table B-15 (2020). PFAS data were compared to applicable SLs and decision rules as defined in the UFP-QAPP Addendum (EA 2022).

4.5 DATA USABILITY ASSESSMENT

The Data Usability Assessment (DUA), which is provided in **Appendix A**, is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation-specific DQOs. Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD 2019a, 2019b; USEPA 2017b).

Based on the DUA, the environmental data collected during the SI were found to be acceptable and usable for this SI evaluation with the qualifications documented in the DUA and its associated data validation reports. These data are of sufficient quality to meet the objectives and requirements of the UFP-QAPP Addendum (EA 2022).

5. SITE INSPECTION ACTIVITIES

This section describes the environmental investigation and sampling activities that occurred as part of the SI. The SI sampling approach was based on the findings of the PA and was implemented in accordance with the following approved documents:

- Final Preliminary Assessment Report, Kalaeloa Army Aviation Support Facility #1-JRF, dated October 2020 (AECOM 2020)

- Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide, dated December 2020 (EA 2020a)

- Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Kalaeloa Army Aviation Support Facility #1-JRF, Hawaiʻi, dated March 2022 (EA 2022)

- Final Programmatic Accident Prevention Plan, Revision 1, dated November 2020 (EA 2020b)

- Final Site Safety and Health Plan, Kalaeloa AASF #1-JRF, dated November 2021 (EA 2021)

- Final Preliminary Assessment Report, Basewide Investigation of Per- and Polyfluoroalkyl Substances (PFAS), Former Naval Air Station Barbers Point, Oʻahu, Hawaiʻi. (NAVFAC 2022).

The SI field activities were conducted from 24 March to 5 May 2022 and consisted of geophysical surveys, land surveys, hollow stem auger (HSA) borings and discrete soil sample collection, monitoring well installation, and grab groundwater sample collection. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2022a) and EPA Guidance (USEPA 2006), except as noted in **Section 5.8**.

The following samples were collected during the SI and analyzed for a subset of 24 PFAS compounds via liquid chromatography/tandem mass spectrometry (LC/MS/MS) compliant with QSM Version 5.3 Table B-15 to fulfill the project DQOs:

- Thirty-one (31) discrete soil samples from 11 locations (10 soil borings locations, 1 in the vicinity of an existing monitoring well location)

- Eleven (11) grab groundwater samples from well locations

- Twenty-six (26) quality assurance (QA)/quality control (QC) samples

Figure 5-1 provides the sample locations for all media across the Facility. **Table 5-1** presents the list of samples collected for each medium. Field documentation is provided in **Appendix B**. A log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 PRE-INVESTIGATION ACTIVITIES

In preparation for the SI field activities, project team members participated in Technical Project Planning (TPP) meetings, performed utility clearance, and sampled decontamination source water. Details of these activities are presented below.

5.1.1 Technical Project Planning

The U.S. Army Corps of Engineers (USACE) TPP Process, Engineers Manual (EM) 200-1-2 (Department of the Army 2016) defines four phases to project planning: (1) defining the project phase; (2) determining data needs; (3) developing data collection strategies; and (4) finalizing the data collection plan. The process encourages stakeholder involvement in the SI, beginning with defining overall project objectives, including DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 14 December 2021, prior to SI field activities with stakeholders. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include ARNG, HIARNG, USACE, and the Hawai‘i Department of Health representatives familiar with the Facility, the regulations, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the UFP-QAPP Addendum (EA 2022).

A TPP Meeting 3 was held on 29 September 2023 to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

EA contacted Hawai‘i One Call to notify them of intrusive work at the Facility. EA contracted GeoTek Hawai‘i, Inc., a private company, to perform utility clearance and drilling services at the Facility. Utility clearance was performed at each of the proposed boring locations on 11 and 14 April 2021 with input from the EA field team. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, a hand auger was used in locations until shallow bedrock/coral was encountered to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to be PFAS-free prior to the start of field activities. A sample from a potable water source at Kalaeloa AASF #1-JRF (behind Building 29), was collected on 18 November 2021, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15.

Materials that were used within the sampling zone were confirmed as acceptable for use in the PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling environment was provided in the Standard Operating Procedures appendix to the Programmatic UFP-QAPP (PQAPP) (EA 2020a).

5.2 HAND AUGER SOIL BORINGS AND SOIL SAMPLING

A hand auger was used to collect soil from up to the top 5 ft of each soil boring in compliance with utility clearance procedures. Soil samples were collected from the 11 monitoring well locations for chemical analysis from 0 to 2 ft below ground surface (bgs) using a hand auger or HSA rig (Geoprobe® 7822DT/6620DT dual-tube sampling system) depending on the presence of shallow bedrock/coral. All soil sample locations are shown on **Figure 5-1**. The locations were selected based on the AOI information provided in the PA (AECOM 2020) and as agreed upon by stakeholders during the TPP and review of the UFP-QAPP Addendum (EA 2022). Non-dedicated sampling equipment (i.e., hand auger or drilling equipment) was decontaminated between sampling locations. A modified incremental sampling procedure was identified in the UFP QAPP which required a larger volume of material to be collected. In order to provide adequate sample volume, additional soil was collected from drilling spoils if needed at certain locations (as noted in the field change request -**Appendix B4**).

Each sample was collected into a laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain-of-custody (COC) procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15) in accordance with the UFP-QAPP Addendum. QC samples and analysis were performed as described in the UFP-QAPP Addendum (EA 2022).

Subsurface soil samples were collected via HSA drilling methods. A Geoprobe® 7822DT/6620DT dual-tube sampling system was used to collect continuous soil cores to the target depth. If necessary to provide adequate sample volume, additional soil was collected from drilling spoils (as noted in the field change request -**Appendix B4**).

Three discrete soil samples were collected for chemical analysis from each soil boring: one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. One subsurface soil sample was collected approximately 1 ft above the groundwater table, and one collected at the mid-point between the surface and the groundwater table (not to exceed 15 ft bgs). Approximately 2 kilograms of soil were collected per sample in order for the laboratory to perform a multi-increment subsampling procedure. Groundwater was encountered at depths ranging from 34 to 48 ft bgs during drilling. Total boring completion depths, to accommodate well installation, ranged from 41 to 57 ft bgs.

Soil borings completed during the SI found silty sand and well graded gravel as the dominant lithology types of the unconsolidated sediments below Kalaeloa AASF. Varying levels of sand occurred throughout the Facility, with some isolated layers of clay observed at AOI 2. Gravel layers typically began at 12-15ft bgs and ranged from 20-25ft in thickness. These observations are consistent with the understood depositional environment of the region.

All soil sample locations are shown on **Figure 5-1**, and boring sample depths are provided in **Table 5-2**. The soil boring locations were selected based on the AOI information provided in the PA (AECOM 2020) and as agreed upon by stakeholders during the TPP and review of the UFP-QAPP Addendum (EA 2022). One boring location was adjusted within a 50-ft offset to bring the location inside the Facility fence line. Only one soil sample (0-2 ft bgs) was collected at location AOI01-05 as noted in the approved field change request included in **Appendix B4**. Additionally, a modified incremental sampling procedure was identified in the UFP-QAPP which required a larger volume of material to be collected. In order to provide adequate sample volume, additional soil was collected from drilling spoils if needed at certain locations (as noted in the field change request -**Appendix B4**).

During the mobilization, the soil cores were continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System. A photoionization detector (PID) was used to screen the breathing zone during boring activities as a part of personal safety requirements. Observations and measurements were recorded on sampling forms (**Appendix B2**) and in a non-treated field logbook. Depth interval, recovery thickness, PID concentrations, moisture, relative density, Munsell color, and Unified Soil Classification System texture were recorded. The boring logs are provided in **Appendix E**.

Each sample was collected into a laboratory-supplied PFAS-free HDPE bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard COC procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), total organic carbon (TOC) (USEPA Method 9060A) and pH (USEPA Method 9045D) in accordance with the UFP-QAPP Addendum (EA 2022).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix spike (MS)/matrix spike duplicates (MSDs) were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, one equipment blank (EB) was collected per day and analyzed for the same parameters as the soil samples. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 degrees Celsius (°C) during shipment.

HSA borings were converted to permanent wells in accordance with the UFP-QAPP Addendum (EA 2022). Whenever possible, borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces. Two boring locations at AOI 1 were installed through asphalt to maintain proximity to the historic release location.

5.3 WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Wells were installed using a GeoProbe® 7822DT/6620DT dual-tube sampling system. Once the borehole was advanced to the desired depth, a permanent well was constructed of a 10-ft section of 1-inch Schedule 40 polyvinyl chloride (PVC) screen with sufficient casing to reach the ground surface. New PVC pipe and screen were used at each location to avoid cross contamination between locations. The screen intervals for the wells are provided in **Table 5-2**.

Wells were not developed until a minimum of 24-hours after installation, in accordance with the UFP-QAPP Addendum. Additionally, wells were not sampled prior to 24-hours after development. Groundwater samples were collected using a bladder pump with PFAS-free HDPE tubing. Each sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. The wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected in a separate container. In accordance with the UFP-QAPP Addendum, a subsample of each groundwater sample was collected in a separate container and a shaker test was performed to identify if there was any foaming which would result in notification to the laboratory (foaming is potentially indicative of high PFAS concentrations). No foaming was noted. The containers were also provided to the lab for their use. Samples were packaged on ice and transported via FedEx under standard COC procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 in accordance with the UFP-QAPP Addendum (EA 2022).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. MS/MSDs were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. Five field blanks (FB) were collected in accordance with the UFP-QAPP Addendum (EA 2022). In instances when non-dedicated sampling equipment was used, such as a bladder pump, one EB was collected a day and analyzed for the same parameters as the groundwater samples A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6°C during shipment. One groundwater sample proposed for location AOI01-05 was collected from an existing monitoring well (MW-11) located approximately 30 ft from AOI01-05 (**Figure 2-5**) as noted in the approved field change request (**Appendix B4**).

5.4 SYNOPTIC WATER LEVEL MEASUREMENTS

Groundwater levels were used to monitor Facility-wide groundwater elevations and assess groundwater flow. Synoptic water level elevation measurements were collected from the newly installed monitoring wells, taken from the survey mark on the northern side of the well casing. Groundwater elevation data is provided in **Table 5-3**.

5.5 SURVEYING

The northern side of each new well casing was surveyed by a Hawaiʻi-Licensed surveyor, Park Engineering. Positions were collected in the applicable Universal Transverse Mercator zone projection with World Geodetic System 1984 datum (horizontal) and North American Vertical Datum 1988 (vertical). Surveying data were collected on 25 April 2022 and are provided in **Appendix B3**.

5.6 INVESTIGATION-DERIVED WASTE

As of the date of this report, the disposal of PFAS investigation-derived waste (IDW) is not regulated federally. IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (EA 2022) and with the DA Guidance for Addressing Releases of PFAS (DA, 2018).

All solid (i.e., soil cuttings) and liquid (i.e., purge water, development water, and decontamination fluids) IDW were contained in labeled, 55-gallon steel drums, removed from the site, and disposed of in a Resource Conservation and Recovery Act Subtitle C landfill. Specifics on the disposal of solid and liquid IDW will be summarized in a separate IDW disposal report.

Other solids such as spent personal protective equipment, plastic sheeting, tubing, rope, unused monitoring well construction materials, and other environmental media generated during the field activities were disposed of as non-hazardous solid waste to be transported to a licensed solid waste landfill.

5.7 LABORATORY ANALYTICAL METHODS

Samples were analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 at Eurofins Lancaster Laboratories Environmental, LLC, in Lancaster, Pennsylvania, a DoD ELAP- and NELAP-certified laboratory.

Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D.

5.8 DEVIATIONS FROM SITE INVESTIGATION UFP-QAPP ADDENDUM

Deviations from the UFP-QAPP Addendum occurred based on field conditions. These deviations were discussed between EA, ARNG G-9, HIARNG, HDOH, and USACE. One deviation from the UFP-QAPP Addendum is noted below:

- AOI01-05: An existing groundwater monitoring well was discovered in the vicinity of the planned location for permanent well AOI01-05. Instead of three soil boring samples, a single surface soil sample was collected in the vicinity of the permanent well. The groundwater sample for this location was collected from the existing monitoring well. This change is noted in the Field Change Request Form provided in **Appendix B4** which includes a figure to show the well and soil sampling location.

Table 5-1. Site Inspection Samples by Medium
Kalaeloa AASF #1-JRF, Hawai‘i
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15 (ISM Preparation for soils)	TOC (USEPA Method	pH (USEPA Method 9045D)	Grain Size	Comments
Soil Samples							
KAASF-01-SB-01-02	11 Apr 2022	0-2	X				
KAASF-01-SB-01-02 (Dup)	11 Apr 2022	0-2	X				Field duplicate of KAASF-01-SB-01-02
KAASF-01-SB-13-15	11 Apr 2022	13-15	X				
KAASF-01-SB-40-42	11 Apr 2022	40-42	X				
KAASF-02-SB-01-02	12 Apr 2022	1-2	X				
KAASF-02-SB-13-15	12 Apr 2022	13-15	X				
KAASF-02-SB-46-48	12 Apr 2022	46-48	X				
AOI2-03-0-2	15 Apr 2022	0-2	X				
AOI2-03-13-15	15 Apr 2022	13-15	X				
AOI2-03-36-38	15 Apr 2022	36-38	X				
AOI02-01-SB-0-2	18 Apr 2022	0-2	X				
AOI02-01-SB-13-15	18 Apr 2022	13-15	X				
AOI02-02-SB-0-2	18 Apr 2022	0-2	X				
AOI02-02-SB-13-15	18 Apr 2022	13-15	X				
AOI02-02-SB-36-38	18 Apr 2022	36-38	X				
AOI02-01-SB-34-36	19 Apr 2022	34-36	X				
AOI02-04-SB-0-2	19 Apr 2022	0-2	X				
AOI02-04-SB-13-15	19 Apr 2022	13-15	X				
AOI02-04-SB-36-38	19 Apr 2022	36-38	X				
KAASF-DUP-SB-01	19 Apr 2022	0-2	X				Field duplicate of AOI02-04-SB-0-2
AOI01-03-SB-13-15	20 Apr 2022	13-15	X	X	X	X	
AOI01-03-SB-0-2	20 Apr 2022	0-2	X				
AOI01-03-SB-34-36	20 Apr 2022	34-36	X				
KAASF-DUP-SB-01	20 Apr 2022	13-15	X				Field duplicate of AOI01-03-SB-13-15
AOI01-02-SB-0-2	20 Apr 2022	0-2	X				
AOI01-02-SB-13-15	20 Apr 2022	13-15	X				
AOI01-02-SB-32-34	20 Apr 2022	32-34	X				
KAASF-DUP-SB-03	20 Apr 2022	0-2	X				Field duplicate of AOI01-02-SB-0-2
AOI01-01-SB-32-34	21 Apr 2022	32-34	X				
AOI01-01-SB-0-2	21 Apr 2022	0-2	X				
AOI01-01-SB-13-15	21 Apr 2022	13-15	X				
KAASF-DUP-SB-04	21 Apr 2022	0-2	X				Field duplicate of AOI01-05-SB-0-2
AOI01-04-SB-0-2	21 Apr 2022	0-2	X				
AOI01-04-SB-31-33	21 Apr 2022	31-33	X				

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15 (ISM Preparation for soils)	TOC (USEPA Method	pH (USEPA Method 9045D)	Grain Size	Comments
AOI01-04-SB-13-15	21 Apr 2022	13-15	X				
AOI01-05-SB-0-2	21 Apr 2022	0-2	X				
Groundwater Samples							
KAASF-01-GW	29 Apr 2022	-	X				
AOI02-02-GW	2 May 2022	-	X				
AOI02-01-GW	2 May 2022	-	X				
AOI02-03-GW	3 May 2022	-	X				
AOI01-03-GW	4 May 2022	-	X				
AOI01-MW11-GW	5 May 2022	-	X				
AOI01-04-GW	5 May 2022	-	X				
AOI02-04-GW	5 May 2022	-	X				
AOI01-02-GW	4 May 2022	-	X				
AOI01-01-GW	5 May 2022	-	X				
KAASF-02-GW	4 May 2022	-	X				
KAASF-DUP-GW-01	4 May 2022	-	X				Field duplicate of AOI01-02-GW
KAASF-DUP-GW-02	5 May 2022	-	X				Field duplicate of AOI02-04-GW
KAASF-MSD-GW	5 May 2022	-	X				MS/MSD
Blank Samples							
KAASF-EB-01	11 Apr 2022	-	X				Equipment Blank
KAASF-EB-02	12 Apr 2022	-	X				Equipment Blank
KAASF-EB-03	15 Apr 2022	-	X				Equipment Blank
KAASF-EB-04	18 Apr 2022	-	X				Equipment Blank
KAASF-EB-05	19 Apr 2022	-	X				Equipment Blank
KAASF-EB-06	20Apr 2022	-	X				Equipment Blank
KAASF-EB-07	21 Apr 2022	-	X				Equipment Blank
KAASF-EB-09	29 Apr 2022	-	X				Equipment Blank
KAASF-FB-01	29 Apr 2022	-	X				Field Blank
KAASF-EB-10	2 May 2022	-	X				Equipment Blank
KAASF-FB-02	2 May 2022	-	X				Field Blank
KAASF-FB-03	3 May 2022	-	X				Field Blank
KAASF-EB-11	3 May 2022	-	X				Equipment Blank
KAASF-FB-04	4 May 2022	-	X				Field Blank
KAASF-FB-05	5 May 2022	-	X				Field Blank
KAASF-EB-12	4 May 2022	-	X				Equipment Blank
KAASF-EB-13	5 May 2022	-	X				Equipment Blank

Table 5-2. Soil Boring Depths and Well Screen Intervals
Kalaeloa AASF #1-JRF, Hawai‘i
Site Inspection Report

Area of Interest	Boring ID	Soil Boring Depth (ft bgs)	Well Screen Interval (ft bgs)[1]	Ground Surface Elevation ft amsl
1	AOI01-01	42	32-42	36.28
	AOI01-02	42	32-42	35.92
	AOI01-03	44	34-44	36.53
	AOI01-04	41	31-41	36.65
	AOI01-MW11[2]	N/A	Unknown	37.99
2	AOI02-01	43	33-43	36.76
	AOI02-02	45	35-45	39.12
	AOI02-03	45	35-45	39.99
	AOI02-04	46	36-46	40.78
	KAASF-01	47	37-47	46.45
	KAASF-02	57	47-57	50.11

Notes:
[1] Well screen set above total depth to capture groundwater interface.
[2] Groundwater sample collected from existing monitoring well (MW-11) found in planned vicinity of Location AOI01-05.
AASF = Army Aviation Support Facility
bgs = below ground surface
ft = feet
JRF = John Rodgers Field

Table 5-3. Groundwater Elevation
Kalaeloa AASF #1-JRF, Hawai‘i
Site Inspection Report

Monitoring Well ID	Top of Casing Elevation (ft amsl)	Depth to Water (ft btoc) [1]	Groundwater Elevation (ft amsl)	Depth to Water (ft bgs)
KAASF-01	46.17	44.51	1.66	45.00
KAASF-02	49.62	47.96	1.66	48.24
AOI01-01	35.97	34.38	1.59	34.69
AOI01-02	35.62	34.01	1.61	34.31
AOI01-03	36.23	34.62	1.61	34.92
AOI01-04	36.46	34.85	1.61	35.04
AOI01-MW11[2]	37.18	35.10	2.08	35.91
AOI02-01	36.50	34.86	1.64	35.12
AOI02-02	38.76	37.12	1.64	37.48
AOI02-03	39.55	37.91	1.64	38.35
AOI02-04	40.46	38.84	1.62	39.16

Notes:
[1] Well screen set above total depth to capture groundwater interface.
[2] Groundwater sample collected from existing monitoring well (MW-11) found in planned vicinity of Location AOI01-05.
btoc = below top of casing
AASF = Army Aviation Support Facility
amsl = Above mean sea level
bgs = below ground surface
btoc = below top of casing
ft = feet
JRF = John Rodgers Field

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Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

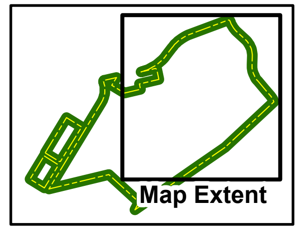
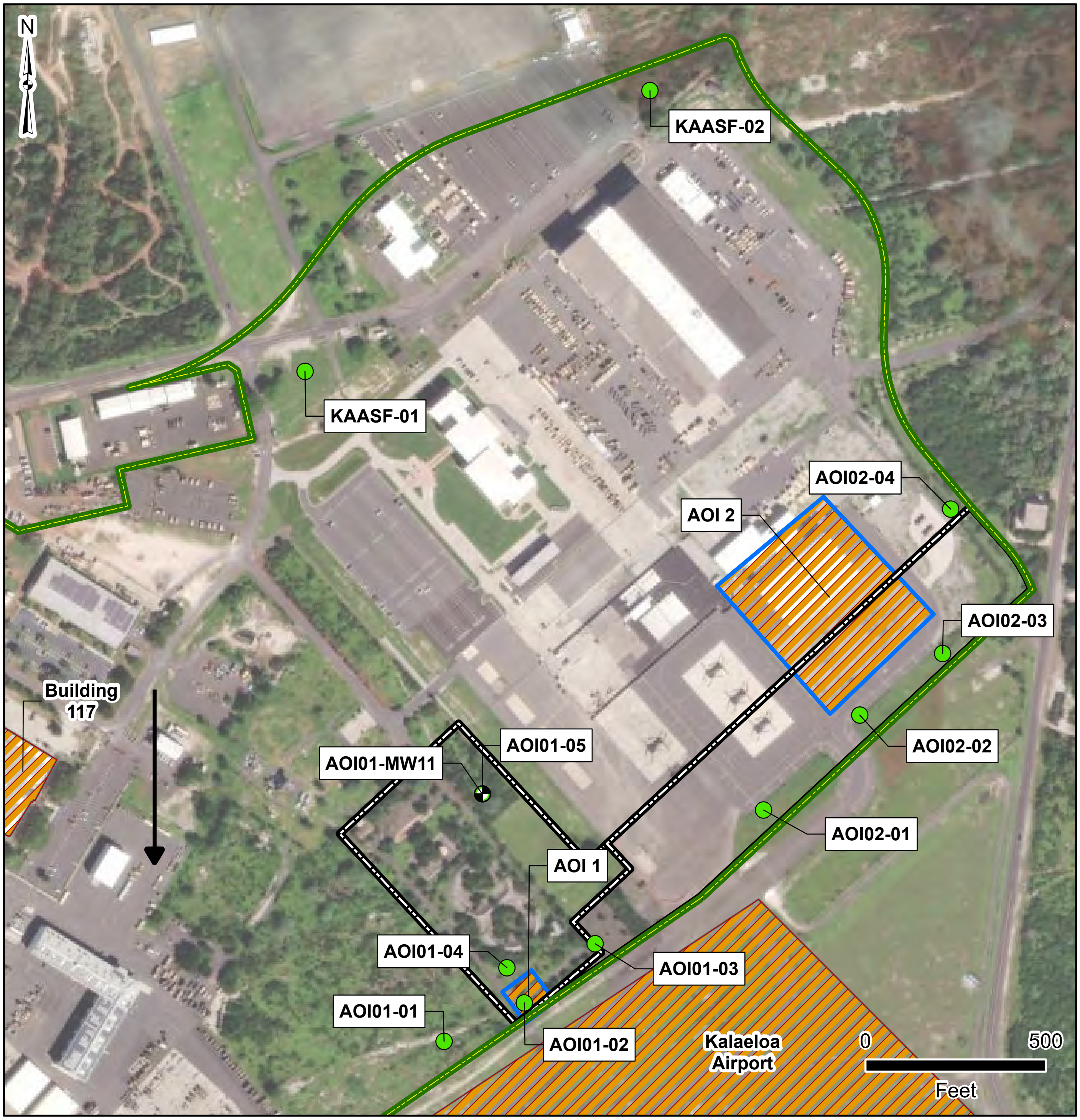


Figure 5-1
Site Inspection Sample Locations



Facility Data
- Facility Boundary
- Leased Parcels
- Area of Interest
- Potential Release Area

Sample Locations
- Monitoring Well Location
- Sample Location

Hydrogeology
- Groundwater Flow Direction

Data Sources:
ESRI 2020
AECOM 2020

Date:....................November 2023
Prepared By:............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 4N

Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\Kalaeloa\KalaeloaSI.aprx

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6. SITE INSPECTION RESULTS

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for the AOIs and boundary areas is provided in **Sections 6.3 through 6.5**. **Tables 6-2 through 6-5** present results for soil or groundwater for the relevant compounds. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 SCREENING LEVELS

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the OSD dated 6 July 2022 (Assistant Secretary of Defense, 2022). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to the five compounds presented on **Table 6-1**.

Table 6-1. Screening Levels (Soil and Groundwater)

Analyte[2]	Residential 0 to 2 ft bgs (Soil) (µg/kg)[1]	Industrial/Commercial Composite Worker 2 to 15 ft bgs (Soil) (µg/kg)[1]	Tap Water (Groundwater) (ng/L)[1]
PFOA	19	250	6
PFOS	13	1,600	4
PFBS	1,900	25,000	600
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022.
2. Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

ng/L = nanogram(s) per liter
µg/kg = Microgram(s) per kilogram

The data in the subsequent sections are compared against the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the Facility: the residential scenario is applied to surface soil results (0 to 2 ft bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 ft bgs). The industrial/commercial worker scenario was applied to shallow subsurface soil samples collected from mid-point at the soil borings (13 to 15 ft bgs) in each AOI, providing a conservative assessment of that potential exposure route for the industrial/commercial workers. The SLs are not applied to deep subsurface soil results (greater than 15 ft bgs) because 15 ft is the anticipated limit of construction activities.

6.2 SOIL PHYSICOCHEMICAL ANALYSES

To provide basic soil parameter information, soil samples were analyzed for TOC and pH, which are important for evaluating transport through the soil medium. **Appendix F** contains the results of the TOC and pH sampling.

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport. According to the Interstate Technology Regulatory Council (ITRC), several important PFAS partitioning mechanisms include hydrophobic and lipophobic effects, electrostatic interactions, and interfacial behaviors. At relevant environmental pH values, certain PFAS are present as organic anions, and are therefore relatively mobile in groundwater (Xiao et al., 2015), but tend to associate with the organic carbon fraction that may be present in soil or sediment (Higgins and Luthy 2006; Guelfo and Higgins 2013). When sufficient organic carbon is present, organic carbon normalized distribution coefficients (K_{oc} values) can help in evaluating transport potential, though other geochemical factors (for example, pH and presence of polyvalent cations) may also affect PFAS sorption to solid phases (ITRC 2018).

Soil pH and TOC was analyzed in soil sample AOI01-03-SB-13-15. Results showed pH values of 7.2 and a TOC result of 8,200 mg/kg. The grain size analysis conducted on sample AOI01-03-SB-13-15 showed a composition of 42.9% sand, 11.7% gravel, 9.2% clay, and 36.2% silt. This result corresponds to a soil texture of sandy loam.

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1, which includes the former fuel farm area, including the site of a 2017 reported release of AFFF. The detected compounds are summarized in **Tables 6-2 through 6-5**. **Figures 6-1 through 6-7** present detections for relevant compounds in soil and groundwater.

6.3.1 AOI 1 Soil Analytical Results

Figures 6-1 through 6-5 present the ranges of detections in soil. **Tables 6-2 through 6-4** summarize the soil results.

Soil was sampled in five locations associated with one potential release area at AOI 1. Soil was sampled from three intervals at four locations (AOI01-01, AOI01-02, AOI01-03, and AOI01-04); surface (0-2 ft bgs), shallow subsurface (13-15 bgs), and deep subsurface soil intervals (32-36 ft bgs). A single surface soil sample (0-2 ft bgs) was collected from one location (AOI01-05).

All five compounds in Table 6-1 were detected in surface soil samples (0-2 ft bgs) at three locations (AOI01-01, AOI01-02, and AOI01-05). PFOA, PFOS, and PFHxS were detected in surface samples from the remaining two locations (AOI01-03 and AOI01-04). PFOA was detected above the SL of 19 µg/kg at AOI01-02 (concentration of 100 µg/kg) and its duplicate sample (110 µg/kg). Remaining detections ranged from 0.26 µg/kg to 2.1 µg/kg at AOI01-04 and AOI01-05, respectively (2.5 µg/kg in the AOI01-05 duplicate sample). PFOS was detected above the SL of 13 µg/kg with concentrations of 45 µg/kg at AOI01-05 (39 µg/kg in the duplicate sample) and 1,500 J+ µg/kg at AOI01-02 (1,500 J- µg/kg in the duplicate sample). Remaining detections ranged from 0.5 J+ µg/kg to 4.7 J+ µg/kg at AOI01-04 and AOI01-01, respectively. PFHxS was detected above the SL of 130 µg/kg at AOI01-02 with a concentration of 340 µg/kg (360 µg/kg in the duplicate sample). Remaining detections ranged from 0.54 µg/kg to 2.6 µg/kg at AOI01-03 and the AOI01-05 (duplicate sample), respectively. PFBS concentrations ranged from 0.084 J µg/kg to 19 µg/kg (25 µg/kg in duplicate sample) at AOI01-01 and AOI01-02, respectively, below the SL of 1,900 µg/kg. PFNA concentrations ranged from 0.042 J µg/kg to 12 µg/kg in AOI01-01 and AOI01-02 (and 12 µg/kg in the AOI01-02 duplicate sample), respectively, below the SL of 19 µg/kg.

No relevant compounds were detected above SLs in the shallow subsurface soil samples (13-15 ft bgs). PFOA was detected in three shallow subsurface soil samples at concentrations ranging from 0.054 J+ µg/kg to 0.2 J+ µg/kg in AOI01-03 and AOI01-02, respectively, below the SL of 250 µg/kg. PFOS was detected in three shallow subsurface soil samples at concentrations ranging from 0.059 µg/kg to 0.54 µg/kg in AOI01-03 (duplicate sample) and AOI01-02, respectively, below the SL of 160 µg/kg. PFHxS was detected in four shallow subsurface soil samples at concentrations ranging from 0.022 J µg/kg to 3.4 µg/kg in AOI01-04 and AOI01-02, respectively, below the SL of 1,600 µg/kg. PFBS was detected in two shallow subsurface soil samples at concentrations of 0.047 J µg/kg, (0.049 µg/kg in the duplicate result), and 6.5 µg/kg in AOI01-03 and AOI01-02, respectively, below the SL of 25,000 µg/kg. PFNA was not detected in any shallow subsurface soil samples.

PFOA was detected in all four deep subsurface soil samples (32-36 ft bgs) at concentrations ranging from 0.024 J µg/kg to 0.1 µg/kg in AOI01-04 and AOI01-02, respectively. PFOS was detected in three deep subsurface soil samples at concentrations ranging from 0.11 µg/kg to 0.33 µg/kg in AOI01-03 and AOI01-02, respectively. PFHxS was detected in three deep subsurface soil samples and a duplicate sample at concentrations ranging from 0.029 J µg/kg to 0.12 µg/kg in AOI01-01 duplicate and AOI01-03, respectively. PFBS was detected in one deep subsurface soil sample (AOI01-02) at a concentration of 0.075 J µg/kg. PFNA was not detected in any deep subsurface soil samples.

6.3.2 AOI 1 Groundwater Analytical Results

Figure 6-6 and Figure 6-7 present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater samples were collected from five permanent wells at AOI 1 during the SI. The following exceedances of the SLs were measured:

- PFOA and PFOS were detected above the SL of 6 ng/L and 4 ng/L, respectively, in all five samples. PFOA concentrations ranged from 18 J ng/L to 740 J ng/L in AOI01-04 and

AOI01-02, respectively, and PFOS concentrations ranged from 16 J ng/L to 6,900 J ng/L in AOI01-04 and AOI01-02 duplicate, respectively.

- PFNA was detected above the SL of 6 ng/L in one well (AOI01-02) at a concentration of 35 J ng/L (34 ng/L in the duplicate sample).

- PFHxS was detected above the SL of 39 ng/L in three wells (AOI01-01, AOI01-02 [and the duplicate sample], and AOI01-03) at concentrations ranging from 50 J ng/L to 7,100 J ng/L in AOI01-01 and AOI01-02, respectively.

PFNA was detected below the SL in three wells with concentrations ranging from 0.9 J ng/L to 2.3 J ng/L in AOI01-04 and AOI01-03, respectively. PFHxS was detected below the SL in two wells with concentrations of 14 J ng/L and 36 J ng/L in AOI01-04 and AOI01-MW11, respectively. PFBS was detected below the SL of 601 ng/L in four wells with concentrations ranging from 4.8 J ng/L to 480 J ng/L (530 ng/L in the duplicate sample) in AOI01-04 and AOI01-02, respectively.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, three relevant compounds (PFOA, PFOS, and PFHxS) were detected in soil above their respective SLs; and PFNA, and PFBS were detected below their respective SLs. Four relevant compounds (PFOA, PFOS, PFHxS, and PFNA) were detected in groundwater at concentrations above their respective SLs and PFBS was detected below the SL. However, at no point during the PA or the SI was there any evidence that any of the relevant compounds were the result of current or historical ARNG/DoD activities.

6.4 AOI 2

6.4.1 AOI 2 Soil Analytical Results

Figures 6-1 through 6-7 present the ranges of detections in soil. **Tables 6-2 through 6-4** summarize the soil results.

Soil was sampled in four boring locations associated with a former AFFF storage area at AOI 2. Soil was sampled from three intervals at four locations (AOI02-01, AOI02-02, AOI02-03, and AOI02-04); surface (0-2 ft bgs), shallow subsurface soil (13-15 bgs), and deep subsurface soil (34-38 ft bgs). Additionally, soil was sampled from three intervals at two boring locations along the Facility boundary (KAASF-01 and KAASF-02 termed boundary locations); surface soil samples (0-2 ft bgs), shallow subsurface soil samples (13-15 bgs), and deep subsurface soil samples (40-48 ft bgs). No relevant compounds were detected above SLs in soil samples collected from AOI 2 or the Facility boundary.

PFOA was detected in six surface soil samples (0-2 ft bgs) (four source sample locations and two boundary sample locations, including duplicate samples) at concentrations ranging from 0.21 J+ µg/kg to 2.4 µg/kg in AOI02-02 and AOI02-03, respectively, below the SL of 19 µg/kg. PFOS was detected in six surface samples (four source sample locations and two boundary sample locations including duplicate samples) at concentrations ranging from 1 J+ µg/kg to 3.5 µg/kg in AOI02-02 and AOI02-03, below the SL of 13 µg/kg. PFNA was detected in five surface samples (four source sample locations and one boundary sample location, including duplicate samples) at concentrations ranging from 0.043 J+ µg/kg (0.041 J µg/kg in the duplicate sample) to 0.31 µg/kg in AOI02-04 and AOI02-03, respectively, below the SL of 19 µg/kg. PFHxS was detected in six surface samples (four source sample locations and two boundary sample locations, including duplicate samples) at concentrations ranging from 0.045 J µg/kg to 0.66 µg/kg in AOI02-02 and AOI02-03, respectively, below the SL of 130 µg/kg. PFBS was detected in two surface samples (two source sample locations) at the same concentration of 0.043 µg/kg in AOI02-01 and AOI02-02, below the SL of 1,900 µg/kg.

PFOA was detected in four shallow subsurface soil samples (13-15 ft bgs) (two source sample locations and two boundary sample locations) at concentrations ranging from 0.024 J µg/kg and 0.16 J+ µg/kg in boundary sample KAASF-01 and source sample AOI02-04, respectively, below the SL of 250 µg/kg. PFOS was detected in four shallow subsurface soil samples (two source sample locations and two boundary sample locations) at concentrations ranging from 0.068 J µg/kg and 0.39 J+ µg/kg in boundary sample KAASF-02 and location AOI02-04, respectively, below the SL of 160 µg/kg. PFHxS was detected in three shallow subsurface soil samples (three source sample locations) at concentrations ranging from 0.025 J µg/kg to 0.32 µg/kg in AOI02-02 and AOI02-04, respectively, below the SL of 1,600 µg/kg. PFBS was detected in two shallow subsurface soil samples (two source sample locations) at concentrations of 0.056 J µg/kg and 0.18 J µg/kg in AOI02-04 and AOI02-03, respectively, below the SL of 25,000 µg/kg. PFNA was not detected in any shallow subsurface soil samples.

PFOA was detected in two deep subsurface soil samples (two source sample locations) at concentrations of 0.12 J+ µg/kg and 0.64 J+ µg/kg in AOI02-01 and AOI02-04, respectively. PFOS was detected in four deep subsurface soil samples (three source sample locations and one boundary sample location) at concentrations ranging from 0.38 J µg/kg to 0.89 J+ µg/kg in boundary sample KAASF-02 and location AOI02-04, respectively. PFNA was detected in one deep subsurface soil sample in the source location (AOI02-02) at a concentration of 0.047 J µg/kg. PFHxS was detected in three deep subsurface soil samples (three source sample locations) at concentrations ranging from 0.029 µg/kg to 0.55 µg/kg in AOI02-02 and AOI02-04, respectively. PFBS was detected in two deep subsurface soil samples (two source sample locations) at concentrations of 0.078 J µg/kg and 0.37 µg/kg in AOI02-04 and AOI02-02, respectively.

6.4.2 AOI 2 Groundwater Analytical Results

Figures 6-6 and Figure 6-7 present the ranges of detections in groundwater. **Table 6-5** summarizes the groundwater results.

Groundwater samples were collected from four permanent wells at AOI 2 and two permanent wells at the Facility boundary (boundary wells) during the SI. The following exceedances of the SLs were measured:

- PFOA was detected above the SL of 6 ng/L in five locations (all four source area wells and one boundary well location KAASF-01). PFOA concentrations ranged from 7 ng/L to 140 J ng/L in KAASF-01 and AOI02-04 (150 J ng/L for the AOI02-04 duplicate sample), respectively.

- PFOS was detected above the SL of 4 ng/L in all six wells (four source area wells and the two boundary well locations). PFOS concentrations ranged from 4.6 J ng/L to 120 ng/L in KAASF-02 and AOI02-02, respectively.

- PFNA was detected above the SL of 6 ng/L in one source area well, AOI02-03, at a concentration of 19 ng/L.

- PFHxS was detected above the SL of 39 ng/L in two source area wells AOI02-02 and AOI02-04 at concentrations of 65 ng/L and 140 J ng/L (130 ng/L for the AOI02-04 duplicate sample), respectively.

PFOA was detected below the SL of 6 ng /L in one boundary well location, KAASF-02, with a concentration of 1.8 ng/L. PFNA was detected below the SL in two wells (one source area well and one boundary well location) with concentrations of 0.75 J ng/L and 1.5 J ng/L in KAASF-01 and AOI02-04, respectively (1.6 ng/L in the duplicate sample for AOI02-04). PFBS was detected below the SL of 601 ng/L in six wells (four source area wells and the two boundary well locations) with concentrations ranging from 0.38 J ng/L to 200 ng/L in KAASF-02 and AOI02-03, respectively. PFHxS was detected below the SL of 39 ng/L in four wells (two source area wells and two boundary well locations) at concentrations of 0.61 ng/L and 32 J ng/L in KAASF-02 and AOI02-01, respectively.

6.4.3 AOI 2 Conclusions

Based on the results of the SI, all five relevant compounds were detected in soil samples below their respective SLs. Four relevant compounds (PFOA, PFOS, PFHxS, and PFNA) were detected in groundwater at concentrations above their respective SLs. PFBS was detected below the SL. Based on the exceedances of the SLs in groundwater, further evaluation at AOI 2 is warranted.

Table 6-2. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil, Site Inspection Report, Kalaeloa AASF #1-JRF

		Location ID	AOI01-01		AOI01-02		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-05		AOI02-01	
		Sample Name	AOI01-01-SB-0-2		AOI01-02-SB-0-2		KAASF-DUP-SB-03		AOI01-03-SB-0-2		AOI01-04-SB-0-2		AOI01-05-SB-0-2		KAASF-DUP-SB-04		AOI02-01-SB-0-2	
		Parent Sample ID					AOI01-02-SB-0-2								AOI01-05-SB-0-2			
		Sample Date	4/21/2022		4/20/2022		4/20/2022		4/20/2022		4/21/2022		4/21/2022		4/21/2022		4/18/2022	
		Depth (ft bgs)	0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Analyte	**Screening Level[1,2]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																		
Perfluorobutanesulfonic acid (PFBS)	1900	µg/kg	0.084	J	19		25		ND	U	ND	U	0.11	J	0.15	J	0.043	J
Perfluorohexanesulfonic acid (PFHxS)	130	µg/kg	2.1		340		360		0.54		0.65		2.2		2.6		0.13	
Perfluorononanoic acid (PFNA)	19	µg/kg	0.042	J	12		12		ND	UJ	ND	U	3		2.7		0.1	J+
Perfluorooctanesulfonic acid (PFOS)	13	µg/kg	4.7	J+	1500		1500	J-	0.72		0.5	J+	45		39		2.3	J+
Perfluorooctanoic acid (PFOA)	19	µg/kg	1.9		100		110		0.33	J+	0.26		2.1		2.5		0.26	J+

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
J- = Estimated concentration, biased low.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
UJ = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD). Associated numerical value is approximate.
µg/kg = Microgram(s) per kilogram.
1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022.
2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.
Values exceeding the Screening Level are shaded gray.
ft bgs = Feet below ground surface.
Qual = Qualifier.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).

Table 6-2. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil, Site Inspection Report, KAASF

Location ID			AOI02-02		AOI02-03		AOI02-04		AOI02-04		KAASF-01		KAASF-01		KAASF-01		KAASF-02	
Sample Name			AOI02-02-SB-0-2		AOI02-03-SB-0-2		AOI02-04-SB-0-2		KAASF-DUP-SB-01		KAASF-01-SB-0TO2		KAASF-01-SB-0TO2 Duplicate		KAASF-01-SB-0TO2 Triplicate		KAASF-02-SB-01-02	
Parent Sample ID									AOI02-04-SB-0-2				KAASF-01-SB-0TO2		KAASF-01-SB-0TO2			
Sample Date			4/18/2022		4/15/2022		4/19/2022		4/19/2022		4/11/2022		4/11/2022		4/11/2022		4/12/2022	
Depth (ft bgs)			0-2		0-2		0-2		0-2		0-2		0-2		0-2		1-2	
Analyte	**Screening Level[1,2]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																		
Perfluorobutanesulfonic acid (PFBS)	1900	µg/kg	0.043	J	ND	U	ND	U	ND	U	ND	UJ	ND	U	ND	U	ND	UJ
Perfluorohexanesulfonic acid (PFHxS)	130	µg/kg	0.045	J	0.66		0.35		0.35		0.09	J	0.087		0.081		0.2	J
Perfluorononanoic acid (PFNA)	19	µg/kg	0.067	J+	0.31		0.043	J	0.041	J	0.092	J	0.094		0.092		ND	UJ
Perfluorooctanesulfonic acid (PFOS)	13	µg/kg	1	J+	3.5		2.7	J+	2.8	J+	1.1	J	1.1		1		2.2	J
Perfluorooctanoic acid (PFOA)	19	µg/kg	0.21	J+	2.4		0.87	J+	0.88	J+	0.28	J	0.26		0.28		1.2	J

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
J- = Estimated concentration, biased low.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
UJ = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD). Associated numerical value is approximate.
µg/kg = Microgram(s) per kilogram.
1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022.
2. The Screening Levels for soil are based on a residential scenario for direct ingestion of contaminated soil.
Values exceeding the Screening Level are shaded gray.
ft bgs = Feet below ground surface.
Qual = Qualifier.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).

Table 6-3. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil, Site Inspection Report, Kalaeloa AASF #1-JRF

		Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-03		AOI01-04		AOI02-01		AOI02-02		AOI02-03		AOI02-04		KAASF-01		KAASF-02	
		Sample Name	AOI01-01-SB-13-15		AOI01-02-SB-13-15		AOI01-03-SB-13-15		KAASF-DUP-SB-02		AOI01-04-SB-13-15		AOI02-01-SB-13-15		AOI02-02-SB-13-15		AOI02-03-SB-13-15		AOI02-04-SB-13-15		KAASF-01-SB-13-15		KAASF-02-SB-13-15	
		Parent Sample ID							AOI01-03-SB-13-15															
		Sample Date	4/21/2022		4/20/2022		4/20/2022		4/20/2022		4/21/2022		4/18/2022		4/18/2022		4/15/2022		4/19/2022		4/11/2022		4/12/2022	
		Depth (ft bgs)	13-15		13-15		13-15		13-15		13-15		13-15		13-15		13-15		13-15		13-15		13-15	
Analyte	**Screening Level[1,2]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																								
Perfluorobutanesulfonic acid (PFBS)	25000	µg/kg	ND	U	6.5		0.047	J	0.049	J	ND	U	ND	U	ND	U	0.18	J	0.056	J	ND	UJ	ND	UJ
Perfluorohexanesulfonic acid (PFHxS)	1600	µg/kg	0.045	J	3.4		0.13		0.13		0.022	J	0.039	J	0.025	J	ND	U	0.32		ND	UJ	ND	UJ
Perfluorononanoic acid (PFNA)	250	µg/kg	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	U	ND	UJ	ND	UJ	ND	U	ND	U	ND	UJ	ND	UJ
Perfluorooctanesulfonic acid (PFOS)	160	µg/kg	0.15	J+	0.54		0.07		0.059	J	ND	U	ND	U	0.13	J+	ND	U	0.39	J+	0.071	J	0.068	J
Perfluorooctanoic acid (PFOA)	250	µg/kg	0.071	J+	0.2	J+	0.054	J+	0.061	J+	ND	U	ND	UJ	0.11	J+	ND	U	0.16	J+	0.037	J	0.024	J

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
UJ = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD). Associated numerical value is approximate.
µg/kg = Microgram(s) per kilogram.
1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022.
2. The Screening Levels for soil are based on incidental ingestion of soil in a industrial/commercial worker scenario.
ft bgs = Feet below ground surface.
Qual = Qualifier.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).

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Table 6-4. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report, Kalaeloa AASF #1-JRF

	Location ID	AOI01-01		AOI01-01		AOI01-01		AOI01-02		AOI01-03		AOI01-04	
	Sample Name	AOI01-01-SB-32-34		AOI01-01-SB-32-34 Duplicate		AOI01-01-SB-32-34 Triplicate		AOI01-02-SB-32-34		AOI01-03-SB-34-36		AOI01-04-SB-31-33	
	Parent Sample ID			AOI01-01-SB-32-34		AOI01-01-SB-32-34							
	Sample Date	4/21/2022		4/21/2022		4/21/2022		4/20/2022		4/20/2022		4/21/2022	
	Depth (ft bgs)	32-34		32-34		32-34		32-34		34-36		31-33	
Analyte	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)													
Perfluorobutanesulfonic acid (PFBS)	µg/kg	ND	U	ND	U	ND	U	0.075	J	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	ND	U	0.029	J	0.039	J	0.11		0.12		0.041	J
Perfluorononanoic acid (PFNA)	µg/kg	ND	UJ	ND	U	ND	U	ND	U	ND	UJ	ND	U
Perfluorooctanesulfonic acid (PFOS)	µg/kg	0.16	J+	0.21		0.28		0.33		0.11		ND	U
Perfluorooctanoic acid (PFOA)	µg/kg	0.032	J+	0.049	J	0.037	J	0.1		0.055	J+	0.024	J

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
UJ = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD). Associated numerical value is approximate.

µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
Qual = Qualifier.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).

Table 6-4. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil, Site Inspection Report, KAASF

	Location ID	AOI02-01		AOI02-02		AOI02-03		AOI02-04		KAASF-01		KAASF-02	
	Sample Name	AOI02-01-SB-34-36		AOI02-02-SB-36-38		AOI02-03-SB-36-38		AOI02-04-SB-36-38		KAASF-01-SB-40-42		KAASF-02-SB-46-48	
	Parent Sample ID												
	Sample Date	4/19/2022		4/18/2022		4/15/2022		4/19/2022		4/11/2022		4/12/2022	
	Depth (ft bgs)	34-36		36-38		36-38		36-38		40-42		46-48	
Analyte	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg													
Perfluorobutanesulfonic acid (PFBS)	µg/kg	ND	U	ND	U	0.37		0.078	J	ND	UJ	ND	UJ
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	0.092		0.029	J	ND	U	0.55		ND	UJ	ND	UJ
Perfluorononanoic acid (PFNA)	µg/kg	ND	UJ	0.047	J	ND	U	ND	U	ND	UJ	ND	UJ
Perfluorooctanesulfonic acid (PFOS)	µg/kg	0.5	J+	0.74	J+	ND	U	0.89	J+	ND	UJ	0.38	J
Perfluorooctanoic acid (PFOA)	µg/kg	0.12	J+	ND	U	ND	U	0.64	J+	ND	UJ	ND	UJ

Notes:
J = Estimated concentration.
J+ = Estimated concentration, biased high.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
UJ = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD). Associated numerical value is approximate.

µg/kg = Microgram(s) per kilogram.
ft bgs = Feet below ground surface.
Qual = Qualifier.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).

Table 6-5. PFOA, PFOS, PFNA, and PFHxS Results in Groundwater, Site Inspection Report, Kalaeloa AASF #1-JRF

		Location ID	AOI01-01		AOI01-02		AOI01-02		AOI01-03		AOI01-04		AOI01-MW11		AOI02-01		AOI02-02	
		Sample Name	AOI01-01-GW		AOI01-02-GW		KAASF-DUP-GW-01		AOI01-03-GW		AOI01-04-GW		AOI01-MW11-GW		AOI02-01-GW		AOI02-02-GW	
		Parent Sample ID					AOI01-02-GW											
		Sample Date	5/5/2022		5/4/2022		5/4/2022		5/4/2022		5/5/2022		5/5/2022		5/2/2022		5/2/2022	
Analyte	**Screening Level[1]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (ng/L)																		
Perfluorobutanesulfonic acid (PFBS)	601	ng/L	6.6	J	480	J	530	J	8	J	4.8	J	ND	UJ	3.4		11	
Perfluorohexanesulfonic acid (PFHxS)	39	ng/L	50	J	7100	J	6700	J	64	J	14	J	36	J	32		65	
Perfluorononanoic acid (PFNA)	6	ng/L	0.99	J	35	J	34	J	2.3	J	0.9	J	ND	UJ	1.2	J	19	
Perfluorooctanesulfonic acid (PFOS)	4	ng/L	25	J	5700	J	6900	J	50	J	16	J	200	J	22		120	
Perfluorooctanoic acid (PFOA)	6	ng/L	52	J	740	J	710	J	55	J	18	J	36	J	17		48	

Notes:
J = Estimated concentration.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
UJ = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD). Associated numerical value is approximate.
ng/L = Nanogram(s) per liter.
1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022.
Values exceeding the Screening Level are shaded gray.
Qual = Qualifier.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).

Table 6-5. PFOA, PFOS, PFNA, and PFHxS Results in Groundwater, Site Inspection Report, Kalaeloa AASF #1-JRF

		Location ID	AOI02-03		AOI02-04		AOI02-04		KAASF-01		KAASF-02		Source-1		Source-2	
		Sample Name	AOI02-03-GW		AOI02-04-GW		KAASF-DUP-GW-02		KAASF-01-GW		KAASF-02-GW		Source 1-18		Source 2-18	
		Parent Sample ID					AOI02-04-GW									
		Sample Date	5/3/2022		5/5/2022		5/5/2022		4/29/2022		5/4/2022		11/18/2021		11/18/2021	
Analyte	**Screening Level[1]**	**Unit**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (ng/L)																
Perfluorobutanesulfonic acid (PFBS)	601	ng/L	200		13	J	12	J	6.4		0.38	J	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	39	ng/L	29		140	J	130	J	8.8		0.61	J	ND	U	ND	U
Perfluorononanoic acid (PFNA)	6	ng/L	ND	U	1.5	J	1.6	J	0.75	J	ND	UJ	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	4	ng/L	13	J	51	J	51	J	8.1		4.6	J	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	6	ng/L	22		140	J	150	J	7		1.8	J	ND	U	ND	U

Notes:
J = Estimated concentration.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
UJ = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD). Associated numerical value is approximate.
ng/L = Nanogram(s) per liter.
1. Assistant Secretary of Defense. July 2022. Risk-Based Screening Levels in Groundwater and Soil using EPA's Regional Screening Level Calculator. Hazard Quotient (HQ)=0.1. May 2022.
Values exceeding the Screening Level are shaded gray.
Qual = Qualifier.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).

Army National Guard Site Inspections
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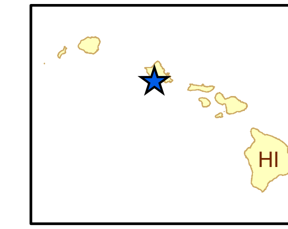
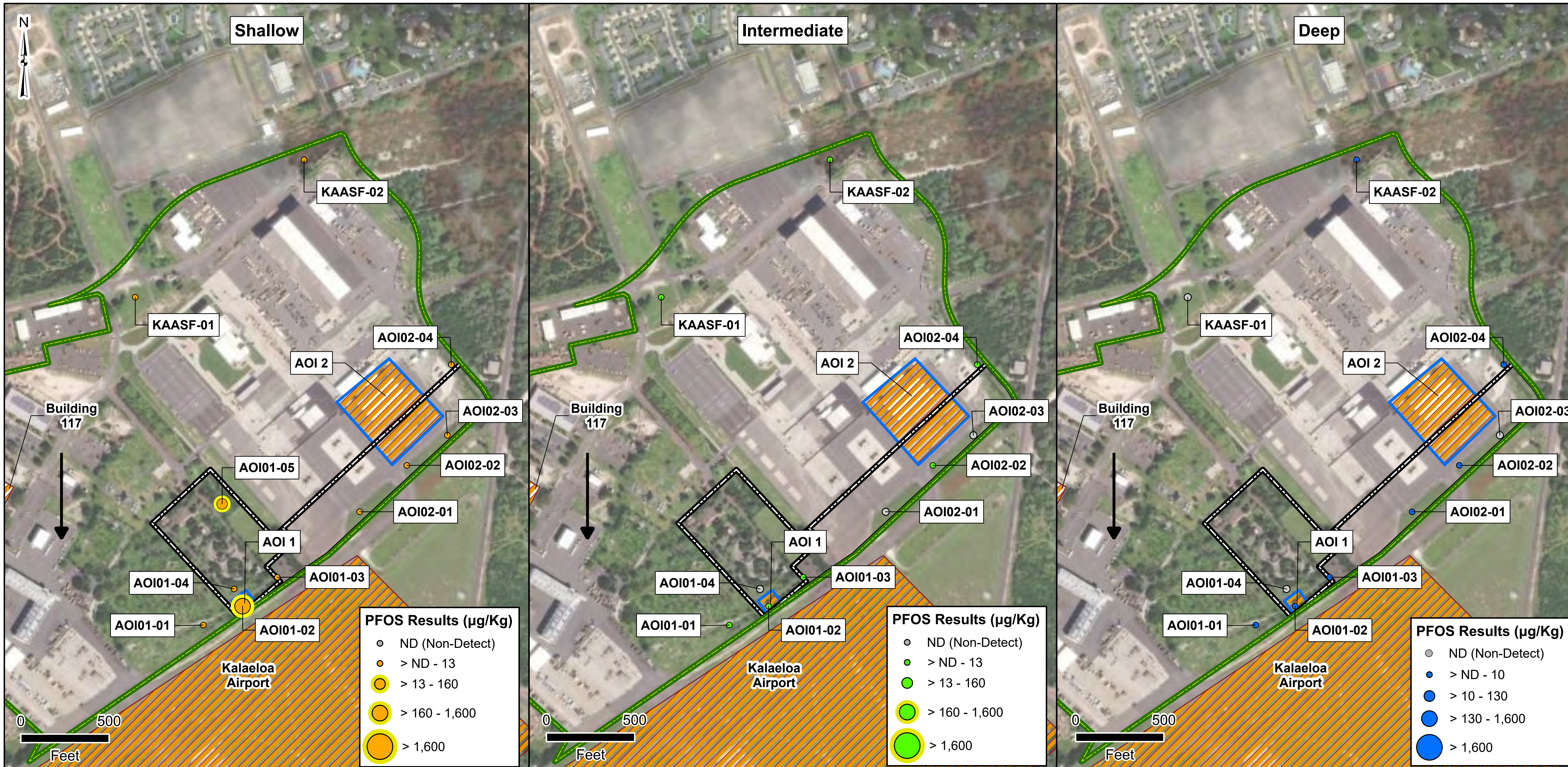


Figure 6-1
AOI 1 and AOI 2
PFOS Detections in Soil



Facility Data

- Facility Boundary
- Leased Parcels
- Area of Interest
- Potential Release Area

Hydrogeology

- Groundwater Flow Direction

Notes:
PFOS = Perfluorooctanesulfonic acid
Exceedances of the OSD SL are depicted with a yellow halo. Depth intervals shown represent respective sampling position within a given soil boring location.

Data Sources:
ESRI 2022
AECOM 2019

Date:....................November 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 4N

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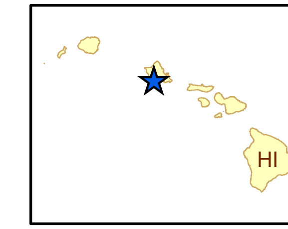
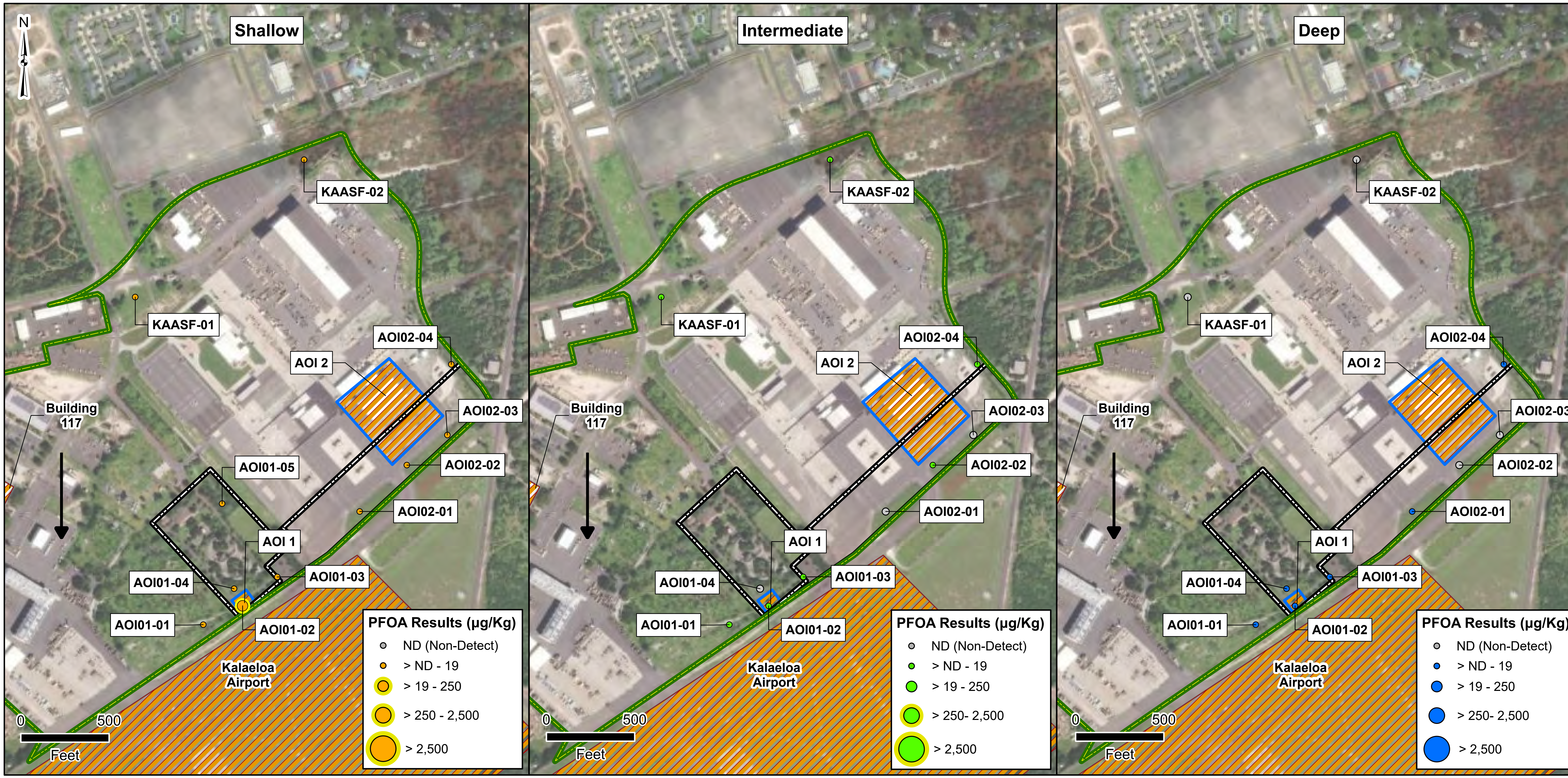
Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

Figure 6-2
AOI 1 and AOI 2
PFOA Detections in Soil





Facility Data
- Facility Boundary
- Leased Parcels
- Area of Interest
- Potential Release Area

Hydrogeology
- Groundwater Flow Direction

Notes:
PFOA = Perfluorooctanoic acid
Exceedances of the OSD SL are depicted with a yellow halo. Depth intervals shown represent respective sampling position within a given soil boring location.

Data Sources:
ESRI 2022
AECOM 2019

Date:......................November 2023
Prepared By:.............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 4N

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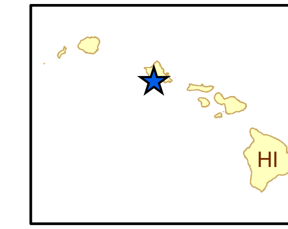
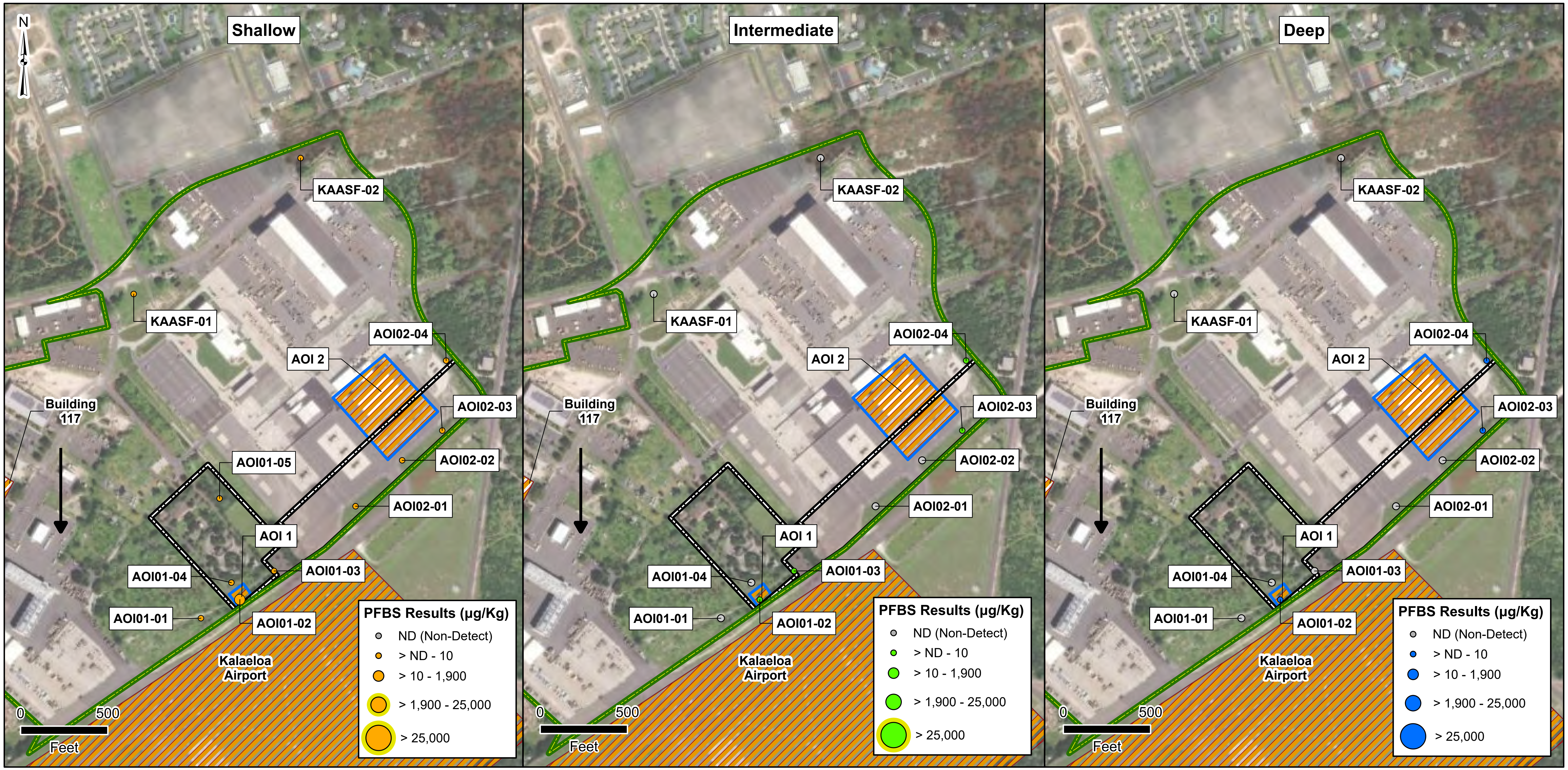
Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

Figure 6-3
AOI 1 and AOI 2
PFBS Detections in Soil





Facility Data

- Facility Boundary
- Leased Parcels
- Area of Interest
- Potential Release Area

Hydrogeology

- Groundwater Flow Direction

Notes:
PFBS = Perfluorobutanesulfonic acid
Exceedances of the OSD SL are depicted with a yellow halo. Depth intervals shown represent respective sampling position within a given soil boring location.

Data Sources:
ESRI 2022
AECOM 2019

Date:......................November 2023
Prepared By:.............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 4N

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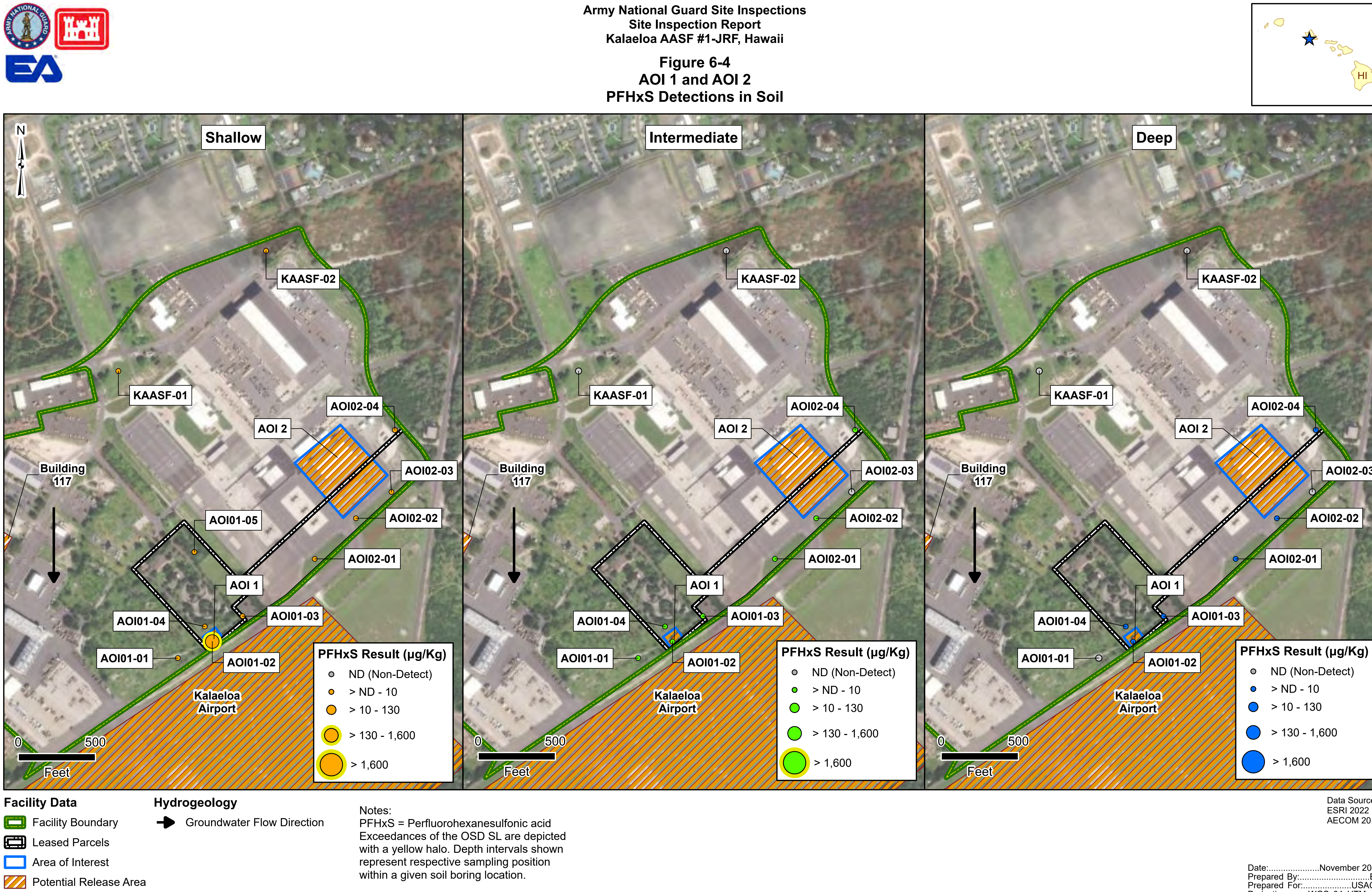
Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

Figure 6-4
AOI 1 and AOI 2
PFHxS Detections in Soil



Notes:
PFHxS = Perfluorohexanesulfonic acid
Exceedances of the OSD SL are depicted with a yellow halo. Depth intervals shown represent respective sampling position within a given soil boring location.

Data Sources:
ESRI 2022
AECOM 2019

Date:....................November 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:.......WGS 84 UTM 4N

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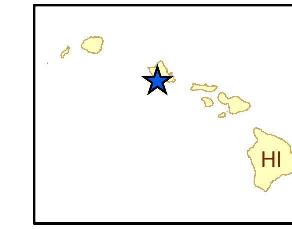
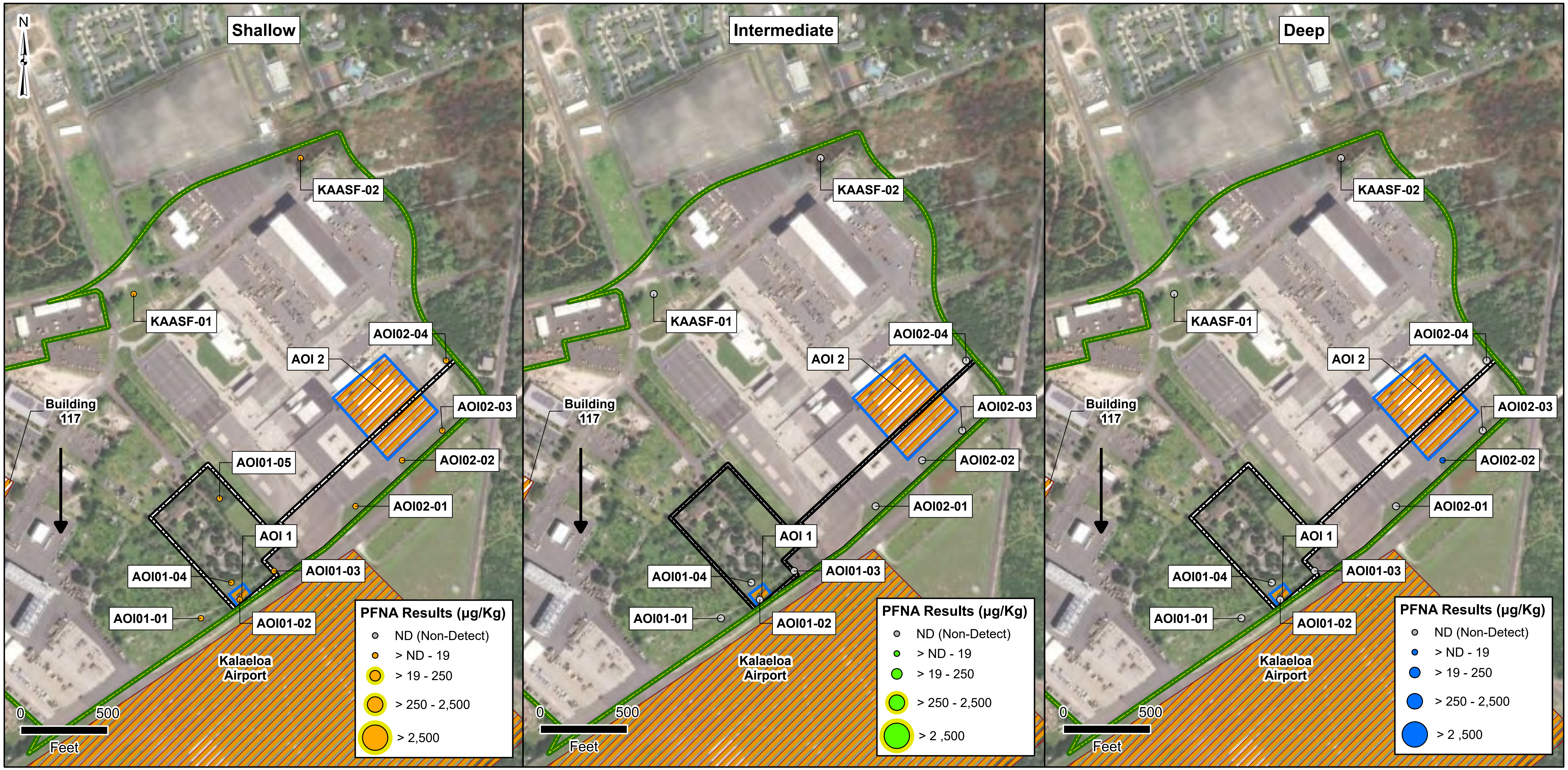
Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

Figure 6-5
AOI 1 and AOI 2
PFNA Detections in Soil





Facility Data

- Facility Boundary
- Leased Parcels
- Area of Interest
- Potential Release Area

Hydrogeology

- Groundwater Flow Direction

Notes:
PFNA = Perfluorononanoic acid
Exceedances of the OSD SL are depicted with a yellow halo. Depth intervals shown represent respective sampling position within a given soil boring location.

Data Sources:
ESRI 2022
AECOM 2019

Date:......................November 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 4N

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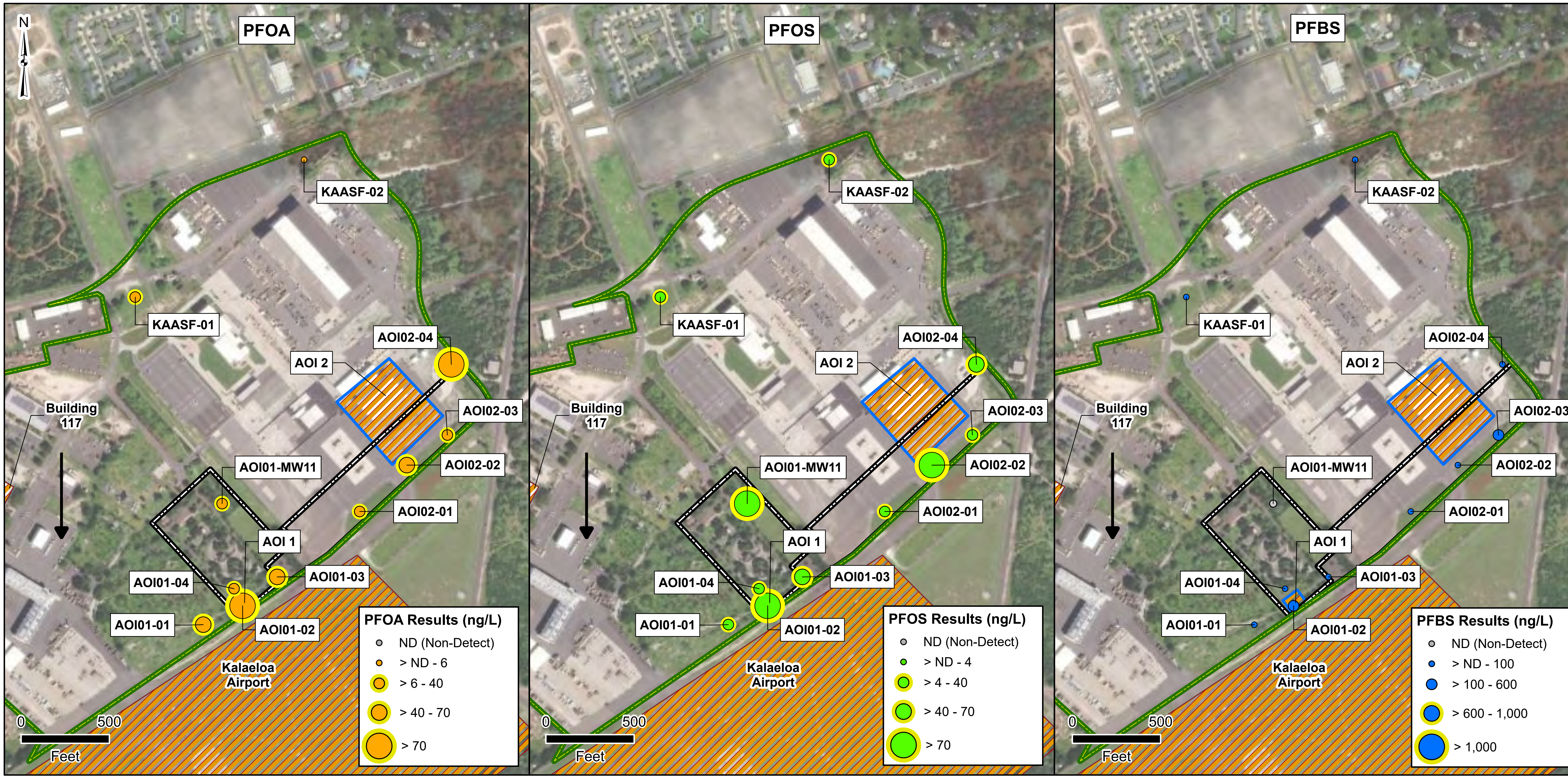
Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

Figure 6-6
AOI 1 and AOI 2
PFOA, PFOS and PFBS Detections in Groundwater



Facility Data
- Facility Boundary
- Leased Parcels
- Area of Interest
- Potential Release Area

Hydrogeology
- Groundwater Flow Direction

Notes:
PFOA = Perfluorooctanesulfonic acid
PFOS = Perfluorooctanoic acid
PFBS = Perfluorobutanesulfonic acid
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2022
AECOM 2019

Date:......................November 2023
Prepared By:.............................EA
Prepared For:...................USACE
Projection:.......WGS 84 UTM 4N

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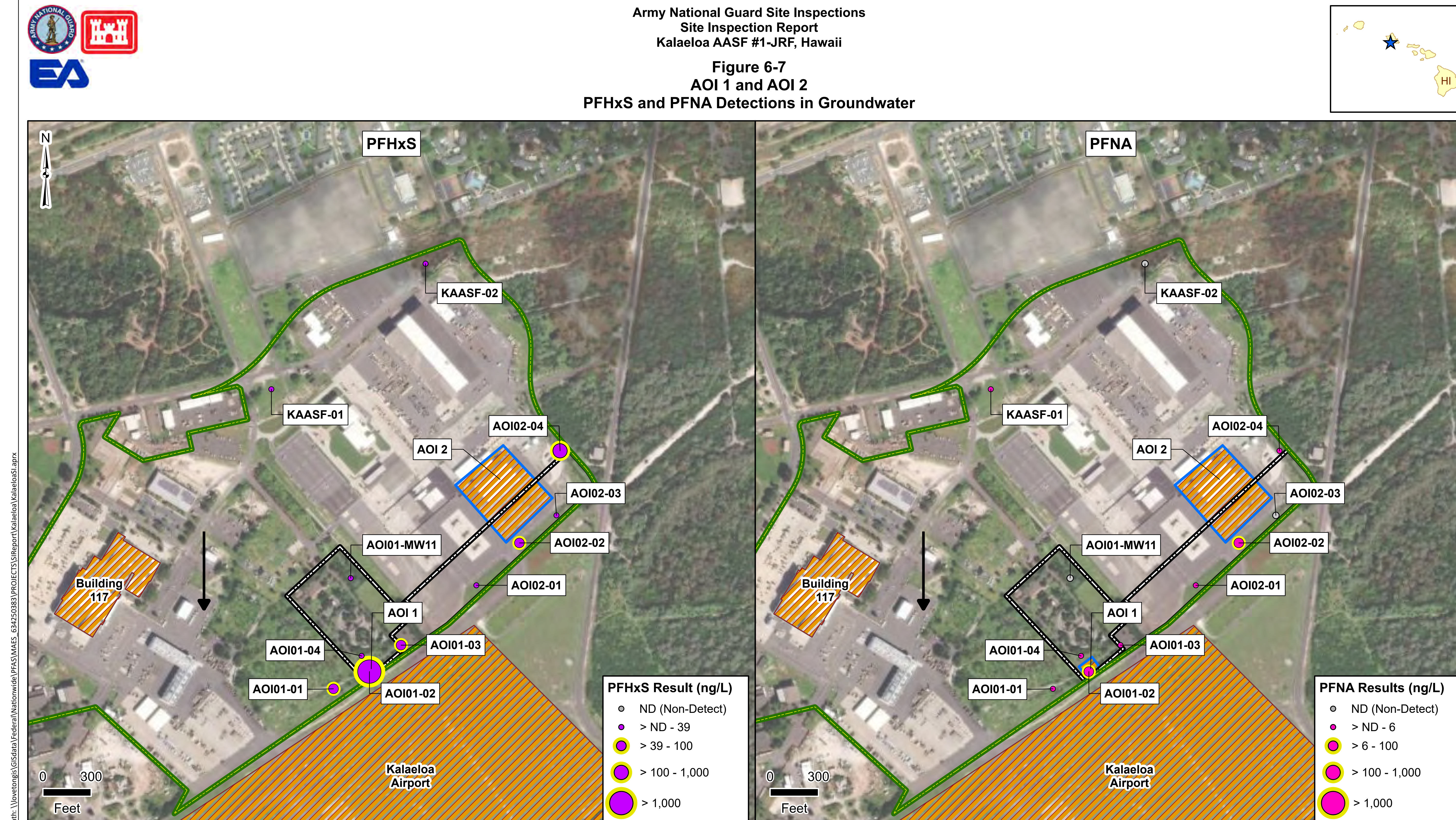
Army National Guard Site Inspections
Site Inspection Report
Kalaeloa AASF #1-JRF, Hawaii

Figure 6-7
AOI 1 and AOI 2
PFHxS and PFNA Detections in Groundwater



Facility Data
- Facility Boundary
- Leased Parcels
- Area of Interest
- Potential Release Area

Hydrogeology
- Groundwater Flow Direction

Notes:
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
Exceedances of the OSD SL are depicted with a yellow halo.

Data Sources:
ESRI 2020
AECOM 2020

Date:......................November 2023
Prepared By:..............................EA
Prepared For:.....................USACE
Projection:........WGS 84 UTM 4N

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7. EXPOSURE PATHWAYS

The conceptual site model (CSM) for the AOIs, revised based on the SI findings, are presented on **Figure 7-1**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined solely based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present. SLs are presented in Section 6.1 of this report.

1. Contaminant source
2. Environmental fate and transport
3. Exposure point
4. Exposure route
5. Potentially exposed populations.

If any of these elements are missing, the pathway is incomplete. The CSM figures use an empty circle symbol to represent an incomplete exposure pathway. Areas with no identified complete pathway generally warrant no further action. However, the pathway is considered potentially complete if the relevant compounds are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of relevant compounds above the SLs. Areas with an identified potentially complete pathway that have detections of the relevant compounds above the SLs may warrant further investigation. Although the CSMs indicate whether potentially complete exposure pathways may exist, the recommendation for future study in a remedial investigation (RI) or no action at this time is based on the comparison of the SI analytical results for the relevant compounds to the SLs and whether the release came from DoD activities.

In general, the potential routes of exposure to the relevant compounds are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA 2001). Receptors at the Facility include Facility workers (e.g., Facility staff and visiting soldiers), construction workers, trespassers, residents outside the Facility boundary, and recreational users outside of the Facility boundary.

7.1 SOIL EXPOSURE PATHWAY

The SI results for soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria.

7.1.1 AOI 1

On 12 October 2017, an HDOT-A Kalaeloa ARFF Unit discharged the contents of a firetruck's water tank, containing 25 gallons of 1.6% Chemguard C301MS AFFF mixed with water, during pump testing/repair along the fence line at AOI 1. The site is covered with low grass and shrubs and there have been no documented releases in this area by the HIARNG.

All five relevant compounds were detected in surface soil at AOI 1. PFOS, PFOA, and PFHxS were detected above SLs in surface soil at two locations, AOI01-01 and AOI01-02. Site workers, construction workers, and trespassers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for site workers, future construction workers, and trespassers is considered potentially complete. PFOA, PFOS, PFHxS, and PFBS were detected below their respective SLs in subsurface soil between 13-15ft bgs. Ground disturbing activities could result in future construction worker exposure. Therefore, the soil exposure pathway for future construction workers is considered potentially complete. The CSM is presented in **Figure 7-1**.

7.1.2 AOI 2

AOI 2 encompasses the hangar at Kalaeloa AASF #1-JRF, which includes an AFFF suppression system and storage as well as the northern Facility boundary. There have been no documented releases of AFFF at AOI 2, however the potential exists for the incidental release of stored material.

All five relevant compounds were detected in soil at AOI 2. None were detected above SLs. Site workers, construction workers, and trespassers could contact constituents in soil via incidental ingestion, dermal contact, and inhalation of dust. Therefore, the soil exposure pathway for site workers, future construction workers, and trespassers is potentially complete. PFOA, PFOS, PFHxS, and PFBS were detected in subsurface soil at AOI 2 and the boundary sample locations below their respective SLs. Ground disturbing activities to this area could result in future construction worker exposure via incidental ingestion. Therefore, the soil exposure pathway for future construction workers is considered potentially complete. The CSM is presented in **Figure 7-2**.

7.2 GROUNDWATER EXPOSURE PATHWAY

The SI results for relevant compounds in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors at each AOI based on the aforementioned criteria.

7.2.1 AOI 1

Drinking water at Kalaeloa AASF #1-JRF is resourced from public drinking water wells. No drinking water wells exist at the Facility, and no private supply wells exist downgradient. Groundwater in the upper, unconfined aquifer is not used for drinking water purposes due to the salinity levels and high vulnerability to contamination (AECOM 2020).

Groundwater was encountered at depths between approximately 34 to 36 ft bgs in the area of AOI 1. As such, groundwater is not considered a complete pathway via drinking water ingestion for any receptor nor via incidental ingestion during excavation activities by construction workers. The CSM is presented in **Figure 7-1**.

7.2.2 AOI 2

As noted above, no drinking water wells exist at the Facility, and no private supply wells exist downgradient. Groundwater was encountered at depths between approximately 36 to 38 ft bgs in the area of AOI 2. As such, groundwater is not considered a complete pathway via drinking water ingestion for any receptor nor via incidental ingestion during excavation activities by construction workers. The CSM is presented in **Figure 7-2**.

7.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAY

PFAS are water soluble and can migrate readily from soil to surface water or groundwater. There are no natural surface water features within the Facility, and surface water and potentially sediment drain into shallow injection wells located around the Facility. These wells are below the UIC line and are not considered a drinking water source. Therefore, the surface water/sediment pathway is considered incomplete. Refer to **Figures 7-1 and 7-2.**

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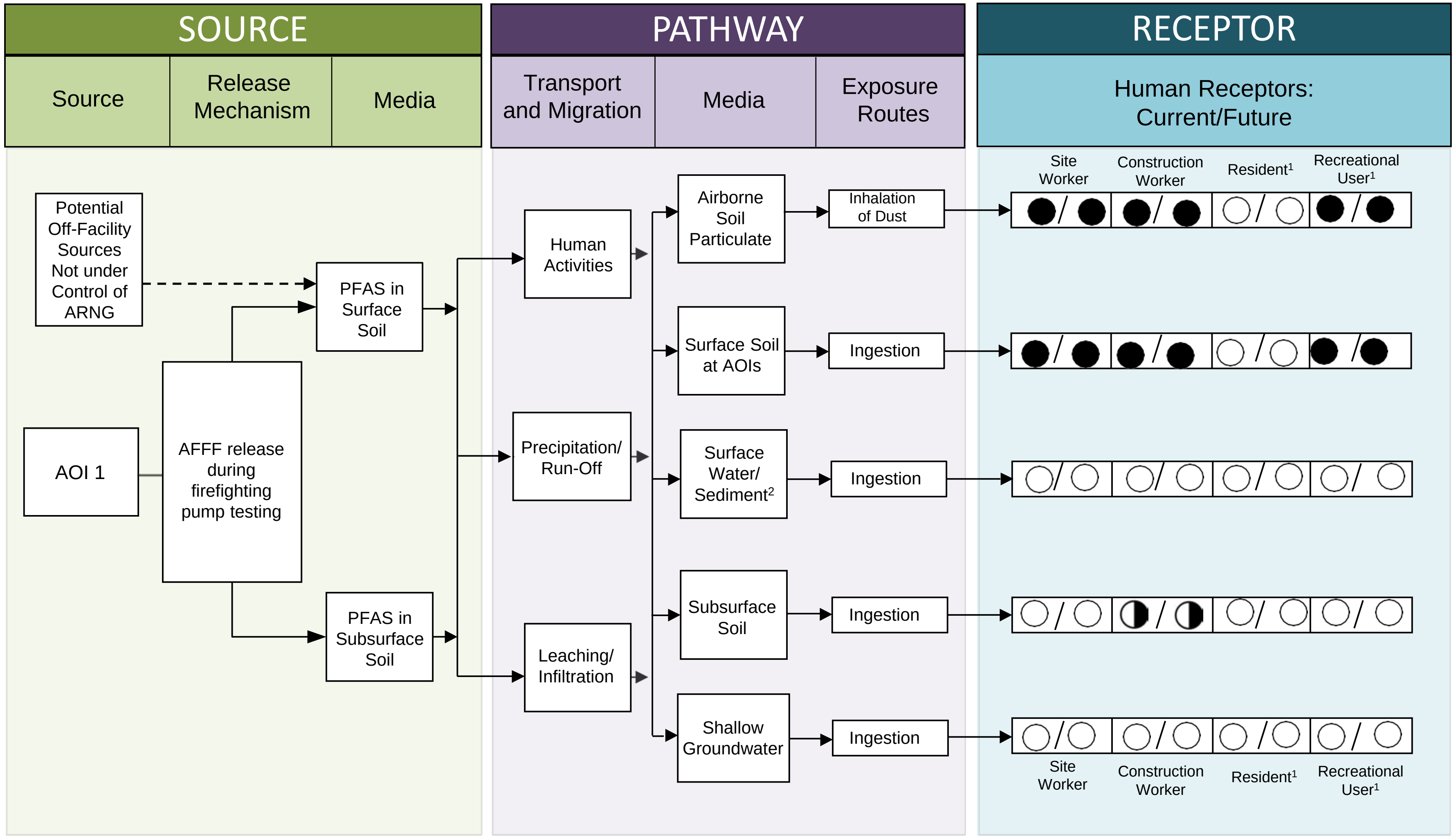

LEGEND

- Flow Chart Stops
- Flow Chart Continues
- Partial/ Possible Flow
- Incomplete Pathway
- Partially Complete Pathway
- Potentially Complete Pathway with Exceedance of Screening Level

Notes:

1. The resident and recreational users refer to off-site receptors.

Figure 7-1
Conceptual Site Model
AOI 1 Kalaeloa AASF #1-JRF

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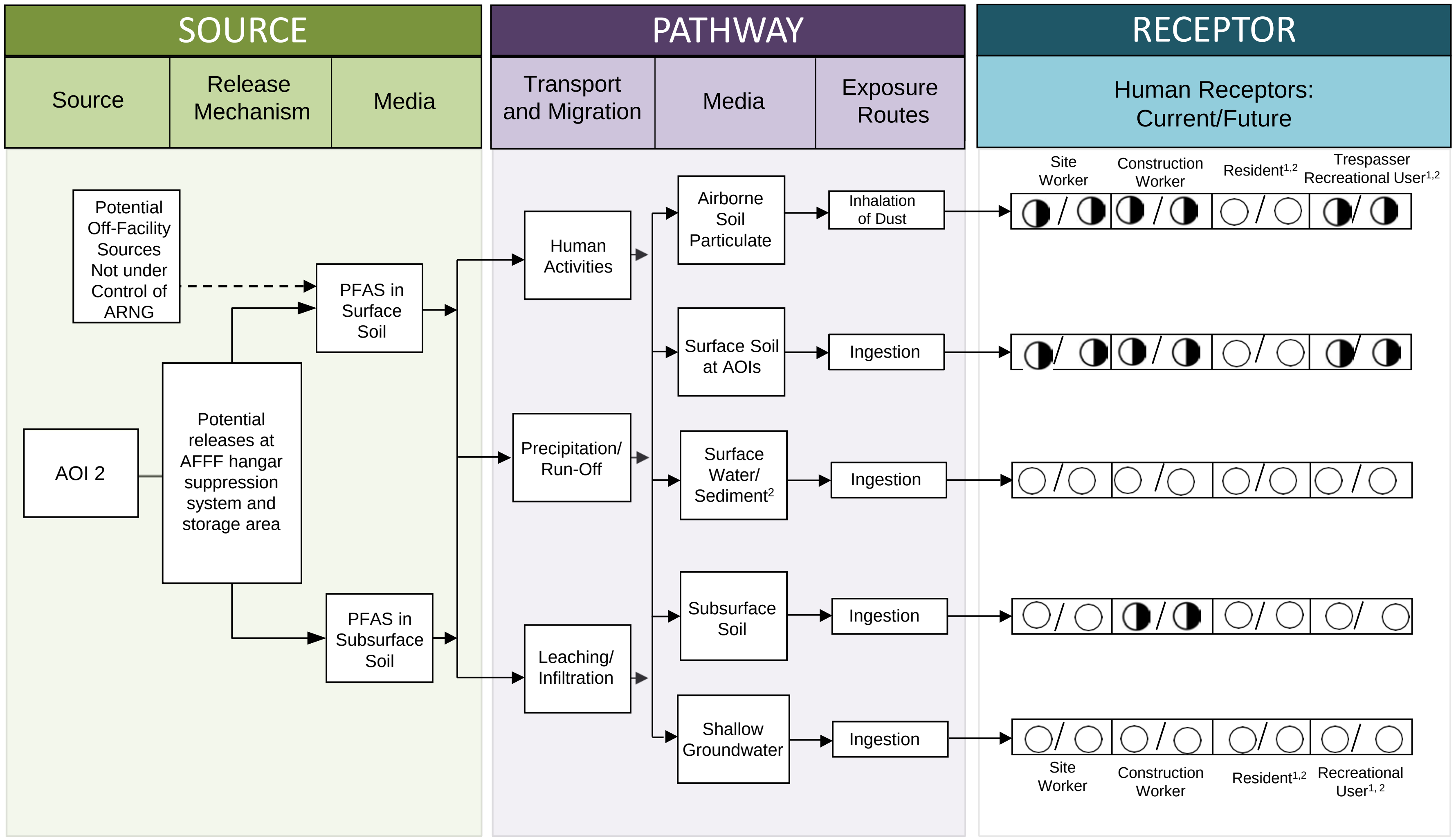

LEGEND

Flow-Chart Stops

Flow-Chart Continues

Partial / Possible Flow

Incomplete Pathway

Potentially Complete Pathway

Complete Pathway

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-2
Conceptual Site Model
AOI 2 Kalaeloa AASF #1-JRF, HI

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8. SUMMARY AND OUTCOME

This section summarizes SI activities and findings. The most significant findings are summarized in this section and are reproduced directly or abstracted from information contained in this report. The outcome provides general and comparative interpretations of the findings relative to the SLs.

8.1 SITE INSPECTION ACTIVITIES

The SI field activities at the Facility were conducted on 25 March through 5 May 2022. The SI field activities included geophysical surveys, soil sample collection, permanent monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2022), except as previously noted in **Section 5.8**.

To fulfill the project DQOs set forth in the approved SI UFP-QAPP Addendum (EA 2022), samples were collected and analyzed for a subset of 24 compounds by LC/MS/MS compliant with QSM Version 5.3 Table B-15 as follows:

- Thirty-one (31) soil sample from 11 locations (10 soil borings locations, one in the vicinity of an existing monitoring well location)
- Eleven (11) grab groundwater samples from well locations
- Twenty-six (26) QA/QC samples

An SI is conducted when the PA determines an AOI exists based on probable use, storage, and/or disposal of PFAS-containing materials. The SI includes multi-media sampling at AOIs to determine whether or not a release has occurred. The SI may conclude further investigation is warranted, a removal action is required to address immediate threats, or no further action is required. Additionally, the CSMs were refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOIs, which are described in **Section 7**.

8.2 OUTCOME

Based on the results of this SI, further evaluation under CERCLA is warranted in an RI for AOI 2 (see **Table 8-1**). Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to site workers, construction workers, and trespassers at AOI 2 from sources on the Facility resulting from historical DOD activities.

There is also a potential for exposure to site workers, construction workers, and trespassers at AOI 1 from AFFF releases during HDOT firefighting training activities. However, at no point during either the PA or the SI was there any evidence that the relevant compounds at AOI 1 were the result of current or historical ARNG/DoD activities.

Sample chemical analytical concentrations collected during this SI were compared against the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to SLs is as follows:

- AOI 1:

  — PFOS, PFOA, PFBS, PFNA, and PFHxS were detected in the five soil boring/hand auger locations at AOI 1. PFOA and PFHxS exceeded the SLs at one location with maximum concentrations of 100 µg/kg (110 µg/kg in duplicate sample) and 340 µg/kg (360 µg/kg in duplicate sample), respectively. PFOS exceeded the SL at two locations with a maximum concentration of 1,500 µg/kg. PFBS and PFNA did not exceed the SL in any sample.

  — PFOS, PFOA, PFBS, PFNA, and PFHxS were detected in groundwater from the five monitoring wells at AOI 1. PFOS and PFOA exceeded the SL in groundwater in all five wells with maximum concentrations of 5,700 ng/L (6,900 ng/L in duplicate sample) and 740 ng/L, respectively. PFNA exceeded the SL in groundwater in one of five wells with a maximum concentration of 35 ng/L. PFHxS exceeded the SL in groundwater in three of five wells with a maximum concentration of 7,100 ng/L. PFBS did not exceed the SL in any sample. There is no evidence that any of the relevant compounds at AOI 1 were the result of current or historical ARNG/DoD activities; therefore, no Further Action under CERCLA is warranted.

- AOI 2:

  — PFOS, PFOA, PFBS, PFNA, and PFHxS were detected in soil at AOI 2 at source locations at concentrations below the SLs. PFOA and PFOS were detected below their respective SLs in the two boundary sample locations, KAASF-01 and KAASF-02, as well.

  — PFOS, PFOA, PFBS, PFNA, and PFHxS were detected in groundwater from the four monitoring wells associated with the source area at AOI 2 as well as the two boundary locations, KAASF-01 and KAASF-02. PFOS and PFOA exceeded the SLs in groundwater in all four source area wells with maximum concentrations of 140 ng/L and 120 ng/L, respectively. PFOA exceeded the SL in boundary well KAASF-01 with a concentration of 7 ng/L. PFOS exceeded the SL in both boundary well locations with concentrations of 8.1 and 4.6 ng/L in KAASF-01 and KAASF-02, respectively. PFNA exceeded the SL in groundwater in one of four wells with a maximum concentration of 19 ng/L. PFHxS exceeded the SL in groundwater in two of four wells with a maximum concentration of 140 ng/L. PFBS did not exceed the SL in any sample. Based on the results of the SI, further evaluation of AOI 2 is warranted in the RI.

Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC AFFF and based on its history including distribution limitations that restricted use of GenX, it is generally not a component of other products the military used. In addition, it is unlikely that GenX would be an individual chemical of concern in the absence of other PFAS.

Table 8-1 summarizes the SI results for soil and groundwater used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI.

Table 8-1. Summary of Site Inspection Findings and Recommendations

AOI	Potential Release Area	Soil Source Area	Groundwater Source Area	Groundwater Facility Boundary	Future Action
1	**Former Fuel Farm Area**	●	●	●	**No further action under CERCLA**
2	**Hangar Suppression and Storage**	◐	●	●	**Proceed to RI**

Legend:

● = Detected; exceedance of screening levels

◐ = Detected; no exceedance of screening levels

○ = Not detected

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